Objective	*1a – Fish Restor.*	*1b – Meadow Restoration*	*1c - Mokelumne Day Use*	*1d – Fish Screens*	*1e – Pardee Riparian Restor.*	*1f - Camanc. Riparian Rest.*	*1g - Soil Rest.*	*2a - Recycled Wastewtr Recharge*	*2b – Constellation Winery*	*2c - Amador County Reuse*	*3a - Solar Powered Desal*	*4a - ESJ Basin Banking*	*4b - Hydrolog. Assessmt.*	*4c - SJC Grndwater Banking*	*4d - NSJWCD Infrastruct*	*5a - Urban Conservation*	*5b - Ag Conservation*	*6a - Floodpl. Mgmt.*	*7a - Silt Removal*	*7b - Raise Lower Bear*	*7c - Surface Storage*	*7d - Storage Reop.*	*7e - Calaveras Co. Reserv.*	*8a – Jeff Davis Replmt.*	*8b – Transmission Rehab*	*8c – Septic System Convers.*	*8d - Camanc. Recycled Wtr*	*1 - Regional Benefits*	*2 - Upper Watershed Benefits*	*3 - Lower Watershed Benefits*	*4 - Low Level of Analysis*	*5 - High Level of Analysis*
Concept Type (p=planning, i=implementation, p&i=planning and implementation)	p&i	p	i	p&i	p&i	i	p	p&i	p&i	i	p&i	p	p	i	i	i	i	i	p	p	p	p	p	p	p&i	p&i	p					
WS-1: Promote demand-side management strategies	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	○	○	○	○	○	○	○	○	○	○	●	○	○	○	●
WS-2: Increase supply reliability	○	◗	○	◗	○	○	○	●	●	●	●	◗	◗	●	●	●	●	○	◗	◗	◗	◗	◗	◗	●	○	◗	●	●	●	●	●
WS-3: Increase amount of stored water	○	◗	○	○	○	◗	◗	●	○	○	○	◗	◗	●	○	◗	◗	●	◗	◗	◗	◗	◗	○	◗	○	○	●	●	◗	●	●
WS-4: Promote smart, responsible development	○	○	◗	○	◗	◗	○	○	○	●	○	◗	○	●	●	●	●	●	○	◗	○	○	◗	◗	○	○	◗	●	●	●	●	●
WS-5: Reduce reliance on groundwater for irrigation	○	○	○	○	○	○	○	○	●	○	◗	○	○	○	●	●	●	○	◗	◗	◗	◗	◗	○	○	○	◗	●	◗	●	●	●
WS-6: Promote a long-term groundwater balance	○	◗	○	○	○	◗	◗	●	●	○	◗	◗	◗	●	●	◗	◗	●	◗	◗	◗	◗	○	◗	○	○	◗	●	◗	●	●	●
WS-7: Maximize water resource availability for all beneficial uses	○	◗	◗	○	●	●	◗	●	●	●	●	◗	◗	●	●	●	●	●	◗	◗	◗	◗	◗	◗	◗	●	○	◗	●	◗	●	●
WS-8: Decrease the need to import water	○	○	○	○	○	○	◗	○	○	○	○	◗	○	●	○	◗	◗	◗	○	◗	◗	◗	◗	◗	○	○	○	○	●	◗	○	●
WD-9: Review and understand existing agency demand estimates	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
WQ-11: Protect and improve surface and groundwater quality	○	◗	●	○	◗	◗	◗	●	◗	○	◗	◗	◗	◗	◗	◗	◗	◗	◗	○	◗	○	○	◗	○	○	○	○	◗	●	●	●	●
WQ-12: Match delivered water quality use	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	◗	●	○	◗	○	●	●	●	○
WQ-13: Use water purification technology as a tool to maximize beneficial uses	○	○	○	○	◗	◗	○	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	◗	●	○	◗	○	●	●	●	○
R-14: Increase access for water-based recreation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◗	○	○	○	○	○	○	●	○	◗	○
R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.)	●	◗	●	●	●	●	◗	○	○	○	○	○	○	○	○	◗	○	◗	○	○	○	○	○	○	○	○	○	◗	●	●	●	●
R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish)	●	○	○	○	◗	◗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	◗	●	●	○
R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke)	●	○	○	○	◗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	●	○
R-18: Increase angling and other recreational opportunities (increase opportunities)	●	◗	◗	◗	●	●	◗	○	○	○	○	○	○	○	○	○	○	○	◗	○	◗	◗	○	○	○	○	○	○	◗	●	●	●	◗
WR-19: Resolve existing water rights conflicts in the watershed	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	◗	◗	◗	○	◗	○	○	○	○	◗	○	●	○	●
F-20: Enhance flood protection and management	○	◗	●	○	◗	●	◗	○	○	○	○	◗	○	◗	○	○	○	●	◗	◗	◗	◗	◗	○	○	○	○	○	◗	●	●	●	●
D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset)	○	○	○	○	○	○	○	○	○	○	●	●	●	●	○	○	○	○	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○
D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail)	○	○	●	○	○	○	◗	◗	◗	◗	○	◗	○	●	●	●	●	●	○	◗	●	◗	●	●	◗	○	○	◗	◗	◗	◗	○	●
D-23: Promote the contribution of sound scientific data to current body of knowledge	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●	●	◗	●	●	●	●	●	●
O-24: Increase investment in forest management	○	◗	○	○	◗	◗	◗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◗	◗	◗	◗	○
O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on DACs	●	◗	●	○	◗	●	◗	●	○	●	◗	◗	◗	●	●	●	●	●	○	◗	◗	◗	◗	◗	●	●	◗	●	●	●	●	●	●
O-26: Achieve equity	●	◗	●	●	●	●	◗	●	●	●	●	◗	◗	●	●	●	●	●	◗	◗	◗	◗	◗	◗	●	●	◗	●	●	●	●	●	●
E-27: Protect and enhance natural environment (enhance natural envt)	●	◗	●	◗	●	●	◗	○	◗	●	◗	○	○	○	○	○	○	●	●	◗	○	○	○	○	◗	◗	◗	◗	●	●	●	●	●
E-28: Protect and enhance natural environment (wild & scenic designation)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
E-29: Protect and restore fisheries	●	◗	●	●	●	●	◗	○	●	○	○	○	○	○	○	◗	◗	●	○	◗	○	◗	○	○	○	○	○	○	◗	●	●	●	●
A-30: Enhance or maintain the water supply for the beneficial use in ag practices	○	○	○	◗	○	○	○	●	●	◗	●	◗	◗	●	●	○	●	○	◗	◗	◗	◗	◗	◗	○	○	◗	●	◗	●	●	●	●
C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	◗	●	●	●	○	○	◗	●	◗	●	●	●	●
C-32: Promote broadly-supported outcomes that benefit a wide range of interests	◗	●	●	●	●	●	●	●	●	●	●	◗	●	●	◗	●	●	●	◗	◗	◗	◗	◗	◗	●	●	◗	●	◗	●	●	●	●
C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects)	●	●	●	●	●	●	◗	●	●	●	●	◗	◗	●	●	●	●	●	◗	◗	◗	◗	◗	◗	●	●	◗	●	●	●	●	●	●
C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict)	●	◗	○	●	○	○	○	○	○	○	◗	○	○	●	○	○	○	○	◗	○	◗	○	◗	○	○	○	○	○	●	●	●	●	●
C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CA-37: Avoid basing decisions on incomplete or inaccurate information	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CA-38: Avoid demand for new or larger on-stream dams	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◗	◗	●	●	●	●	●	●	●	◗	●	◗	◗
CA-39: Avoid harmful impacts to fisheries and other wildlife	●	●	●	●	●	●	●	●	●	●	◗	◗	●	◗	○	●	●	●	◗	◗	◗	◗	◗	●	●	●	●	●	◗	◗	◗	◗	◗
CA-40: Avoid conversion of agricultural lands to developed uses	●	●	●	●	●	●	●	●	●	●	◗	◗	●	◗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◗	◗	◗	◗	◗
CA-41: Avoid shifting environmental impacts from one area to another	●	●	●	●	●	●	●	●	●	●	◗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◗	◗	◗	◗	◗
CA-42: No diminishment of the benefits of existing in-stream flow	●	●	●	●	●	●	●	●	◗	●	●	◗	●	◗	○	●	●	●	●	◗	◗	◗	◗	◗	●	●	●	●	●	◗	●	●	●
CA-43: Avoid closing the process to the public	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◗	◗	◗	◗	◗
CA-44: Avoid dependency on potentially unreliable supply	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CA-45: Minimize adverse socio-economic and public health and safety impacts	◗	●	●	●	●	●	●	●	●	●	◗	●	●	●	◗	◗	●	●	●	◗	◗	◗	◗	●	●	●	●	●	◗	◗	◗	◗	◗
CA-46: Avoid end use harm	◗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◗	◗	◗	◗	●	●	●	●	●	●	◗	◗	●	◗	◗
CA-47: Avoid violating procedural or substantive laws	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CA-48: Avoid interregional inequity	●	●	●	◗	●	●	●	●	●	●	●	◗	●	◗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◗	◗	◗	◗	◗
Number of ○	21	16	19	22	16	15	16	20	18	20	17	17	21	16	23	16	15	18	17	13	14	19	15	20	24	27	18	9	6	8	7	10
Number of ◗	3	14	3	4	8	7	15	1	3	2	10	18	10	6	4	7	5	3	18	24	23	16	19	12	3	1	14	16	16	10	11	9
Number of ●	24	18	26	22	24	26	17	27	27	26	21	13	17	26	21	25	28	27	13	11	11	13	14	16	21	20	16	23	26	30	30	29

MokeWISE Draft Concept Assessment Information

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#	Concept Name	Feasibility (scale 1-5, 1 less ~~worse~~, 5 more ~~best~~) Benefit score explanation	Geomorphic benefit (scale 1-5, 1 less ~~worse~~, 5 more ~~best~~) Benefit score explanation	Fisheries benefit (scale 1-5, 1 less ~~worse~~, 5 more ~~best~~) Benefit score explanation	Environmental considerations	General Comments	Potential Direction for Concept Development including Additional Benefits
1a	Upper Mokelumne Anadromous Fish Restoration	4 Logistics in transporting salmonids into and out of upper watershed would carry costs. How much suitable habitat remains upstream? How much of the upper watershed has compromised habitat from hydroelectric operations? There is a high degree of interest in implementing this type of program, though none that have yet come to fruition.	5 If increased resiliency becomes a real outcome, it would be of immense benefit to stressed salmonid populations in central, interior CA. Additionally, presence of anadromous fish would result in many measures which would enhance habitat in the upper watershed. For instance, successful implementation could create positive biogeomorphic benefits through substrate rejuvenation during spawning, and in providing a reintroduction of marine nutrients into the upper watershed ecosystem when spawners die.	2 Relocating adult anadromous salmonids from the lower Mokelumne River to the upper Mokelumne River offers the opportunity to bring marine nutrients into the upper watershed and, if accomplished using steelhead, would provide advantages of increasing genetic diversity of the resident rainbow trout population in the upper watershed. Relocating adult fall-run Chinook salmon to the upper watershed, however, is not expected to produce substantial benefits in terms of increasing fall-run Chinook salmon population abundance in the absence of an effective method for trap and haul to return juvenile salmon to the lower river where they can complete their migration to coastal marine waters. Passage of juvenile Chinook salmon from the upper watershed downstream volitionally is not expected to be feasible as a result of both existing passage barriers to downstream migration as well as predation mortality occurring within the reservoirs.	Could potentially introduce new water temperature requirements in the upper watershed, which may improve water quality but could potentially decrease water supply as additional flows could be required. Hydropower peaking flows could be disruptive to habitat requirements in the upper watershed.	Positive effects to fish populations would be anticipated to be larger than biogeomorphic effects. Studies would need to be in place to assess outcomes and to ensure that goals are met. // The concept of relocating adult salmonids to the upper parts of the watershed has merit and is a restoration activity compatible with both salmonid recovery actions, as well as establishing diversified life history strategies within the watershed. Technical issues with regard to migration feasibility, particularly for juveniles that would be migrating downstream through the watershed, would need to be addressed.	Develop implementation plan including all logistics, benefits and costs. Develop monitoring plan to track project trajectory following implementation. Identify which reaches might warrant managing for temperature, if any. // Including downstream collection facilities and transport for juvenile salmonids produced in the upper watershed (e.g., trap and haul) would substantially enhance fishery benefits but has proven to be difficult, in many cases has low trap efficiency (e.g., rotary screw traps), and has relatively high cost and ongoing annual labor needs. Variable flows and high debris loading have posed problems for downstream migrant traps. A more detailed plan of the trap and haul program for both upstream adults and downstream juvenile migrants could improve this concept.
1b	High Country Meadow Restoration Program	5 Meadow restoration projects have been successfully implemented in the Mokelumne River watershed as well as other Sierra Nevada watersheds. There appears to be a high degree of institutional interest, knowledge and support for such projects.	5 Meadow restoration would improve geomorphic functions in the upper watershed, which have been shown to result in a cascade of positive effects locally and downstream. Locally, GW retention of flows in a healthy the meadow aquifer may result in continuous flows through a dry summer. A cascade effect may occur downstream, which could include an increase in baseflows leading to better water quality and geomorphic functionality, which may improve fish habitat and riparian corridor health.	4 Protecting existing high elevation meadows, in combination with implementing the meadow restoration program, provides environmental benefit through the protection and preservation of sensitive habitat as well as promoting habitat diversity within the watershed. High elevation meadows serve a variety of environmental functions that can be easily lost if adequate protections and restoration mechanisms are not implemented.	Restoration of meadow functions would likely increase groundwater supplies and baseflows at least in the upper watershed via greater infiltration rates as waters slow from draining hillslopes to crossing meadows prior to entering streams. Peak flow and sediment transport rates should decrease during episodic flood events. Meadow morphology may be returned to approximate natural capabilities, which should allow provide increased levels of geomorphic and ecologic processes in restored meadows, including a possible shift from xeric plant species such as sage back to mesic meadow species such as grasses and sedges that have the added benefit of greater bank stability properties.	Rehabilitation actions would likely restore geomorphic functions in the meadow and downstream from it. Such projects have been shown to result in a cascade of positive effects to hydrologic elements within the greater watershed, including downstream flows and groundwater storage. Ecological elements of the meadow community such as vegetation and animal communities would also benefit from restoration. Upper watershed meadows may soon, if not quite yet, be considered a keystone environmental element much as protection and enhance of salmonids and their habitats are now, so perceived positive benefits of meadow restoration would likely be lower than those for salmonids, but may be as important geomorphically and ecologically. // The concept of restoration of diverse natural habitat, such as high elevation meadows, should be strongly supported and encouraged.	Utilize available governmental documents and grants along with existing professional expertise and literature sources to develop the proposed three-phase program. Gather baseline data pre-restoration and conduct post-restoration monitoring to quantify restoration outcomes.

#	Concept Name	Feasibility (scale 1-5, 1 less ~~worse~~, 5 more ~~best~~) Benefit score explanation	Geomorphic benefit (scale 1-5, 1 less ~~worse~~, 5 more ~~best~~) Benefit score explanation	Fisheries benefit (scale 1-5, 1 less ~~worse~~, 5 more ~~best~~) Benefit score explanation	Environmental considerations	General Comments	Potential Direction for Concept Development including Additional Benefits
1c	Mokelumne River Day Use Area Floodplain Habitat Restoration Project	4 Floodplain connectivity was achieved when slope creation directly downstream of Camanche Dam flooded killed existing riparian trees on left bank of the river (when looking downstream). This and other floodplain restoration projects could provide a template within which to develop a program for the lower Moke.	5 Floodplain restoration would help to restore fundamental geomorphic functions, positively influencing hydrologic and ecologic functions.	4 A number of studies are currently emerging from the Yolo Bypass, Cosumnes River, and many other watersheds that have demonstrated the benefit of seasonally inundated floodplain habitat as juvenile rearing areas for Chinook salmon and steelhead. Floodplain habitat has been shown to be productive and results in increased growth rates of juvenile salmonids that has been identified as a factor increasing the probability of survival during their downstream migration through the Delta and ocean. Floodplain habitat needs to be carefully developed to provide connectivity with the mainstem river, avoid areas of stranding and dewatering as flows recede, and provide cover and substrate to promote both production of prey resources, but also to provide cover habitat to reduce the risk of predation.	The ability of flows greater than the natural "bankfull" (i.e. unimpaired, average 2-yr flow) to spread out across additional floodplain space would increase potential sediment deposition. Flood flow attenuation may decrease flood effects on downstream structures and communities. Reconnection would promote increased channel morphodynamics, as the river and the floodplain adjust to locally refreshed hydraulics.	Floodplain restoration projects are more likely to be implemented on public lands. Because the Mokelumne flows east-west, shading benefits are greater on the south bank than on the north. Different restoration techniques may be needed on the two banks to protect the existing shading values. // There is growing broad support within the scientific community for reconnecting mainstem rivers with seasonally inundated floodplain to benefit juvenile salmonid growth and survival. Floodplain restoration offers a variety of environmental benefits that can be relatively expensive to accomplish and requires a stable and sufficient funding source for implementation.	Perhaps specific individual landowners would be willing to implement additional floodplain restoration programs over and above that achieved on public lands. Any increase in connectivity between the river channel and the floodplain would be beneficial to geomorphic, hydrologic and ecologic functions. A continuous stretch of reconnected floodplain along at both sides of the river corridor would provide the most positive benefit, though any increase would be beneficial. If bankline trees are lost during a project, there could be localized temperature effects, but in the long-term replanting and natural recruitment would provide new shading.
1d	Fish Screens for Riparian Diversions in the Lower Mokelumne	4 From a technical point of view, screening diversions is a matter of installation of the necessary materials.	4 The more fish and supporting food web organisms killed because of diversions, the fewer that can contribute to river bed and bank bioturbation processes such as salmonids revitalizing the channel bed during spawning activities. Diversions alter hydraulic gradients and shear stresses, dependent on a given river discharge and the diversion rate and volume. Any reduction in kill rate would be very beneficial to the river ecosystem.	3 There are a number of riparian diversions that occur from the lower Mokelumne River, primarily for agricultural irrigation, that are currently unscreened. The largest of the diversions, such as that at the Woodbridge Irrigation District dam, have been screened to provide protection for downstream migrating juvenile salmonids. Although installation of positive barrier fish screens is identified as an environmental benefit through reducing the risk of juvenile salmonid entrainment, the incremental benefit of screening only a small percentage of the existing unscreened diversions diminishes the overall effectiveness of screening program. In addition, no information is available on the specific unscreened diversions and their operations that would contribute to the greatest level of entrainment risk and hence it is difficult, given the current state of information, to prioritize among the existing unscreened diversions, and determine which should receive the highest priority. The magnitude of biological benefit varies in response to a number of factors such as the magnitude and seasonal timing of diversion as well as the location of the diversion. Relatively large unscreened diversions located in areas where juvenile salmonid rearing occurs typically pose the greatest risk of entrainment. Funding priorities focused on providing intake screening of the largest diversions (by volume) located in sensitive habitat are expected to offer the greatest biological benefit. Installation of positive barrier fish screens on the lower Mokelumne River should be encouraged and will result in direct benefits to improving juvenile survival. The greater the volume of unscreened diversions that can be equipped with intake screens the greater the potential biological benefit.	It is unknown how many aquatic organisms are directly and negatively affected by the stresses of diversions, but diversions contribute to an overall decrease in abundance and diversity of organisms in the river ecosystem, first simply due to decreased volume of water in the river, and also due to deaths directly related to the diversion intake. A decrease in diversions would allow flows to perform more geomorphic work. An increase in diversion screens would decrease the number of organisms killed during the diversion process. Providing positive barrier intake screens on currently unscreened water diversions will contribute directly to a reduction in entrainment risk and mortality. The concept plan would be improved by providing additional detailed information on the locations, size, volume of diversion, availability of funding for intake screen installation, location relative to sensitive habitat such as juvenile rearing areas, and willingness of local landowners to participate in a screening program will be beneficial in better describing the potential biological benefits, educating local landowners regarding the benefits of screening, and for use as a technical basis for developing grant applications and securing funding.	~~The terminology of "willing landowners" suggests that this program might be considered cost prohibitive or unnecessary by a percentage of diverters. The Moke Diversions spreadsheet was not dated but suggests that about 60% of diversions are not screened. The number "60" in the project description is confusing. Should it be 60%? Or does the number come from another source? Further, the project description also suggests that up to 99% (4 of 400) diversions are not screened.~~ It would be useful to determine accurate values for numbers of diversions and of those, how many are not screened. Either way, it appears to be many in number. // In general reducing sources of direct mortality, such as entrainment into unscreened diversions, provides a positive incremental benefit to increasing survival and abundance of juvenile salmonids produced in the lower Mokelumne River. The relatively large number of diversions within the lower Mokelumne River and Delta, however, make the incremental contribution of installing positive barrier fish screens on each individual diversion relatively low.	Develop a plan to quantify diversion fish fills, prioritize diversions to be screened, calculate costs associated with screening. A potential key to successful screening compliance may be in developing a compelling, consistent message that resonates with water rights owners along with making the cost of compliance via grant funding or other monies attractive/tractable, or perhaps in developing regulations or legislation that would mandate compliance. // The program would benefit from developing a plan or vision of how intake screening would be accomplished, the schedule for screening, the anticipated cost and availability of grant and other funds, identification of highest priority diversions from the river based on their size and locations, seasonal diversion patterns relative to the occurrence of sensitive fish species in the area, and proximity of the diversion to sensitive fish habitat such as juvenile salmonid rearing areas. Survival studies have been done that show relatively low survival in the Mokelumne River for juvenile Chinook salmon. Qualitative analyses of the potential contribution to juvenile survival as a result of various levels of fish screening would be helpful to provide a basis for assessing "costs and benefits" for funding proposals. Development and installation of even a small number of intake screens on a pilot scale would be beneficial to demonstrating the operational reliability and benefits to gain local landowner support for expanding the program in the future.

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1e	Riparian Restoration Program – Upstream of Pardee	5 Meadow and riparian resportation projects have been accomplished in the Mokelumne River watershed and elswhere and are demonstrated to be feasible. Challenges such as establishing and maintaining a reliable water supply for irrigation during the re-establishment phase of restoration has been a challenge for some projects. A key element to restoration success is to identify reaches where riparian restoration can be accomplished. Develop criteria in which short term goals and long term goals are equally weighted. Riparian corridor restoration that contains fully mature trees may take up to 3-4 decades. Most upstream riparian corridor lands are publically -or agency-owned, so feasibility of project implementation is likely very high. The feasiblity score is dependent on the specific locations and attributes of individual restoration sites but there is great potential benefit to the integrity of the watershed and its functions.	5 In upper watersheds, undisturbed riparian corridors provide the natural interface between the channel environment and local hillslopes, meadows and floodways. Removal of invasive plant species and an increase in native species should improve riparian/forest health and strengthen its connectivity to the river. An increase in the amount of wood available to fall into the channel (i.e. streamwood) would improve habitat diversity through structural additions to flow fields, refugia during high flows and from predation, and provide additional nutrients to aquatic organisms. Should help improve water quality, and may attenuate flood flows.	3 Protecting and improving riparian vegetation is an important watershed management activity that contributes directly towards increased habitat diversity, habitat complexity, and habitat function not only for terrestrial species, but also for those aquatic species inhabiting the Mokelumne River. Insect production from riparian areas provides a valuable foraging resource for juvenile salmonid and other fish species inhabiting the river. Much of the upper Mokelumne River watershed is under the ownership of organizations such as BLM, PG&E~~, EBMUD,~~ and the U.S. Forest Service which is expected to help facilitate planning and implementation of successful protection of existing resources and restoration of degraded resources with substantial areas of riparian vegetation that would provide significant benefit to the ecosystem. A number of small restoration projects that are fragmented within the watershed provide less environmental benefit than providing greater contiguous areas that have connectivity among riparian corridors. The benefit score for fishery habitat reflects the high potential benefits to the watershed and ecosystem. There is some uncertainty in the planning, scope and magnitude of the restoration effort, and in some projects the lack of a reliable long-term water supply for irrigation during the re-establishment process has diminished restoration success and benefits.	Riparian restoration takes time, particularly for trees to mature and become large enough to function as structural components when they enter the river network. Hydropower peaking flows could be disruptive to riparian restoration.	It is important to allow streamwood and other organic materials to remain undisturbed in the river in the patterns in which they fall or come to rest, if at all possible. Streamwood breaks down stochastically via decay and disintegration. This process is meant to contribute to carbon storage and carbon transport from upper watershed to the ocean in a range from entire trees to dissolved organic carbon. // Protecting and restoring riparian habitat within the Mokelumne River watershed is an important element in developing a more comprehensive and integrated watershed management program. The program should receive broad support from the scientific community, various agencies, and landowners as it proceeds forward.	Develop a framework and public outreach program in which streamwood is shown to be a necessary, vital component to river health. One project goal could be to educate the public that removal/cutting of streamwood when found in the river, even if it is blocking passage, is not of ecological/geomorphic benefit. Another project could be to pass through or transport streamwood around existing dams so that the structural and carbon contributions of streamwood are not lost to the downstream reaches.
1f	Riparian Restoration Program – Below Camanche	3 Identify reaches where riparian restoration can be accomplished. Develop criteria in which short term goals and long term goals are equally weighted. Riparian corridor restoration that contains fully mature trees may take up to 3-4 decades. Most downstream riparian corridor lands are privately-owned, so feasibility of project implementation is probably not as high as for concept 1e.	5 In lowland environs, riparian corridors connect river corridors and floodplains. In many cases, floodplains develop natural levees that serve to capture high flows that then spread out on the adjacent floodplain, thus providing a natural sink for particulate organics and minerals along with a percolation basin into which still waters can recharge the local aquifer while contributing to flood attenuation downstream.	3 The implementation of efforts identified in the Mokelumne River stewardship plan are valuable to provide an opportunity for coordination, communication, integrated management planning, in securing additional funding for implementation of various restoration and enhancement projects. The environmental benefits are difficult to assess at this time since the magnitude of benefit is linked to the types of projects that would be implemented, the magnitude and duration that those projects would provide benefit, and the level of funding for restoration and long-term maintenance are largely unknown.	Riparian restoration takes time, particularly for trees to mature and become large enough to function as structural components when they enter the river network.	Same comments as 1e, with an additional comment that lowland river corridors are more heavily populated than in the upper watershed. More people generally means more river interaction, and in some cases may result in more manipulation (i.e. cutting or removal) of streamwood perceived as dangerous or to be clogging the river. It's important to work to change perceptions so that residents, visitors and stakeholders understand that streamwood is "good" in rivers. // Support for the stewardship program should be broad-based within the watershed and should be used as the political and scientific foundation for identifying specific high priority projects for implementation in combination with specific estimates of the schedule for implementation and the corresponding budget. A 5 to 10 year description of the vision of the stewardship program implementation would be helpful to convey the long-term vision for the watershed.	Develop a framework and public outreach program in which streamwood is shown to be a necessary, vital component to river health. One project goal could be to educate the public that removal/cutting of streamwood when found in the river, even if it is blocking passage, is not of ecological/geomorphic benefit. Further, riparian corridors are vital components of a healthy river corridor, serving many important functions. Linking riparian corridors and adjacent floodplains provides the best possible use of near-channel space by recreating natural conditions.

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1g	Mokelumne Water Quality, Soil Erosion & Sedimentation Restoration	~~3~~ 4 ~~Technical difficulty, implementation time and costs are high mainly due to the need to (a) update or further inventory roads, trails, fires, and other eroded areas and (b) understand the range of natural baseline and episodic sedimentation rates. Distinguishing between a large natural range and sediment increases over and above that range could be difficult. Increased sedimentation from roads, trails and other human development may be easy to quantify, but perhaps allowing fire scorched areas to regenerate naturally (including possibilities of landsliding) are much more difficult, as there are natural and human elements to the effects of the fire (i.e. perhaps larger, hotter fires due to previous/current fire suppression techniques).~~ Technically feasible to inventory upper watershed roads, trails, and other areas that have been disturbed by human development and that are visibly eroded and gullied. Project may take 3-5 years to coordinate between land owners. USFS, BLM and PG&E are likely to support project goals. Similar projects have been successfully implemented in other California watersheds.	3 Water quality would improve with a decrease in artificially increased sediment supply from roads, trails, and other development. ~~The project would reduce suspended and fine sediment that can clog gravels and suffocate benthic and other aquatic organisms. Project would likely~~ decrease the need for mechanical removal of sediment from reservoirs (i.e. Tiger Creek Afterbay sedimentation).	3 Management of soil erosion and sediment deposition within aquatic habitats is an important element in defining the quality and suitability of aquatic habitat, particularly for salmonid spawning and juvenile rearing, but also for other aquatic resources, including macroinvertebrate and insect production within various parts of the watershed. Soil erosion as a result of road crossings, local land use, fire, and other factors has been identified as an important factor affecting habitat quality and suitability within a watershed. Development of a strategic management and restoration program to address soil erosion issues within the watershed provides a variety of environmental benefits. A key element in assessing the magnitude of potential environmental benefit of such a program, however, is dependent upon the location and the magnitude of restoration, the degree of suspended sediment and deposited sediment reduction, and the ability for long-term maintenance are key elements underscoring the magnitude of benefits such a program would have to Mokelumne River watershed aquatic resources.	A decrease in sedimentation and turbidity would increase water quality and potentially improve substrate habitat for spawning fish and invertebrates that utilize interstitial spaces in the channel bed, as well as improve spring and summer fish growth rates. Reduce fine-grained sedimentation reduces redd (fish nest) scour, with the associated loss of incubating eggs.	~~It is important to understand that sediment in and of itself is not a bad thing.~~ Large influxes of sediment from roads and trails are known to have an adverse effect on the river channel ecosystems. On the other hand, steady influxes of sediment during typical flows and runoff events should be expected. Large influxes of sediment following fire, or during episodically large runoff and flood events should also be expected. Furthermore, sedimentation build-up in reservoirs should not be unexpected given these natural processes. These examples bring home the point that it is important to identify the baseline sedimentation rates along with where increased sedimentation rates are originating from. // Sediment deposition and soil erosion has been identified as a significant factor affecting habitat conditions for salmonids and other aquatic resources throughout the Central Valley. A number of innovative programs are being developed in other watersheds, such as the Napa River watershed, that can serve, in part, as case studies and models for the development of a strategic plan for sediment erosion control, public landowner outreach and education, identification of funding mechanisms, and identification of the environmental benefits that would be derived from such a program. ~~It is encouraged that~~ Other similar programs ~~that~~ have been developed and are being implemented in other watersheds in California and can ~~elsewhere~~ be reviewed and considered when developing a similar program for the Mokelumne River system.	~~Develop framework to adequately address technical aspects of quantification, baseline conditions, and range in variability, and then address greatest areas of need first~~. Use similar watershed improvement projects and the knowledge and data developed from those studies to help in the planning and design of this project. Develop a public outreach program to achieve landowner support as needed.

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2a	Municipal Recycled Wastewater Recharge Program	3 Description focuses mainly on GW recharge, while spreadsheet focuses more on recycled water used for irrigation. Both concepts are valid and complementary.	3 The less water diverted from the river channel, the better for the geomorphic and ecological health of the ecosystem.	2 The use of treated water supplies for groundwater storage augmentation has a number of benefits associated with increasing water storage, water supply reliability, drought water contingency, and other water demand related benefits. The benefits of groundwater storage for enhancing fishery conditions, however, are considered to be relatively low given the cost of groundwater storage and the relatively small amount of water that could be used beneficially for enhancing instream flows.	Programs where reclaimed water is used to recharge aquifers exist, so frameworks and guidelines are likely readily available.	Water rights issues could "muddy" this effort. Improvements in irrigation practices, fallowing fields, or replacing water intensive crops with drought tolerate crops could create a potentially large source of water that was perhaps once needed but after changes could be used to recharge local aquifers or remain as fresh water in the channel (major benefit to the river ecosystem). California regulations for groundwater replenishment via either surface or subsurface using recycled water went into effect on June 18, 2014: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.shtml A potential key component of measuring successful project implementation would be that conserved water does not become supply for new demand. // There is limited experience on how groundwater storage opportunities could be used to enhance fishery habitat, however, opportunities for conjunctive benefit either directly or indirectly through groundwater storage should be explored and identified. In several systems, the use of riparian wells has been identified as a method for seasonally increasing critically low instream flows or reducing water temperatures to benefit Chinook salmon, steelhead, and other aquatic species. Benefits and these types of conjunctive operations should be further explored.	Develop framework to identify treatment plants ready and able to begin program versus those that will need upgrades. Identify GW aquifers in greatest need of recharge. Prioritize where initial implementation might be most feasible and expand program as funding and opportunities present themselves. // Additional benefits of wastewater recharge programs in reducing demands on surface water supplies may also provide instream flow benefits but they are difficult to quantify given the level of information available at this time. Reducing demand on surface water supplies offers biological benefits to Mokelumne River fishery resources. The magnitude of benefits depends, in large part, on the magnitude, seasonal timing, and water year types when surface water demands can be reduced and instream flows increased and made more reliable.
2b	Constellation Winery Wastewater Reuse	3 If private interest is high and funds are available, then project could be moved to a higher feasibility score. A simplified permit process may be helpful here, as the efforts appear to be voluntary (though not explicitly stated).	3 The less water diverted from the river channel, the better for the geomorphic and ecological health of the ecosystem.	1 There appears to be very little potential benefit to fishery habitat or resources that would be gained by the use of treated wastewater for agricultural irrigation in lieu of groundwater pumping. There may be opportunities where a reduction in groundwater demand could provide direct and/or indirect benefits to increased instream flows and enhance fishery habitat, however, those opportunities have not been identified in the concept proposal.	Monitoring requirements per CA groundwater replenishment or other pertinent regulations should be followed to provide for useful assessment of effects to GW quality and water table levels.	Individuals who voluntarily chose to participate in important changes to water use are to be highly commended. On September 30, 2014, Assembly Bill 2193 was signed into law by Governor Brown, which aims to streamline permitting processes for voluntary restoration projects. Other ways to reduce water needs may be achieved through improvements in irrigation methods and potentially development of grape strains that can tolerate less water yet produce quality grapes. A potential key component of measuring successful project implementation would be that conserved water does not become supply for new demand. // Although there is general support for the use of treated wastewater as an agricultural irrigation source that would serve beneficially to reduce demands on local groundwater storage for municipal and other water supplies, the linkage to enhancing fishery habitat through conjunctive operations has not been developed for the proposed project.	Establish a pre- and post-implementation monitoring plan that would help in the development of a region- and winery-specific framework that could be adopted by others.