HYDROLOGY		
Type of strategy	**General adaptation approach**	**Specific adaptation action**
Enhance Resistance (or Reduce Non-Climate Stresses)	Increase resistance of road surfaces to higher peak flows at stream crossings	Install hardened stream crossing
		Perform a basin-wide assessment of current hydrological interactions with roads
		Continue to use grade control structures, humps, and water bars to reduce velocity and redirect flow
	Increase resistance of infrastructure and cultural and historic resources	Stabilize banks near resources with rip-rap or vegetation
		Consider increased use of engineered log jams to redirect flows
		Continue installing and monitoring river/stream gages and snotel sites and consider additional data needs for monitoring (e.g., snotel, stream gaging, precipitation)
		Conduct a basin-wide risk assessment of hydrologic interactions with roads and other infrastructure; where vulnerability of infrastructure and/or resource values are highest, direct funding priorities
		Improve infrastructure to withstand flooding
		Map and prioritize areas with higher peak flows
		Communicate risk to stakeholders (public and private)
	Manage for more landslides by protecting roads and structures from higher landslide frequency	Increase maintenance frequency
		Stabilize slopes mechanically or with vegetation
		Compensate for landslides by reducing weight
		Alter road surface type and grade
		Elevate roads to allow landslides to pass underneath
		Improve drainage
	Protect seeps and springs from degradation and development	Inventory and map seeps and springs at 6th code level
		Collect detailed flow info from prioritized representative springs

	degradation and development	Develop local protection strategies (e.g., fencing, identify alternative water sources, etc.)
	Reduce erosion potential to protect municipal water supplies	Implement fuels reduction
		Reduce disturbances such as grazing, riparian roads, OHV
		Implement road management to reduce erosion
	Identify and protect aquifer recharge zones	Map and inventory recharge zones
		Form watershed user groups to identify concerns and solutions
		Improve diversion efficiencies
	Prevent flood damage to high-use campgrounds	Accept higher maintenance costs associated with more floods
		Protect campgrounds from initial increase in flood risk
	Enhance education and outreach around benefits of riparian restoration	Educate private landowners, county development and recreational users on the benefits of riparian vegetation and water storage and impacts of floodplain development
	Manage watersheds to improve water quality by addressing sedimentation issues	Manage forest roads to decrease sediment delivery to streams and riparian areas
		Reduce sediment input to streams by replacing culverts and relocating and decommissioning roads
		Optimize grazing management practices to reduce sediment production
		Utilize vegetation management (fuels reduction/mechanical treatments) to reduce fire severity and subsequent effects such as erosion
		Restore natural function of the floodplain allowing waterways to migrate
		Abandon damaged trails with less use and high flood risk
		Remove or modify infrastructure allowing channels to migrate within the floodplain

Increase resilience of the floodplain	Identify and restore degraded riparian and wet meadow areas to reduce flooding and increase natural storage; utilize large woody debris, beavers, wetlands, riparian roughness, etc. to increase resilience
	Improve livestock management to reduce water use (e.g., shut-off valve on stock ponds)
	Reduce the amount of infrastructure in the floodplain
	Strategically reduce the mileage of roads by decommissioning high-risk, low-access roads
	Evaluate road system for sediment input in order to manage and reduce sediment generated
	Using the 100-year flood high-water mark to delineate the floodplain, reroute roads and trails and move existing infrastructure out of floodplains
	Provide for connectivity of wetlands; avoid degradation, protect beaver dams, implement restoration
	Develop funding and native seed sources for longer term restoration strategies for burned areas where grass and forb communities are not naturally occurring
Increase resilience of facility and campground system to maintain access	Redirect, but not require, changes in visitor use of facilities
	Change timing or route of access; change the nature of the access mechanism
	Abandon campsites in high risk locations but add sites in other locations, conserving the total number of sites; educate the public about how funds are allocated to relocate sites but the total number of sites is conserved
Increase resilience of trail system to higher peak flows by repairing,	Continue to upgrade trail bridges with stronger rot resistant materials
	Consider future peak flows in design of new trails and bridges (e.g., collaborate with hydrologists)
	Reroute trails above waterways with high flood risk and/or reroute trails in locations that eliminate the need for trail bridges

Increase Resilience	replacing, and rerouting trails and trail bridges with high demand for access	Increase long-range planning to prioritize trail and bridge repair, replacement, and rerouting
		Request additional funding to prepare for more trail and bridge failures; focus on acquiring funding for high-profile projects based on co-benefits of public demand and safety
		Continue to relocate bridges to locations with stronger parent material when possible and/or increasing the height of bridges above waterways
	Allow for increased landslide frequency by relocating roads and structures	Close and decommission roads in areas of high landslide risk and low access
		Locate new construction or reroute roads away from areas of high landslide risk
		Convert use to other transportation modes (e.g., from vehicle to bicycle or foot)
	Increase resilience of trail system to soil saturation and erosion	Increase restoration and erosion control with revegetation projects
		Locate piezometer where the greatest impacts are expected (i.e., mixed rain-on-snow basins)
		Reroute high-risk trails that experienced past problems with soil moisture
		Inventory frequently saturated areas and prioritize changes in trail locations
		Reduce erosion by building protection into trail design
	Increase resilience of stream crossings, culverts, and bridges to higher peak flows	Complete regional inventory of culverts and bridges, including GPS locations of structures and accurate culvert data
		Consider a process for replacing culverts based on projected future, rather than historical, peak flows
		Consider prioritizing structure replacement in high-risk (i.e., mixed rain-on-snow) watersheds
		Replace culverts with higher capacity culverts or other appropriate drainage (e.g., ford, dip) in high-risk locations

	Increase natural and build water storage; maintain sufficient water supply to meet demand	Build storage by mirroring natural processes (constructed wetlands, beavers, road obliteration)
		Create distributed small scale water storage (small dams, retention ponds, etc.)
		Utilize groundwater injection wells and/or sills to retain water upstream of alluvial deposits (and retain high water table)
		Attribute causes of potable water loss to determine appropriate response
		Investigate alternative water sources (e.g., groundwater)
		Consider constructing new wells, cisterns, and reservoirs
		Import water from other regions
		Reduce water provided in campgrounds and other facilities and/or reduce campground capacity to decrease water demand
		Close campground facilities when water is not available
		Educate the public about water shortages and conservation; change user expectations of water availability
		Institute grey water recycling
		Install waterless urinals and low-flow, solar, and composting toilets
		Increase water storage with artificial storage infrastructure (e.g., water towers)
	Reduce evapotranspiration and interception losses	Evaluate increasing presence of moisture-dependent species to decrease evapotranspiration
		Implement targeted removal of moisture-dependent species to increase water yield
	Increase knowledge of groundwater resources	Map aquifers and/or alluvial deposits; identify groundwater-influenced streams
		Determine legal availability and better understanding of physical availability of water for aquifer recharge
		Improve stream flow and groundwater monitoring information to improve understanding of surface water-groundwater interactions and obtain real-time data

Increase Knowledge	Increase resilience of trail system to erosion	Increase monitoring of groundwater to assess risk of landslides and slope failures
	Increase knowledge of built resources	Complete geospatial database of culverts and bridges
	Build an information base for timely response to water quality disturbance to ensure data are available for timely decision making	Prioritize data collection based on forecasted drought
		Develop a database of more thorough pre-disturbance data on stream and riparian conditions (i.e. where are high-quality values/habitat most in need of protection)
		Develop directory/checklist for sites where disturbance has direct effect on water quality (metals)
		Create a directory of information sources for water quality issues (metals, temp, sediments)
	Determine lake/reservoir response to climate change	Create a clearinghouse of available information (sources: USACE, DEQ, DWR, USGS etc.)
		Increase coordination between all partners (federal, state, tribal, private)
		Investigate connectivity and interaction of streams and lakes (e.g., temperature influences, nutrient sinks/sources)
	Determine water flows necessary to sustain ecological processes and aquatic communities and ensure this information is incorporated in integrated watershed management plans	Integrate planning for fire plans, road management, aquatic restoration, and fisheries and wildlife management in order to capture system changes related to climate change and their interactions
	Identify and map wetlands location and evaluate risk	Update NWI maps for all wetlands
		Assess vulnerability of wetlands

Engage Coordination	Leverage partnerships with recreational user groups to increase awareness of threats to access, and adjust user expectations	Increase efforts to collaborate with volunteers and build capacity for trail maintenance
		Coordinate between agencies for a consistent message on access and climate change
		Coordinate with recreational user groups to educate the public about safety concerns associated with increased bridge and trail damage
		Collaborate with user groups to educate the public and increase political support and funding to maintain access
	Modify recreation access based on changing conditions	Alter management and recreation timing and access as the length of the recreation season changes
		Open trails, campgrounds, and facilities earlier in the season
	Allow for increased landslide frequency by relocating roads and structures	Collaborate with partners to compare data of current damage with data on soil moisture and landforms to identify sensitive areas
	Minimize risks to human safety	Educate the public about risks associated with early and late-season access
		Evaluate and monitor timing of visitor use relative to hydrologic dynamics
		Limit visitor access when safety is a concern