

Yuba County IRWMP | 2015 UPDATE

APPENDIX 11-1

Climate Vulnerability Checklist

Yuba County IRWMP Climate Vulnerability Checklist

Water Demand	Y/N	Vulnerability	High Priority Y/N
Are there industries that require cooling/process water in your planning region?	Yes	Agriculture is the only identified industry requiring cooling and process water. This industry could be impacted by rising utility costs from additional air-conditioning, and eventually by higher power costs if hydropower generation is impacted as projected.	
Does water use vary by more than 50% seasonally in parts of your region?	Yes	Irrigated agriculture is a primary industry in the region; summer water demand can vary by more than 50% in parts of the region. Specifically, Camptonville’s demand increases by more than 50% in summer and has had to require water rationing. Summer demand could increase if not offset by agricultural water efficiencies, cropping techniques, and change in crop mix.	
Are crops grown in your region climate sensitive? Would shifts in daily heat patterns, such as how long heat lingers before nighttime cooling, be prohibitive for some crops?	Yes	Walnuts, prunes/dried plums, peaches, kiwis, and almonds are heat-sensitive crops (particularly with regard to number of chilling hours) that can also be susceptible to unseasonable precipitation. Non-irrigated agriculture—grazing and dryland hay—may be the most vulnerable to projected climate changes. However, more frost-free and growing-degree days could benefit some crop production and local agricultural profits, and could affect the current crop mix.	
Do groundwater supplies in your region lack resiliency after drought events?	Yes/Foothills No/Valley	Though small in comparison to Central Valley agricultural demands, Camptonville’s water demand (partially supplied by wells) varies by more than 50% during the summer as compared to the winter. Camptonville has faced water shortages during drought conditions; water rationing has been required in the past. Other foothill communities and rural areas affected as well. Valley supplies have lacked resiliency in the past but are remaining stable with introduction of surface water supplies to agriculture. Ultimately, this could be vulnerability if the Yuba basin is overdrawn due to out-of-basin transfers or diversions, climate drying, or shifting state policies that could tax this finite supply.	
Are water use curtailment measures effective in your region?	Yes	Water users are receptive to short-term, low-magnitude water curtailment measures. Receptivity to longer-term and/or greater-magnitude measures is unknown.	
Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?	Under Study	The well-being and life cycles of sensitive aquatic species are complex and identifying their respective instream flow requirements is difficult. The Yuba Accord has brought into force new instream flow requirements in the Lower Yuba River designed to better support aquatic ecosystems. However, concerns have been raised regarding these requirements as well as the lack of updated upper-basin flow requirements, and research is ongoing to best identify where opportunities for improvement may be feasible.	
Water Supply			
Does a portion of the water supply in your region come from snowmelt?	Yes	Runoff from snowmelt is a primary contributor to Yuba River and other surface flows. The runoff season has already been documented to be shifting earlier in the spring	

		from a March-June period to a February-May period. This shift is projected to become even more pronounced as the climate warms and suggests greater uncertainty and altered water facilities management into the future.	
Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?	No		
Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?	No		
Would your region have difficulty storing carryover supply surpluses from year to year?	No	Not in most years. The exception would be following wet years when reservoirs and groundwater basins are at capacity. Browns Valley Irrigation District's Browns Valley Reservoir and other area reservoirs don't have sufficient capacity to carry over surpluses (less than 2 years' capacity).	
Has your region faced drought in the past during which it failed to meet local water demands?	Yes	Some sub-regional areas with limited storage capacity may be the most vulnerable and have failed to meet local water demands, such as the North Yuba and Brown's Valley sub-regions. Minimum instream flows are routinely met in the Yuba River in compliance with the Yuba Accord and FERC license conditions. However, this may become more difficult as warming and drying of the climate is projected to reduce regional surface flows in some streams and future state water regulations and policies are uncertain.	
Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?	No	Water storage and distribution systems are currently unaffected by invasive species; water managers remain vigilant for signs of infestation, but invasive species do exist at boat launch locations. Non-native invasive species within the region are listed in Chapter 6 <i>Region Description</i> . Many of these species are expected to be favored by warming and drying conditions.	
Water Quality			
Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby that could pose a water quality concern from increased erosion?	Yes	Up to two-thirds of Yuba County is exposed to increased fire risk from May through October annually; and the fire season has extended in recent years, according to stakeholders. Research has identified high fire hazards in even-aged silvicultural systems (clear-cut conifer plantations) such as those located north and east of New Bullards Bar Reservoir (Stephens and Moghaddas 2005). Increased fire frequency, intensity, and season may impact vegetative species composition, especially the size and extent of old-growth forest habitat and related fauna; threaten critical facilities located in fire-prone areas; and increase chances for human and economic loss due to development in fire-prone areas. Reservoir water	

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		quality could be adversely affected by increased erosion post-fire.	
Does part of your region rely on surface waterbodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?	No/Yes	At the current time, most surface waterbodies do not have these water quality issues, although these issues have emerged during drought. However, climate-induced increases in storm intensity and warmer water temperatures/decreased assimilative capacity could produce increased turbidity and algae growth. This could, in turn, decrease water quality and generate the need to filter surface water for micro-irrigation of orchard crops.	
Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?	Yes	In a 2012 study, PG&E examined possible side effects of climate change on runoff by comparing two consecutive 35-year periods (1942-1976 and 1977-2011). ¹ The company maintains daily runoff records for 100+ locations in the Sierra, southern Cascade, and Coastal Ranges of California. Trend analyses over a moving 30-year average show reductions in flow on tributaries to the North Yuba in 2009 at between -3% and -28% (Slate Creek). In the South Yuba for the same period, decreases in flow are between 0% and -13% (Lake Spaulding). This would suggest that "low flows are decreasing for some waterbodies." To ameliorate these conditions, the Yuba Accord addresses minimum instream flow requirements below the dams. However, this issue may be further exacerbated in late spring and summer months due to earlier and faster spring snowmelt with rising temperatures. Decreased flows in some waterbodies likely results in a higher concentration of pollutant/reduced assimilative capacity.	
Are there beneficial uses designated for some waterbodies in your region that cannot always be met due to water quality issues?	Yes	Several regional waterbodies are listed as impaired on the CWA 303(d) list. The Lower Yuba River watershed has seven waterbodies (Deer Creek, Englebright Lake, Scotts Flat Reservoir, Yuba River, South Fork Yuba, Middle Fork Yuba, and North Fork Yuba) listed as impaired due to mercury, arsenic, copper, chlorpyrifos, diazinon, and/or temperature. The Lower Bear watershed has six impaired waterbodies (Lake Combie, Lower Bear River, and Camp Far West Reservoir), mostly due to mercury contamination but with secondary contamination from chlorpyrifos and diazinon. The Lower Feather River is 303(d) listed as water quality-impaired from mercury, polychlorinated biphenyls (PCBs), and agricultural chemicals. Water flow to meet the requirements of both anadromous fish and irrigated agriculture is also a management concern. (http://www.sacriver.org/aboutwatershed/roadmap/watersheds/feather) The State of California identified the Bear River and South Fork Yuba River as Priority 1 Impaired Watersheds (RWQCB Basin Plan) requiring restoration to improve water	

¹ Freeman, G. J. *Analyzing the Impact of Climate Change on Monthly River Flows in California's Sierra Nevada and Southern Cascade Mountain Ranges*. Western Snow Conference 2012. Available from: <http://www.westernsnowconference.org/sites/westernsnowconference.org/PDFs/2012Freeman.pdf>

		<p>quality as a result of the large amounts of mercury. The Lower Feather River is 303(d) listed as water quality-impaired from mercury, polychlorinated biphenyls (PCBs), and agricultural chemicals. Water flow to meet the requirements of both anadromous fish and irrigated agriculture is also a management concern.</p> <p>Overall climate drying and warming could exacerbate elevated water temperatures, a reduced capacity for dilution, potential for eutrophication and Total Organic Carbons related to increased algae presence, sediment and non-point source pollution from more intense storm events and higher peak flows, and the potential for wastewater runoff into receiving waters. Several streams, lakes, and reservoirs in the Yuba County IRWMP region exceed water quality standards for mercury and several species of resident fish exceed safety levels for human consumption due to bioaccumulation of mercury.</p>	
Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?	Yes	Camptonville’s water quality suffers during heavy rain events, requiring that the treatment plant be shut down due to turbidity in the surface water source. North Yuba Water District’s surface supplies are also compromised by turbidity.	
Sea-Level Rise (Questions not applicable)	N/A		
Flooding			
Does critical infrastructure in your region lie with in the 200-year floodplain?	Yes	<p>Roughly one-third of the county’s population lives in the 500-year floodplain, along with emergency evacuation routes, sewer and water treatment plants and other infrastructure, and numerous critical community facilities. At higher elevations, damage to roadways has occurred from landslides and debris flows. Increased storm intensity and severity brought on by climate variation could exacerbate impacts from flooding.</p> <p>The urban communities in the county are in the process of improving their levee systems to meet the state’s 200-year Urban Level of Protection standards.</p>	
Does part of your region lie within the Sacramento-San Joaquin Drainage District?	Yes	Yes, Sacramento-San Joaquin Drainage District boundaries are located online at: http://www.cvfpb.ca.gov/ssjdd_maps/	
Does aging critical flood protection infrastructure exist in your region?	Yes	From the Feather River Regional Flood Management Plan (2013): “Broadly stated, the levees that were originally constructed to protect largely agricultural areas are inadequate to protect developing areas. Although the regional flood management system has prevented millions of dollars in flood damages since its construction, a better understanding of the risk assessment and engineering standards has made it clear that some of the regional levee segments face an unacceptably high chance of failure. This, combined with	

		growth in the region, has increased the estimated level of flood risk. While the chance and frequency of flooding has decreased since construction of the region’s levees and multipurpose reservoirs, the damages that would occur if a levee were to fail in one of these areas are much greater, resulting in a net long-term increase in cumulative damages if no further action is taken to improve the flood management system or to limit further development in these areas.” The urban levee systems are in the process of being upgraded to meet current standards. Studies are underway to determine what repairs should be considered for the rural levees.	
Have flood control facilities (such as impoundment structure) been insufficient in the past?	Yes	Extreme flood events in 1986 and 1997 led to levee failures on the Yuba and Feather Rivers and inundated large areas in the Linda and Olivehurst communities. A levee also failed in 1997 in the Wheatland area, with flooding limited to rural areas. Other levees have experienced distress during flood events, but have been repaired or improved.	
Are wildfires a concern in parts of your region?	Yes	Up to two-thirds of Yuba County is exposed to increased fire risk, normally from May through October annually. However, fire managers have reported fires every month during 2013. Residential development has and is taking place in vegetative communities with historically high-fire-return intervals. Wildfire risk is projected to increase in both frequency and intensity and season under warmer, drier conditions. Research has identified high fire hazards in even-aged silvicultural systems (clear-cut conifer plantations) such as those located north and east of New Bullards Bar.	
Ecosystem and Habitat Vulnerability			
Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?	Yes	Regional wetland and riverine habitats are vulnerable to erosion and subsequent sedimentation, particularly from past mining and timbering practices, and road building.	
Does your region include estuarine habitats that rely on seasonal freshwater flow patterns?	No		
Do climate-sensitive fauna or flora populations live in your region?	Yes	Climate-sensitive include several aquatic and wetland-related species and the full complement of amphibious species. Bird species in the Sierra region already and will continue to experience habitat displacement due to climate variation. The Lower Yuba River Accord resolves various conflicts concerning fishery flow requirements in the Plan area. Species of primary management concern include: <ul style="list-style-type: none"> ▪ Recreationally or commercially important (fall-run Chinook salmon, steelhead, American shad, and striped bass). ▪ Federal- and/or state-listed species: Chinook salmon–Central Valley spring run. ▪ Species proposed for federal or state listing within the area (steelhead, delta smelt and green sturgeon), and state Species of Special Concern (late fall-run Chinook salmon, green sturgeon, hardhead, longfin smelt, river lamprey, Sacramento perch, Sacramento splittail, and San Joaquin roach). 	

		California species of concern that might also be climate sensitive due to their respective dependence on wetland or riparian habitat include: vernal pool fairy shrimp, bald eagle, California red-legged frog, bank swallow, and California black rail.	
Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?	Yes	Climate-sensitive include several aquatic and wetland-related species and the full complement of amphibious species. Bird species in the Sierra region already and will continue to experience habitat displacement due to climate variation. Federally listed Endangered and Threatened species include: vernal pool fairy shrimp (Threatened), vernal pool tadpole shrimp (Endangered), giant garter snake (Threatened), California red-legged frog (Endangered), western yellow-billed cookoo (candidate for federal listing), Valley elderberry long beetle (Threatened)	
Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?	Yes	Recreational floating and tourism are important drivers of the economy; 39 miles of the lower South Yuba River are heavily used by recreationists, and are designated as a California Wild and Scenic River and recommended as a federal Wild and Scenic River. Low flows brought on by warming and drying of the climate may increase competition for adequate flows to support recreational pursuits.	
Are there rivers in your region with quantified environmental flow requirements or known water quality/ quantity stressors to aquatic life?	Yes	The Yuba Accord is being implemented to address these issues in the Yuba River. Several streams, lakes, and reservoirs in the Yuba County IRWMP region exceed water quality standards for mercury and several species of resident fish exceed safety levels for human consumption due to bioaccumulation of mercury	
Do estuaries, coastal dunes, wetlands, marshes or exposed beaches exist in your region?	No		
Does your region include one or more of the habitats described in the Endangered Species Coalition’s Top 10 habitats vulnerable to climate change? (http://www.itsgettinghotoutthere.org/)	Yes	The Sierra Nevada Mountains	
Are there areas of fragmented estuarine, aquatic, or wetland habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?	Yes	Aquatic and wetland habitat has been fragmented both by storage and water-delivery infrastructure, roads and irrigation diversions, and by seasonal low flows. Roads and development have impeded movement corridors for wildlife. Essential Fish Habitat (EFH) is the aquatic habitat necessary for fish to spawn, breed, feed, or grow to maturity that will allow a level of production needed to support a long-term, sustainable commercial fishery and contribute to a healthy ecosystem. For the Sacramento River watershed, the aquatic areas identified as EFH for Chinook salmon are within the hydrologic unit map numbered 18020112 (upper Sacramento River to Clear Creek). The upstream extent of Pacific salmon EFH in the Yuba River is to Englebright Dam at river mile 23.9 (USACOE 2012).	

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		There are 1,324 acres of isolated designated critical habitat for fairy shrimp in vernal pool wetlands located near Beale AFB (USFWS website).	
Hydropower			
Is hydropower a source of electricity in your region?	Yes	YCWA’s New Colgate Powerhouse (downstream of New Bullards Bar) provides more energy than any other hydroelectric facility supplying power directly to PG&E. Narrows 1 & 2, Deadwood Creek, and Fish Release also supply hydropower. Reductions in water supply and increases in peak events (drought and floods) could affect hydropower management and reduce generation capabilities.	
Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities, or conditions for hydropower generation in your region?	Yes	Energy needs will likely increase with population and industrial growth and increased need for cooling due to warming of the climate, unless substantial energy conservation takes place. Local entities are considering the potential for small hydroelectric facilities that are exempt from the requirements of the Federal Power Act. There are currently no plans for new large-scale hydroelectric facilities.	