



Watersheds Coalition of Ventura County Proposition 84 IRWMP Implementation Grant
Attachment 9 – Economic Analysis - Flood Damage Reduction Costs and Benefits

This attachment will provide estimates for the flood damage reduction benefits for applicable projects. Only include this attachment if projects in the proposal claim flood damage reduction benefits. See Exhibit E for detailed guidance on the preparation of this attachment.

Note that commitment to providing the flood damage reduction benefits will become a term of the grant agreement if the Proposal is selected for funding.

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I. The Nature Conservancy Natural Floodplain Protection Program (SC-7)

Summary

The Nature Conservancy (TNC) is planning to implement the Natural Floodplain Protection Program (NFPP). This program will preserve critical sections of the remaining undeveloped 500-year floodplain in the Santa Clara River Watershed in Ventura County by establishing a Floodplain Conservation Zone. TNC will acquire private property easements as a means to preclude future development, preserving highly productive farmland and riparian habitat along the Santa Clara River, and preventing urban development in the floodplain that leads to levee building, degraded floodplain functioning and habitat, and increased downstream flood damage.

The project is the first step in a stakeholder initiative organized under the Floodplain Working Group (FWG), which includes representatives from the Ventura County Watershed Protection District (VCWPD), Ventura County Farm Bureau (Farm Bureau), Ventura County

Resource Conservation District (VCRCD), Natural Resources Conservation Service (NRCS), and TNC. The NFPP targets acquisition of 225 acres of easement of the approximately 4,100 total acres in the 500-year floodplain of the Watershed. TNC anticipates that with acquisition of sufficient easements in key areas of the 500-year floodplain, the risk of development on the remaining lands will be substantially reduced, and therefore it will not be necessary to acquire easements across the entire floodplain. Ultimately, TNC hopes to establish conservation easements to protect the 80 percent of the floodplain that is likely to be developed (approximately 3,280 acres) starting with the 225 acres targeted under this initial step. The benefits from protection will increase over time as additional acres are acquired in the future.

A summary of all benefits and costs of the project is provided in Table 1. Flood control benefits are discussed in the remainder of this attachment.

Table 1: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and Operations and Maintenance	\$3,786,300
Monetizable Benefits	
Flood Control Benefits	
Avoided Downstream Flood Damage	\$9,902,622
Total Monetizable Benefits	\$9,902,622
Qualitative Benefit or Cost	Qualitative Indicator*
Water Supply Benefits	
Avoided Loss of Groundwater Recharge	+
Water Quality and Other Benefits	
Maintain Protected Riparian Habitat	++
Avoided Degradation of Water Quality	+
Protect Wetland and Riparian Habitats	++
Recovery of Endangered Southern Steelhead	++
Protect Farmland from Development	++
Provide Educational and Recreational Opportunities	+
Flood Control Benefits	
Avoided Construction Cost of New Levees	++
Avoided Maintenance Costs for New Levees	++
Avoided Upgrade Costs for Existing Levees	++

Notes:

* Direction and magnitude of effect on net benefits:

- + = Likely to increase net benefits relative to quantified estimates.
- ++ = Likely to increase net benefits significantly.
- = Likely to decrease benefits.
- = Likely to decrease net benefits significantly.
- U = Uncertain, could be + or -.

The “Without Project” Baseline

The NFPP is located in the Santa Clara River Watershed (Watershed), from the Ventura County line upstream to the estuary downstream. The River originates on the northern slope of the San Gabriel Mountains in Los Angeles County, traverses Ventura County, and flows into the Pacific Ocean between the cities of San Buenaventura (Ventura) and Oxnard (LAWQCB 2010a). Municipalities within the Watershed include Santa Clarita in the Los Angeles County portion, and Fillmore and Santa Paula in the Ventura County portion. The Cities of Oxnard and Ventura are located in the Ventura Coastal Watershed, which includes the areas downstream of the Santa Clara River Watershed (LAWQCB 2010b).

The predominant land uses in the Watershed include agriculture, open space, and residential uses. The gross value of agricultural output in Ventura County in 2009 was \$1.6 billion (County of Ventura, 2010). Ventura County is the 9th most agriculturally productive county in the State of California and the 10th most productive in the nation. Due to the high value of land in Ventura County, farmers specialize in high value crops, and grow more strawberries, lemons, and celery than any other county in the U.S. Almost all high value crops in the County require irrigation, often from local groundwater sources that benefit from recharge from the floodplain.

The Watershed remains relatively pristine in comparison with other large coastal Southern California rivers, but rapid population growth and economic development in the Watershed have led development to encroach into the floodplain. When this happens, levees are built and the river is channelized to reduce flooding risks to the development. This often leads to

greater water velocities and more serious and extensive flooding downstream.

Currently, the cities of Fillmore and Santa Paula are annexing property along the Santa Clara River and expanding. In the Upper Santa Clara Watershed, numerous development projects along the Santa Clara River in the City of Santa Clarita are either in the approval process or partly built – on the order of 60,000 housing units. The planned Newhall Ranch Subdivision alone involves adding 20,885 homes and additional commercial real estate along the Santa Clara River. This development will eliminate 140 acres of floodplain (Billingsley, 2010; Friends of the Santa Clara River, 2009).

If development in the Watershed continues and this project is not implemented, it is anticipated that 80 percent of the Santa Clara River floodplain will be developed or impacted by levees to protect nearby development. Thus, without the project, residents along the Santa Clara River downstream will experience increased flood damage to their properties. Ventura County will also incur substantial costs associated with new flood control structures and maintenance and upgrade of existing levees in order to protect the development that would occur absent the project.

Flood Control Benefits

Flood control benefits include avoided downstream flood damage, avoided cost of new flood control structures, and avoided maintenance / upgrade of existing levees. Avoided downstream flood damage has been monetized using the Flood Rapid Assessment Model (FRAM).

Avoided Downstream Flood Damage

VCWPD provided a technical report titled “Hydraulic Impact Analysis of the Santa Clara

River Floodplain Protection Program” found as Exhibit 9-1 (Att9_IG1_DEeduc_2of2.pdf on BMS) that provided inputs to FRAM to assess the avoided downstream flood damage from the full NFPP (VCWPD, 2010a). Those inputs include the results of a modeling analysis to determine flood damages for a 50-, 100-, and 500-year flood with and without the project for existing residential and commercial properties, both for structural and contents damages. This report uses the Santa Clara River HEC-RAS model to calculate hydrologic impacts, and calculates the change in flood damage costs to existing residential and commercial properties.

VCWPD estimates that total inundation areas for a given 100-year flood event change only slightly from the without-project condition to the with-project conditions (from 15,737 acres to 15,765 acres). However, the locations of these 100-year flood inundation areas will shift from upstream to downstream, and primarily from agricultural lands/open space areas to existing urban areas, which are mostly concentrated in the City of Oxnard. The same holds true of the 50- and 500-year events (VCWPD, 2010a). As a result, the number of structures affected by a flood, as well as the value of residential and commercial flood damages, will increase dramatically if the floodplain is not protected by the NFPP. Agricultural damages will be lower without the NFPP because less agricultural acreage will be affected as the inundation areas shift downstream towards more urban areas in the City of Oxnard.

The damage calculations produced by VCWPD include the effects of the existing SCR-1 levee that is just upstream of the City of Oxnard. VCWPD estimates that the levee will not provide protection in a 100-year flood event in the without-project condition because of the lack of freeboard during a 100-year event. However, with the NFPP, the levee is estimated to provide its intended partial protection of the City of Oxnard. Since the damage estimates already include the protective effects of this levee, a value of 1.0 was entered into FRAM for the probability of levee failure for both the with- and without-project condition. A flood warning time of 4.5 hours was entered into FRAM, which is the average of the 3-6 hour range that was provided by VCWPD, and the selection

was made in FRAM to show that the community has flood experience.

The residential and commercial damage estimates are based on figures from the U.S. Department of Housing and Urban Development (HUD) and consider the assessed values of existing structures. According to the HUD flood damage estimate method, flood damages are estimated based on structure and content values. Content values are assumed to be 35 percent of structure values for residential buildings and 100 percent for commercial buildings (VCWPD, 2010a). VCWPD calculated flooding depth and associated damages using HEC-RAS.

The change in agricultural flood damage was also assessed. VCWPD modeled how much total agricultural land will experience flooding under a 50-, 100-, and 500-year flood for both the with- and without-project scenarios. VCWPD also provided an estimate of the composition of agricultural crops based on the Ventura County Parcel GIS database. There was not a direct match between the crops available for selection in FRAM and crops listed in the GIS database. Therefore, the crops in the GIS database with the largest share of acreage were aligned as closely as possible with the crops in the FRAM model based on the relative values of the crops within FRAM as well as with the types of crops within FRAM as follows: citrus crops (oranges, lemons, and grapefruit) were assumed to be equivalent to “walnuts” in FRAM because walnuts and almonds were the tree crops quantified. Mixed orchards such as avocado were not defined, but were assumed to exclude oranges, lemons and grapefruit. Mixed orchards were assumed to be equivalent to “almonds” in FRAM, to utilize the other orchard crop defined in FRAM. Since nut crops are higher value than citrus crops, the estimates are potentially overstated.

Pasture and rangeland were assumed to be equivalent to “pasture” in FRAM. Finally, all truck crops were assumed to be equivalent to “tomatoes.” This yielded the following fractions of crops: walnuts 26 percent, almonds 28 percent, pasture 16 percent, and tomatoes 30 percent. Each of these fractions of crops was applied to the total inundated agricultural

land for the 50-, 100-, and 500-year floods to determine a total number of acres of each crop type for the FRAM model. This approach assumes that the mix of crops in the Watershed will stay constant over time, and makes an imperfect match between the crops listed in the GIS database for crops in the floodplain and crop types available in FRAM. Despite these limitations, it is believed that the approach provides a reasonable idea of the order of magnitude of the change in agricultural flood damages.

Using these inputs, the FRAM model calculated estimated annual damages (EAD) without the project of \$14,859,634 and a with-project EAD of \$5,700,174. Thus the change in EAD from the project totaled \$9,159,460. Of this change, \$9,188,298 in estimated residential and commercial damages were avoided, while the project increased estimated agricultural damages by \$29,468 annually. The present value of these benefits, using the 6 percent discount rate specified for the analysis and a 50-year analysis period, amounts to \$144,353,090. However, because this project will only accomplish a portion of the total protection necessary to realize these benefits, this value needs to be scaled down accordingly. A total of 3,280 acres must be protected to avoid the projected development of 80 percent of the Watershed, and realize the full benefit of avoided flood damage from protection of all properties targeted by the NFPP. This project protects 225 acres, or 6.86 percent of the total land targeted for protection. After assigning this project credit for 6.86 percent of the total avoided flood damage, the present value for the avoided flood damage is \$9,902,622 over the assumed 50-year life of the project.

In addition to the avoided flood damage estimates described above, VCWPD concludes that there will be significant life and safety benefits from the NFPP that can only be qualitatively assessed (VCWPD 2010a). These life and safety benefits are directly related to the reduced number of homes that are at risk with the NFPP. At full implementation for the 100-year flood VCWPD estimated that up to 6,000 homes may be inundated in the 100-year floodplain without the project as compared to approximately 3,000 homes with the project. By

comparison, for the 500-year flood, VCWPD estimated that up to 28,000 homes may be inundated in the 500-year floodplain without the project as compared to approximately 6,500 homes with the project. Each home is directly related to individuals and families that can be spared the risks of drowning and disease in addition to the monetary flood damage.

Avoided Construction Cost of New Levees

By preventing development in the Santa Clara River floodplain, this project eliminates the need for new levees that would otherwise be required to protect that new development. Based on recent experience building a new levee to protect the Santa Paula airport and other similar projects, it is known that new levee construction costs \$1,000-\$3,000 per linear foot (Su 2010). Protecting 80 percent of the remaining floodplain will require approximately 150,000 total linear feet of levee to be constructed (Su 2010). Assuming build-out of the Santa Clara River floodplain over 50 years, average new levee construction costs of \$2,000 per linear foot, and construction costs rising at the rate of inflation, the benefit from avoided levee construction amounts to about \$300,000,000. This benefit, however, accrues relative to a without-project baseline that assumes an 80 percent developed floodplain over a 50-year timeframe, and this project only protects 225 acres of the 3,280 acres necessary to avoid the without-project developed future. Consequently, this project could be apportioned credit for 6.86 percent of this benefit, or \$20,580,000. This overstates the value of this benefit because a discounted present value has not been calculated that incorporates the timing of potential future levee construction into the future. This benefit is not included in the benefit tables for this project because of significant uncertainty involving the feasibility and timing of future levee construction and because it involves future development. It is shown here to demonstrate the substantial magnitude of this potential benefit.

An additional benefit is the avoided cost of regulatory requirements for structural flood control projects (i.e., CEQA, state, and federal permitting) and avoided costs of potential litigation for contested levees. Each of these

costs would increase the total avoided cost of new flood control structures. Because flood control structures are typically paid for through flood assessments to all Ventura County property owners, most of the costs avoided will translate into direct financial benefits for Ventura County property owners.

Avoided Maintenance Costs of New Levees

All levees require significant maintenance and associated costs. VCWPD currently spends approximately 25-30 percent of its budget on maintaining flood control structures (Su, 2010). VCWPD's annual budget is approximately \$30 million, so annual flood control structure maintenance is approximately \$8.25 million per year (Su, 2010). New flood control structures developed under the without-project conditions will also require regular maintenance, which will cost millions of dollars per year. Implementation of the NFPP will avoid the need for new levees and therefore the associated maintenance costs of new levees. Because this project only protects 225 acres of the 3,280 acres necessary to avoid the without-project developed future, this project can claim 6.86 percent of this benefit, or \$565,950 per year. This overstates the value of this benefit because a discounted present value has not been calculated that incorporates the timing of potential future levee construction into the future. This benefit is not claimed in the benefit tables for this project because of significant uncertainty involving new levee construction, including the rate at which they would be constructed and the pace at which maintenance costs would arise, and because this benefit involves future development.

Avoided Upgrade Costs for Existing Levees

Another benefit of this project is avoided maintenance and upgrade costs for existing levees. In early 2010, the Federal Emergency

Management Agency (FEMA) revised its Flood Insurance Rate Maps for Ventura County, indicating that the levees adjacent to the cities of Oxnard and Fillmore along the Santa Clara River were no longer adequate to protect adjacent existing urbanized areas. Estimates for upgrading these levees to adequately protect these areas indicate that Ventura County would need to spend \$50-\$100 million dollars (VCWPD, 2010b).

A significant reason for the increased flood hazard identified by FEMA is upstream urbanization and loss of floodplain. Because these levees need to be upgraded under current hydrologic conditions, it is not reasonable to use these estimates as possible avoided costs for this analysis. However, should further development and associated floodplain loss occur upstream, other levees designed for then-current hydrologic conditions could also become inadequate under the altered hydrology of a developed Santa Clara River floodplain. If the remaining floodplain is not protected, this problem will continue to grow, perhaps to the point where even upgrades to the Fillmore and Oxnard levees may become inadequate soon after upgrade to protect existing development.

Distribution of Project Benefits and Identification of Beneficiaries

The NFPP provides many flood-related benefits to a variety of stakeholders. First, avoided flood damage provides a benefit to mostly urbanized areas on the lower Santa Clara River, primarily in the City of Oxnard. Furthermore, avoiding further levee development and associated regulatory requirements and potential litigation costs benefits all Ventura County property owners since flood control structures are typically paid for through county-wide flood assessments. Avoided maintenance costs of new levees and upgrade costs for existing levees will directly benefit VCWPD and the affected municipalities.

Table 2: Project Beneficiaries Summary

Local	Regional	Statewide
Ventura County Watershed Protection District City of Fillmore City of Oxnard City of Santa Paula City of Ventura	Ventura County property owners	--

Project Benefits Timeline Description

This project is assumed to be executed over an 18-month timeframe from June 2011 through December 2012. The flood control benefits accrue relative to a without-project baseline that assumes an 80 percent developed floodplain over a 50-year timeframe.

This project, however, only protects 225 acres of the 3,280 acres necessary to avoid the without-project developed future. Consequently, this project can be assigned credit for 6.86 percent of all of the flood control benefits discussed in this attachment. To fully realize these benefits, the NFPP must continue and protect the remainder of the 3,280 acres necessary to prevent development of these areas within the floodplain.

Potential Adverse Effects from the Project

This project is exempt under CEQA under two categories: Acquisition for Wildlife Conservation

Purposes (Class 13) and Open Space Contracts of Easements (Class 17). There are no adverse effects anticipated from this project.

Summary of Findings

The NPFF is estimated to provide \$9,902,622 of present value avoided downstream flood damages. Additional flood control benefits include the avoided cost for new levees to protect upstream development, the avoided maintenance cost of new levees, and avoided upgrade costs for existing levees. The avoided cost of new flood control structures that could be apportioned to the NFPP was calculated, but this value was not included as a monetized benefit due to the uncertainty involved in new levee construction and because it involves new development. Monetized values also were not claimed for avoided maintenance costs or avoided upgrade costs, although in both cases, existing data suggest potentially enormous benefits. These qualitatively assessed benefits are summarized in Table 3.

Table 3: Qualitative Benefits Summary – Flood Control Benefits

Benefit	Qualitative Indicator*
Avoided Construction Cost of New Levees	++
Avoided Maintenance Costs for New Levees	++
Avoided Upgrade Costs for Existing Levees	++

Notes:

* Direction and magnitude of effect on net benefits:

++ = Likely to increase net benefits significantly.

This analysis of benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, there are uncertainties associated with claimed

monetized benefits regarding the total number of acres required to prevent development in the Watershed, the use of FRAM for estimating the change in agricultural damages in the Santa Clara River floodplain, and the selection of

crops in FRAM to match the estimated mix of crops in the Santa Clara River floodplain. These

issues are listed in Table 4.

Table 4: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Acres for NFPP	+	There are about 4,100 acres in the 500-year floodplain of the Santa Clara River, and it was assumed that the overall NFPP will need to protect 80 percent of those acres, or 3,280 acres, in order to prevent development in the floodplain. However, it is possible that acquisition of less than 3,280 acres will be sufficient in order to prevent development because the risk of development on the remaining lands will be substantially reduced. Also, numerous groups have worked together to preserve the Santa Clara River, and about 13 miles (3,000 acres) of the approximately 40 miles of riverfront property, including some in the 500-year floodplain in Ventura County, although existing conservation programs do not permit acquisition of land for the primary purpose of retaining the floodplain, or acquisition of inundation (flood) easements over existing agricultural land in this Watershed. Both of these factors indicate that less than 3,280 acres may be needed to prevent development, and therefore that the avoided flood damage benefit shown here is understated. This is because the benefit from the overall NFPP is scaled by the ratio of acres in this portion of the NFPP project (225 acres) to the number of acres to be acquired in the overall, which is assumed to be 3,280 acres. If the number of overall acres is less, the share assigned to this portion of the NFPP will be greater.
Use of FRAM to Estimate Change in Agricultural Damages	U	Agricultural damages in FRAM were developed based on conditions in the Central Valley agricultural area of California. Use of these damage estimates may not strictly be appropriate for estimating the change in agricultural damages in Ventura County, but it is believed that this estimate provides a realistic estimate of the magnitude of the change in damages.
Crop Selection in FRAM to Estimate Change in Agricultural Damages	U	An exact match was not possible between the crops in the floodplain that were indicated in the Ventura County GIS database and the crops available for selection in FRAM. Changes in the selection of crops in FRAM could change the analysis result, but it is expected that this change would be small relative to the overall avoided flood damage estimated.

Notes:

* Direction and magnitude of effect on net benefits:

- + = Likely to increase net benefits relative to quantified estimates.
- ++ = Likely to increase net benefits significantly.
- = Likely to decrease benefits.
- = Likely to decrease net benefits significantly.
- U = Uncertain, could be + or -.

References

“Newhall Land Plots Strategy After Turbulent Times.” January 2010 San Fernando Valley Business Journal, Eric Billingsley. Available: <http://www.sfvbj.com/news/2010/jan/18/newhall-land-plots-strategy-after-turbulent-times/>. Accessed December 26, 2010.

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Newhall Ranch, June 2009 Update. 2009. Friends of the Santa Clara River. Available: <http://www.fscr.org/html/newhall.html>. Accessed December 29, 2010

Table 19 - Present Value of Expected Annual Damage Benefits

Project: The Nature Conservancy Natural Floodplain Protection Program (SC-7)

Project: The Nature Conservancy Natural Floodplain Protection Program (SC-7)	Expected Annual Damage Without Project (1)		\$14,859,634
(b)	Expected Annual Damage With Project (1)		\$5,700,174
(c)	Expected Annual Damage Benefit	(a) – (b)	\$9,159,460
(d)	Present Value Coefficient (2)		15.76
(e)	Present Value of Future Benefits	(c) x (d)	\$144,353,090
(f)	Percent of Present Value Benefits Claimed		6.86%
(g)	Benefits Claimed	(e) x (f)	\$9,902,622

(1) This program assumes no population growth thus EAD will be constant over analysis period.

(2) 6% discount rate; 50-year analysis period

(3) This initial step in the NFPP protects 225 acres, or 6.86% of the total land targeted for protection.

Consequently, the benefits from the whole NFPP shown above on line (e) are multiplied by 6.86% on line (f) to get benefits for this initial portion of NFPP on line (g).

II. Ojai Valley Land Conservancy Ojai Meadows Ecosystem Restoration Final Phase (V-5)

Summary

The Ojai Valley Land Conservancy (OVLC) Ojai Meadows Ecosystem Restoration Final Phase restores upland and transitional habitats to prevent soil erosion and sedimentation into recently restored wetlands and establishes appropriate plant density in those wetland habitats at the Ojai Meadows Preserve (OMP). The overall OMP is designed to resolve flooding problems on State Highway 33 and at Nordhoff High School, while providing a variety of ancillary benefits. The initial phase modified the site topography to direct stormwater from three adjacent sites into a variety of wetland channels and pools in order to prevent flooding on nearby properties, allow stormwater contaminants to break down through natural processes, promote water infiltration to recharge groundwater, and provide habitat for plants, amphibians, birds, and other wildlife.

The Final Phase of the OMP Ecosystem Restoration will add 41 acres of upland and transitional habitats to complement the wetland features and place the wetlands in an ecological context that is self-sustaining. This phase is critical, not just to finish the project, but also to protect the flood control, groundwater recharge, and stormwater contaminant filtration

benefits produced by the initial phase. After earth moving was completed, the area outside of the wetland habitat was colonized by invasive weed species with shallow root systems that are not particularly effective at holding soil in place. If this problem is not addressed, sedimentation of the riparian areas and wetlands will require periodic dredging and habitat rehabilitation in order to maintain the benefits already realized through the initial phase. This project will restore the weed-infested upland areas of OMP by planting 20 acres of native grasslands and valley oak savannah vegetation, 20 acres of coast live oak woodlands, and 1 acre of coastal sage scrub in habitat transition areas.

This phase will also include additional riparian plantings, as necessary, in the wetlands areas along the drainage channels to establish appropriate plant densities. The restored native oak and grassland habitats are important to the ecological functioning of the site because they reduce sedimentation issues in the wetlands; provide the vertical structure and hunting areas necessary for sustainable bird populations; and improve the aesthetic, recreational, and educational value of the OMP.

A summary of all benefits and costs of the project is provided in Table 5. Flood Control benefits are discussed in the remainder of this attachment.

Table 5: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and Operations and Maintenance	\$514,327
Monetizable Benefits	
Flood Control Benefits	
Avoided Dredging to Maintain Flood Control Improvements	\$342,244
Total Monetizable Benefits	\$342,244
Qualitative Benefit or Cost	Qualitative Indicator*
Water Supply Benefits	
Maintained and Enhanced Groundwater Recharge	+
Water Quality and Other Benefits	
Maintained Wetland and Riparian Habitat	+
Enhanced Upland Habitat	++
Potential Special Status Species Habitat	+
Increased Greenhouse Gas Sequestration	+
Reduced Invasive Weed Infestations	++
Improved Stormwater Quality	+
Enhanced Recreational Opportunities	+

Notes:

* Direction and magnitude of effect on net benefits:

- + = Likely to increase net benefits relative to quantified estimates.
- ++ = Likely to increase net benefits significantly.
- = Likely to decrease benefits.
- = Likely to decrease net benefits significantly.
- U = Uncertain, could be + or -.

The “Without Project” Baseline

The OMP occupies a low-lying area where runoff converges from several drains and ditches prior to flowing to the Ventura River. These drains are fed by precipitation, runoff from higher elevation lands, and piped stormwater flows. A majority of the runoff from higher elevation lands is accentuated by nearby Nordhoff Ridge, which experiences significantly increased precipitation as storms pass over it. Large, slow-moving winter storms are common in the area, often leading to flooding that impacts the City of Ojai, the community of Meiners Oaks, and the area around the OMP (Condor Environmental Services 2004).

Prior to the initial phase of the OMP Ecosystem Restoration, flooding occurred commonly along State Highway 33 (an important transportation route for the City of Ojai) and at Nordhoff High School. According to Glenn Hawks, City

Engineer for Ojai, Highway 33 flooded almost every time the City received an inch of rain. The flooding was so common that the City of Ojai did not keep flood statistics, and the flooding at this site was simply accepted “as a fact of life” by the City residents. Approximately three times a year the water depth would be deep enough to lead to closure of Highway 33. Road closures during the worst storms prevented access to the region’s flood emergency center at Nordhoff High School.

Modification of the topography and wetland creation from the initial phase has addressed these flooding issues. However, if the upland areas are not restored, sedimentation will gradually reduce the capacity of the pools and wetlands and exacerbate flooding issues. Revegetating the upland areas will keep the soil in place, reduce or eliminate sedimentation, and ensure that the benefits provided by the initial phase of the OMP Ecosystem Restoration will

continue to be realized in the future. Maintenance of such benefits without the ecological restoration would require periodic dredging and restoration of the riparian corridors and wetland areas at significant cost.

Flood Control Benefits

Avoided Dredging to Maintain Flood Control Improvements

Implementation of the Final Phase of the OMP Ecosystem Restoration will avoid the cost associated with the frequent dredging and restoration of the riparian corridors and wetland areas that would otherwise be necessary to maintain the flood control benefits realized in the initial phase. Avoided costs were calculated using an estimate of \$20,000 for excavation, \$10,000 for permitting, and \$70,000/acre for restoration and stabilization of 1/2 acre of wetland and riparian area on the project site after dredging. These estimates were developed using the experience from the initial phase to calculate earth-moving equipment rental, permitting costs, and other costs relevant to repeated dredging and stabilization

of the wetlands and riparian corridors. The dredging was assumed to be needed on a three-year return interval starting in 2009 based on an estimate of a two- to four-year return interval from similar work on Maricopa Creek, as discussed in the OMP Habitat Restoration Plan found as Exhibit 3-4 (Att3_IG1_WorkPlan_5of5.pdf on BMS). All dredging costs were assumed to remain constant in real dollars over time. The present value of this avoided dredging through the end of assumed 50-year project life was calculated to be \$342,244.

Distribution of Project Benefits and Identification of Beneficiaries

Table 6 shows the distribution of flood protection beneficiaries from the project. The OVLC owns the OMP. Flood protection benefits OMP neighbors, Nordhoff High School, the City of Ojai, the community of Meiners Oaks, the Ventura County Watershed Protection District, and the California Department of Transportation.

Table 6: Project Beneficiaries Summary

Local	Regional	Statewide
Ojai Valley Land Conservancy	Ventura County Watershed	
Ojai Meadows Preserve Neighbors	Protection District	
Nordhoff High School	California Department of	-
City of Ojai	Transportation	
Community of Meiners Oaks		

Project Benefits Timeline Description

This project will be executed over a 36-month time frame from June 2011 through May 2014. Habitat restoration is an intensive activity that must consider the life cycle of both weed species and the native vegetation to ensure an efficaciously restored habitat. The project will first focus on managing weeds, removing non-native woody species, and managing the weed seedbank through mechanical and manual techniques.

Application of native grass and wildflower seeds will begin in 2012 depending upon weed

management success. This will be followed by planting of the potted plant stock to establish the desired habitats. Together, these plantings will establish vegetation that will provide erosion control and prevent sedimentation of the restored wetlands. Weed management will continue throughout the project's assumed 50-year lifetime and likely for many years beyond. Most project benefits will be realized very quickly after native plants begin to recolonize the area. However, some benefits will be realized over time as the plants mature and the habitat becomes fully established.

Potential Adverse Effects from the Project

A Final Initial Study/Mitigated Negative Declaration (IS/MND) was prepared to comply with CEQA (Rincon Consultants, Inc. 2007). The IS/MND found that there are no adverse effects anticipated from this project.

Summary of Findings

A number of flood control benefits were realized in the initial phase of this project. However, to maintain these benefits, either the implementation of this project or periodic dredging and habitat restoration will be required. The

avoided costs of dredging and restoring habitat were estimated over a 50-year project lifetime. The present value of avoided dredging over the project life totals \$342,244.

The flooding benefits identified in this analysis were monetized based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. The main uncertainties in this calculation are assumptions of inflation, costs of permitting, costs of dredging, costs of habitat restoration, and the necessary dredging return interval. These issues are listed in Table 7.

Table 7: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Costs of Dredging	U	It is possible that the assumed cost of dredging could be different than estimated. However, because this cost has been estimated based on recent experience on the site, any errors are likely to be small.
Escalation of Dredging Costs	+	This project assumes that the costs associated with permitting, dredging, and habitat restoration will remain constant in real terms over time. Given that these are all labor-intensive and skilled activities, this assumption may underestimate the true avoided costs.
Costs of Permitting	+	Permitting of environmental projects in California is a difficult, time-consuming, and costly enterprise. Further regulation or even small mistakes that require resubmission can drastically escalate the cost of permitting.
Dredging Return Interval	U	The dredging return interval could be more or less frequent depending upon the stability of the soil, the types of vegetation covering upland areas over time, the types of storms the area experiences over time, and many other factors. Because this quantity is hard to estimate accurately, the middle of the cited range was used. However, dredging could be needed on a different return interval, perhaps an irregular return interval, that would change the calculated benefits.

* Direction and magnitude of effect on net benefits:

- + = Likely to increase net benefits relative to quantified estimates.
- U = Uncertain, could be + or -.

References

Condor Environmental Planning Services. 2004. Ojai Meadows Preserve Habitat Restoration and Flood Control Plan. Prepared for the Ojai Valley Land Conservancy. (Provided as Exhibit 3-4 to Attachment 3 or Att3_IG1_WorkPlan_5of5.pdf on BMS)

Table 13 - Annual Costs of Avoided Projects

(All avoided costs should be in 2009 dollars)

Project: OVLC Ojai Meadows Ecosystem Restoration Final Phase (V-5)

Table 13 - Annual Costs of Avoided Projects						
(All avoided costs should be in 2009 dollars)						
Project: OVLC Ojai Meadows Ecosystem Restoration Final Phase (V-5)						
(a)	Costs				Discounting Calculations	
	(b)	(c)	(d)	(e)	(f)	(g)
YEAR	Alternative (Avoided Project Name): Dredging and Wetland Restoration at Ojai Meadows Preserve				Discount Factor	Discounted Costs (e) x (f)
	<i>Avoided Project Description: Dredging of constructed riparian corridors and wetlands to maintain flood control, water supply, water quality, and other benefits provided.</i>					
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)		
2009	0	0	0	0	1.000	0
2010	0	0	0	0	0.943	0
2011	20,000	35,000	10,000	65,000	0.890	57,850
2012	0	0	0	0	0.84	0
2013	0	0	0	0	0.792	0
2014	20,000	35,000	10,000	65,000	0.747	48,555
2015	0	0	0	0	0.705	0
2016	0	0	0	0	0.665	0
2017	20,000	35,000	10,000	65,000	0.627	40,755
2018	0	0	0	0	0.592	0
2019	0	0	0	0	0.558	0
2020	20,000	35,000	10,000	65,000	0.527	34,255
2021	0	0	0	0	0.497	0
2022	0	0	0	0	0.469	0
2023	20,000	35,000	10,000	65,000	0.442	28,730
2024	0	0	0	0	0.417	0
2025	0	0	0	0	0.394	0
2026	20,000	35,000	10,000	65,000	0.371	24,115
2027	0	0	0	0	0.350	0
2028	0	0	0	0	0.331	0
2029	20,000	35,000	10,000	65,000	0.312	20,280
2030	0	0	0	0	0.294	0
2031	0	0	0	0	0.278	0
2032	20,000	35,000	10,000	65,000	0.262	17,030
2033	0	0	0	0	0.247	0
2034	0	0	0	0	0.233	0
2035	20,000	35,000	10,000	65,000	0.220	14,300
2036	0	0	0	0	0.207	0
2037	0	0	0	0	0.196	0
2038	20,000	35,000	10,000	65,000	0.185	12,025
2039	0	0	0	0	0.174	0
2040	0	0	0	0	0.164	0
2041	20,000	35,000	10,000	65,000	0.155	10,075
2042	0	0	0	0	0.146	0
2043	0	0	0	0	0.138	0
2044	20,000	35,000	10,000	65,000	0.130	8,450
2045	0	0	0	0	0.123	0
2046	0	0	0	0	0.116	0
2047	20,000	35,000	10,000	65,000	0.109	7,085
2048	0	0	0	0	0.103	0
2049	0	0	0	0	0.097	0
2050	20,000	35,000	10,000	65,000	0.092	5,980
2051	0	0	0	0	0.087	0
2052	0	0	0	0	0.082	0
2053	20,000	35,000	10,000	65,000	0.077	5,005
2054	0	0	0	0	0.073	0

Table 13 - Annual Costs of Avoided Projects

(All avoided costs should be in 2009 dollars)

Project: OVLC Ojai Meadows Ecosystem Restoration Final Phase (V-5)

Table 13 - Annual Costs of Avoided Projects						
(All avoided costs should be in 2009 dollars)						
Project: OVLC Ojai Meadows Ecosystem Restoration Final Phase (V-5)						
Costs					Discounting Calculations	
(a)	(b)	(c)	(d)	(e)	(f)	(g)
YEAR	Alternative (Avoided Project Name): Dredging and Wetland Restoration at Ojai Meadows Preserve				Discount Factor	Discounted Costs (e) x (f)
	<i>Avoided Project Description: Dredging of constructed riparian corridors and wetlands to maintain flood control, water supply, water quality, and other benefits provided.</i>					
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)		
2055	0	0	0	0	0.069	0
2056	20,000	35,000	10,000	65,000	0.065	4,225
2057	0	0	0	0	0.061	0
2058	0	0	0	0	0.058	0
2059	20,000	35,000	10,000	65,000	0.054	3,529
2060	0	0	0	0	0.051	0
2061	0	0	0	0	0.048	0
Project Life	340,000	595,000	170,000	1,105,000	...	
Total Present Value of Discounted Costs (Sum of Column (g))						\$342,244
(% Avoided Cost Claimed by Project)						100%
Total Present Value of Discounted Avoided Project Costs Claimed by alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)						\$342,244
Comments: Avoided cost were calculated using an estimate of \$20,000 for excavation, \$10,000 for permitting, and \$70,000/acre for rehabilitation with 1/2 acre of wetland and riparian area on the project site. The dredging was assumed to be needed on a three year return interval starting in 2009 based on an estimate of 2-4 years for Maricopa Creek in the Ojai Meadows Preserve Monitoring and Maintenance Plan. All costs were assumed to remain constant in real dollars over time.						