Appendix 2-D: Climate Change Vulnerability Assessment Checklist and Prioritization

The 2012 IRWM Plan Standards for Proposition 84 and 1E requires an evaluation of the Region's vulnerabilities to the effects of climate change using, at a minimum, the Climate Change Vulnerability Checklist included in the Climate Change Handbook from the Department of Water Resources (DWR). The Climate Change Handbook can be found at *http://www.water.ca.gov/climatechange/CCHandbook.cfm*. The IRWM Plan Standards also require a prioritization of those vulnerabilities with a plan or program for further analysis of the prioritized vulnerabilities.

Responses to the checklist questions and prioritization specific to the Region, and linkages to the Plan objectives and projects, are provided in this appendix. The checklist questions are identified by number. The first subsection below provides the prioritization list with the question number, checklist category (i.e. Water Demand), and a brief note describing the rationale for the prioritization. The second subsection below provides the text of the question with bullet notes from the Climate Change Handbook, the response specific to the Region, and the objectives and projects that link to the vulnerability. Responses are italicized and indented. Positive responses are also in bold.

D.1 Proposed Prioritization of Climate Change Vulnerabilities

High Priority Vulnerabilities

1.2 Water Demand – There is a high degree of seasonal fluctuation in water use.

2.1 Water Supply – Snowmelt is the primary source of water supply in the Region.

2.4 Water Supply – There is limited ability to store carryover supply surpluses.

2.6 Water Supply – Invasive species are a concern in the Region.

3.1 Water Quality – Increased wildfires are a threat to reservoirs.

3.2 Water Quality – Water quality concerns in Lake Tahoe may be exacerbated by climate change.

3.4 Water Quality – TMDLs are being or have been set for several waterbodies.

3.5 Water Quality – Treatment facilities are not impacted by rain event water quality shifts.

5.5 Flooding – Wildfires are a concern in the Region.

6.1 Ecosystem and Habitat Vulnerability – Erosion and sedimentation are problems for aquatic habitats in the Region.

6.2 Ecosystem and Habitat Vulnerability – Riparian, meadow, and aquatic habitats depend on seasonal freshwater flow patterns.

6.4 Ecosystem and Habitat Vulnerability – Endangered and threatened species exist in the Region.

6.5 Ecosystem and Habitat Vulnerability – The Region relies on aquatic habitats for recreation.

6.9 Ecosystem and Habitat Vulnerability – Native fish habitat has been fragmented by dams.

Medium Priority Vulnerabilities

1.1 Water Demand – Water is needed for irrigation and snowmaking.

3.3 Water Quality – Seasonal low flows have decreased slightly in some streams.

6.3 Ecosystem and Habitat Vulnerability – Climate-sensitive fauna and flora to live in the Region.

6.6 Ecosystem and Habitat Vulnerability – The Truckee and Carson Rivers are entirely adjudicated.

6.8 Ecosystem and Habitat Vulnerability – The Region is in the Sierra Nevada.

Low Priority Vulnerabilities

1.3 Water Demand – No climate-sensitive crops.

1.4 Water Demand – Groundwater supplies have been reliable even during drought.

1.5 Water Demand – Curtailment measures are effective in the Region.

1.6 Water Demand – Instream flow requirements are sufficient and typically met.

2.5 Water Supply – Water demands have always been met, even during drought.

5.1 Flooding – Most critical infrastructure does not lie within the 100-year flood plain.

5.3 Flooding – Aging flood control infrastructure is not currently a significant concern.

5.4 Flooding – Flood control facilities have not been insufficient in the past.

7.1 Hydropower – Hydropower is not a significant source of electricity in the Region.

7.2 Hydropower – There are no future plans for hydropower generation facilities.

Vulnerabilities Not Applicable in the Region

2.2 Water Supply – All water supplies originate within the Region, no water is imported from the Delta or Colorado River.

2.3 Water Supply – The Region does not rely on coastal aquifers.

4.x Sea Level Rise – The Region is not located near the coast.

5.2 Flooding – The Region is not located within the Sacramento-San Joaquin Drainage District.

6.7 Ecosystem and Habitat Vulnerability – The Region does not contain estuaries, coastal dunes, wetlands, marshes, or exposed beaches.

D.2 Climate Change Vulnerability Checklist Responses

This subsection provides the responses to questions in the DWR Climate Change Handbook for Regional Water Planning, Appendix B: Vulnerability Assessment Checklist. Responses are indented and *italicized*. Positive responses are in **bold**.

1. Water Demand

1.1 Are there major industries that require cooling/process water in your planning region?

- As average temperatures increase, cooling water needs may also increase.
- Identify major industrial water users in your region and assess their current and projected needs for cooling and process water.

There are no major industrial or commercial users within the Region that require cooling water. However, the recreation sector includes golf courses that need water for irrigation and ski resorts that need water to make snow.

1.2 Does water use vary by more than 50% seasonally in parts of your region?

- Seasonal water use, which is primarily outdoor water use, is expected to increase as average temperatures increase and droughts become more frequent.
- Where water use records are available, look at total monthly water uses averaged over the last five years (if available). If maximum and minimum monthly water uses vary by more than 25%, then the answer to this question is "yes".
- Where no water use records exist, is crop irrigation responsible for a significant (say >50%) percentage of water demand in parts of your region?

Yes, there is a high degree of seasonal fluctuation in municipal use in the Region. The maximum and minimum municipal water use vary by as much as 100% (West Yost and Associates 2012). A major contributing factor to this variability is the seasonal variations in the tourism and recreation industry. Agriculture is not a significant water user in the Region.

1.3 Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?

- Fruit and nut crops are climate-sensitive and may require additional water as the climate warms.

No, irrigated agriculture is a very minor sector within the Region. Most agriculture in the Region is unirrigated rangeland. (El Dorado County Department of Agriculture 2013) Irrigated agriculture in Alpine County utilizes recycled water from South Tahoe PUD and local surface water.

1.4 Do groundwater supplies in your region lack resiliency after drought events?

- Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts and may become more dependent on groundwater pumping.

No, groundwater supplies have been reliable even in times of drought and are forecast to continue as such even during multiple dry year scenarios.

1.5 Are water use curtailment measures effective in your region?

- Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts.

Yes, water use curtailment measures have been demonstrated to be effective in the Region. All major water suppliers have water shortage contingency plans in place, and are implementing demand management measures. The installation of water meters has resulted in decreased water usage in the Tahoe and Truckee areas. The effectiveness of restrictions on water use were demonstrated when several of South Tahoe PUD's groundwater supply wells were impacted by MTBE and restrictions were emplaced to reduce demand in the face of the reduced supply. Installation of water meters and implementation of other water conservation measures is being actively pursued in the Region, and is addressed by Plan objective WS3.

1.6 Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?

- Changes in snowmelt patterns in the future may make it difficult to balance water demands. Vulnerabilities for ecosystems and municipal/agricultural water needs may be exacerbated by instream flow requirements that are:
    1. not quantified,
    2. not accurate for ecosystem needs under multiple environmental conditions including droughts, and
    3. not met by regional water managers.

Yes. Instream flow requirements in the Truckee and Carson Rivers may be sufficient to support aquatic life. However, they are occasionally unmet. As interstate rivers, the waters of the Truckee and Carson Rivers are entirely adjudicated through the Truckee River Operating Agreement (TROA) and the Alpine Decree. The TROA includes defined minimum flows with consideration of the fisheries in the Truckee River and Pyramid Lake.

2. Water Supply

2.1 Does a portion of the water supply in your region come from snowmelt?

- Snowmelt is expected to decrease as the climate warms. Water systems supplied by snowmelt are therefore potentially vulnerable to climate change.

Yes, snowmelt provides most surface water supply in the Region, and is the primary source of infiltration for groundwater.

- Where watershed planning documents are available, refer to these in identifying parts of your region that rely on surface water for supplies; if your region contains surface water supplies originating in watersheds where snowpack accumulates, the answer to this question is "Yes."

  Planning documents used to identify reliance on surface water include:

  North Tahoe Public Utilities District (North Tahoe PUD) Urban Water Management Plan (UWMP)
  Placer County Water Agency UWMP
  South Tahoe Public Utilities District UWMP
  Tahoe City Public Utilities District (Tahoe City PUD) UWMP
  Truckee Donner Public Utilities District UWMP

- Where planning documents are not available, identify major rivers in your region with large users. Identify whether the river's headwaters are fed by snowpack.

  Major rivers in the Region, all fed by snowpack, and large surface water users:

  Little Truckee River
  Upper Truckee River
  Lake Tahoe (North Tahoe PUD, Tahoe City PUD)
  Truckee River (Nevada water users)
  West Fork Carson River
  East Fork Carson River (Markleeville Mutual Water Company)

2.2 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?

- Some imported or transferred water supplies are sources from climate-sensitive watersheds, such as water imported from the Delta and the Colorado River.

No, all water supplies originate within the Region.

2.3 Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?

- Coastal aquifers are susceptible to salt intrusion as sea levels rise, and many have already observed salt intrusion due to over-extraction, such as the West Coast Basin in southern California.

No, the Region is not located near the coast and has no problem with salt intrusion.

2.4 Would your region have difficulty in storing carryover supply surpluses from year to year?

- Droughts are expected to become more severe in the future. Systems that can store more water may be more resilient to droughts.

Not in the Tahoe or Truckee areas, as there are several reservoirs on the Truckee River or its tributaries that could store surpluses. Outflow from Lake Tahoe into the Truckee River is controlled by the Federal water master and the release rates are based on flooding concerns and downstream demands. Storage and releases in other reservoirs are managed together to meet the required flows and vary by the surface elevation in Lake Tahoe. There is capacity for additional storage of supply surpluses.

There are no reservoirs to store carryover supply surpluses along the East or West Forks of the Carson River within California, or Markleeville Creek from which the community of Markleeville obtains water.

Meadows and riparian habitat provide a significant amount of water storage in the Region, and there are several meadow restoration projects to improve this function among others.

2.5 Has your region faced a drought in the past during which it failed to meet local water demands?

- Droughts are expected to become more severe in the future. Systems that have already come close to their supply thresholds may be especially vulnerable to droughts in the future.

No. Although historically the surface elevation of Lake Tahoe has occasionally dropped below the natural rim during prolonged dry periods. Much of the local water demand is met by groundwater which has ample recharge relative to demands.

2.6 Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?

- As invasive species are expected to become more prevalent with climate change, existing invasive species issues may indicate an ecological vulnerability to climate change.

Yes, invasive species of concern in the Region are discussed in Section 2. Aquatic invasive species of concern that are present in the Region include large mouth bass, Asian clam, bluegill, goldfish, bull frogs, curly leaf pondweed, and Eurasian watermilfoil. Efforts are in place to prevent the encroachment of zebra mussels, quagga muscles, and New Zealand mudsnails into waterbodies in the Region. Terrestrial invasive species of concern include spotted knapweed, yellow starthistle, purple loosestrife, various thistles, and cheatgrass. Plan objective ER2 addresses invasive species concerns, and there are many projects and programs throughout the Region for both control of existing invasive species and prevention of encroachment of new invasive species.

3. Water Quality

3.1 Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?

- Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research (PIER) Program has posted wildfire susceptibility projections as a Google Earth application at: *http://cal-adapt.org/fire/*. These projections are only the results of a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.

Yes, the Region has high vulnerability to wildfires due to the amount of forested land throughout. Wildfire risk is projected to increase as a result of changes to temperatures, evapotranspiration, and snowmelt. All reservoirs in the Region are surrounded by fire-susceptible vegetation and many are also surrounded by steep slopes increasing the erosion risk. The risks and impacts of wildfires in the Region were highlighted by the Angora fire in the Tahoe Basin in 2007. The Angora fire burned over 3,000 acres, and raised significant concerns about the increased erosion and sedimentation of Lake Tahoe as well as potentially hazardous impacts to Lake Tahoe from the debris of the hundreds of structures that were burned in the fire. The US Forest Service and other land management agencies are actively pursuing fire fuel management actions; however, much of the forest in the Region still needs treatment. Plan objective ER3 addresses forest health management and wildfire risk issues.

3.2 Does part of your region rely on surface water bodies 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?

- Warming temperatures will result in lower dissolved oxygen levels in water bodies, which are exacerbated by algal blooms and in turn enhance eutrophication. Changes in streamflows may alter pollutant concentrations in water bodies.

Yes. Most surface water bodies in the Region have very good water quality and do not currently have issues related to eutrophication. However, some surface water bodies including Lake Tahoe do have water quality issues related to high nutrient levels in runoff contributing to algal growth. Warming surface temperatures in Lake Tahoe may also alter deep mixing in the lake, which could effectively increase nutrient loadings at the surface due to upwelling from the deep water. As an Outstanding National Resource Water, Lake Tahoe is subject to a non-degradation standard for water quality. Also, maintaining Lake Tahoe's famed clarity is an important environmental and economic/tourism goal for the Region.

3.3 Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?

- In the future, low flow conditions are expected to be more extreme and last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.

Based on gauge data, some streams and rivers in the Region including the Truckee River and the East Fork Carson River have a slight decreasing trend in the seasonal low flows (more information in Appendix 2-F). Diminished snow pack will change the flow curve of Sierra streams for spring runoff. If snow packs decline sufficiently low flow conditions will be reached earlier in the calendar year, resulting in potential adverse effects to aquatic species.

3.4 Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?

- In the future, low flows are expected decrease, and to last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.

Yes. TMDLs are being set or have been set for several bodies of water in the Region. The listed waterbodies and TMDLs are discussed in Section 2 and Appendix 2-B. Plan objective WQ1 addresses TMDLs, and there are many projects in the Region related to addressing water quality issues in the listed waterbodies, especially through stormwater management.

3.5 Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?

- While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to increased erosion, which will increase turbidity in surface waters. Areas that already observe water quality responses to rainstorm intensity may be especially vulnerable.

Although the majority of water supply is met with groundwater, there are a few surface water treatment plants that are active and/or becoming active that could be impacted by potential water quality shifts during rain events.

4. Sea Level Rise

4.1 Has coastal erosion already been observed in your region?

- Coastal erosion is expected to occur over the next century as sea levels rise.

No, the Region is not located near the coast.

4.2 Are there coastal structures, such as levees or breakwaters, in your region?

- Coastal structures designed for a specific mean sea level may be impacted by sea level rise.

No, the Region is not located near the coast.

4.3 Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region?

- Coastal flooding will become more common, and will impact a greater extent of property, as sea levels rise. Critical infrastructure in the coastal floodplain may be at risk.
- Digital elevation maps should be compared with locations of coastal infrastructure.

No, the Region is not located near the coast.

4.4 Are there climate-sensitive low-lying coastal habitats in your region?

- Low-lying coastal habitats that are particularly vulnerable to climate change include estuaries and coastal wetlands that rely on a delicate balance of freshwater and salt water.

No, the Region is not located near the coast.

4.5 Are there areas in your region that currently flood during extreme high tides or storm surges?

- Areas that are already experiencing flooding during storm surges and very high tides, are more likely to experience increased flooding as sea levels rise.

No, the Region is not located near the coast.

4.6 Is there land subsidence in the coastal areas of your region?

- Land subsidence may compound the impacts of sea level rise.

No, the Region is not located near the coast.

4.7 Do tidal gauges along the coastal parts of your region show an increase over the past several decades?

- Local sea level rise may be higher or lower than state, national, or continental projections.
- Planners can find information on local tidal gauges at *http://tidesandcurrents.noaa.gov/sltrends/sltrends_states.shtml?region=ca*.

No, the Region is not located near the coast.

5. Flooding

5.1 Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at: *http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/*.

- While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to higher peak flows and more severe floods.
- Refer to FEMA floodplain maps and any recent FEMA, US Army Corps of Engineers, or DWR studies that might help identify specific local vulnerabilities for your region. Other follow-up questions that might help answer this question:

    1. What public safety issues could be affected by increased flooding events or intensity? For example, evacuation routes, emergency personnel access, hospitals, water treatment and wastewater treatment plants, power generation plants and fire stations should be considered.
    2. Could key regional or economic functions be impacted from more frequent and/or intense flooding?

Most critical infrastructure is not located within the 100-year or 500 year floodplains. The 200-year floodplain has not been developed for the east face of the Sierra Nevada Mountains. The Lake Tahoe Airport outside of South Lake Tahoe is in the 500-year floodplain, and partially in the 100-year floodplain. The South Tahoe PUD wastewater treatment plant is partially in the 100-year flood plain.

5.2 Does part of your region lie within the Sacramento-San Joaquin Drainage District?

- The SSJDD contains lands that are susceptible to overflows from the Sacramento and San Joaquin Rivers, and are a key focus of the Central Valley Flood Protection Plan. (*http://www.water.ca.gov/cvfmp/program.cfm*).

No, the Region is not located within the Sacramento-San Joaquin Drainage District.

5.3 Does aging critical flood protection infrastructure exist in your region?

- Levees and other flood protection facilities across the state of California are aging and in need of repair. Due to their overall lowered resiliency, these facilities may be particularly vulnerable to climate change impacts.

- DWR is evaluating more than 300 miles of levees in the San Joaquin and Sacramento Rivers Valleys and the Delta (*http://www.water.ca.gov/levees/*).

Yes. While the dams on the Truckee River were primarily constructed for irrigation water storage they do provide some flood protection for downstream users outside of the Region. The dams were originally constructed between forty and seventy years ago. The Lake Tahoe Dam was modified and repaired in 1988, and repairs have also been performed on the Boca, Stampede, and Prosser Creek Dams since construction. The Martis Creek Dam is currently considered high risk and is operated with open spillways. The Army Corp of Engineers is conducting a Dam Safety Modification Study of the Martis Creek Dam. In addition, infrastructure such as culverts are aging and in need of replacement, and in some cases are undersized.

5.4 Have flood control facilities (such as impoundment structures) been insufficient in the past?

- Reservoirs and other facilities with impoundment capacity may be insufficient for severe storms in the future. Facilities that have been insufficient in the past may be particularly vulnerable.

No, not within the Region. Most flooding concerns along the Truckee River have been downstream in the Reno, Nevada area.

5.5 Are wildfires a concern in parts of your region?

- Wildfires alter the landscape and soil conditions, increasing the risk of flooding within the burn and downstream areas. Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research Program (PIER) has posted wildfire susceptibility projections as a Google Earth application at: *http://cal-adapt.org/fire/*. These projections are the results of only a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.

Yes, wildfires are a concern throughout the Region. See the response to item 3.1.

6. Ecosystem and Habitat Vulnerability

6.1 Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?

- Erosion is expected to increase with climate change, and sedimentation is expected to shift. Habitats sensitive to these events may be particularly vulnerable to climate change.

Yes, erosion and sedimentation are problems for aquatic habitats in the Region. Several creeks in the Region, the Truckee River, and Lake Tahoe have or require TMDLs for sedimentation. TRPA, state agencies, and local agencies have implemented and are planning several river and wetland restoration projects to help reduce fine and suspended sediment volumes reaching Lake Tahoe. High flow years can add large volumes of sediment to Lake Tahoe and other water bodies. Plan objective WQ1 addresses TMDLs, and there are several projects in the Region addressing erosion and sedimentation issues.

6.2 Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?

- Seasonal high and low flows, especially those originating from snowmelt, are already shifting in many locations.

The Region includes only freshwater habitats, however riparian, meadow, and aquatic habitats in the Region rely on the current seasonal freshwater flow patterns. There are many projects and organizations focused on restoration of these habitats in the Region.

6.3 Do climate-sensitive fauna or flora populations live in your region?

- Some specific species are more sensitive to climate variations than others.

Yes. The Region includes significant areas with high elevation alpine and subalpine ecosystems that include both plants and animals that are sensitive to climate variations and have limited abilities to shift their ranges.

Shorter winters would likely reduce seed germination for plants that need a long cold stratification period to prepare seeds for germination. Plants may be stressed by changes in soil moisture throughout the year, and may also be subjected to greater threats from pests and diseases as the insects and diseases may not be killed during milder winters with fewer and shorter frost periods and warmer temperatures. Some high elevation mammals, like pika, cannot tolerate warm temperatures, and the plants that they rely on for food and shelter may be affected by climate change. Aquatic ecosystems are generally sensitive to increases in water temperature, and changes to the volume and timing of runoff in streams and rivers in the Region may also affect foraging, migration, and spawning of fish.

6.4 Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?

- Species that are already threatened or endangered may have a lowered capacity to adapt to climate change.

Yes, a list of endangered or threatened species in the Region is included in Section 2. Some of these species are particularly susceptible to the potential effects of climate change. The Sierra Nevada yellow-legged frog and

Yosemite toad are dependent on the snowpack and quantity of water in alpine ponds and lakes. The pika cannot tolerate warm temperatures, and warming temperatures would also contribute to reductions in habitat for the Sierra Nevada red fox. The Lahontan and Paiute cutthroat trout are adapted to the historical stream flow patterns and temperatures from snowmelt for spawning. Plan objective ER1 addresses restoration of habitats that support many special status species.

6.5 Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?

- Economic values associated with natural habitat can influence prioritization.

Yes, water-dependent recreation is the major economic activity in the Region. Recreation opportunities include rafting, kayaking, boating, fishing, and swimming in the lakes and rivers; and camping, hiking, and biking in the State Parks and other publicly accessible open space. In addition, ski areas rely on snow-making using groundwater. As snow pack decreases with climate change, even greater emphasis will be placed on water-oriented recreation for attracting tourists.

6.6 Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?

- Constrained water quality and quantity requirements may be difficult to meet in the future.

Yes, as discussed in item 1.6, the Truckee River and Carson River are entirely adjudicated, including quantified flow requirements for fisheries. Also, surface water contamination from mine drainage has occurred in parts of the watershed for the East Fork Carson River, especially downstream of Leviathan Mine.

6.7 Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?

- Storm surges are expected to result in greater damage in the future due to sea level rise. This makes fragile coastal ecosystems vulnerable.

No, the Region is not located near the coast.

6.8 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/)?*

- These ecosystems are particularly vulnerable to climate change.

Yes, the Region is in the Sierra Nevada.

6.9 Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?

- These ecosystems are particularly vulnerable to climate change.

Native fish habitat has been fragmented by dams on the Little Truckee River and Truckee River tributaries. No infrastructure projects are planned that might further preclude species movement; and some stretches of the East Fork Carson River and Upper Truckee River are in consideration as Wild and Scenic Rivers, which would prohibit construction of dams in those stretches of river. Plan objective ER1 addresses restoration and enhancement of aquatic habitats.

7. Hydropower

7.1 Is hydropower a source of electricity in your region?

- As seasonal river flows shift, hydropower is expected to become less reliable in the future.

No, there is one hydropower facility, Stampede Powerhouse, which generates electricity to operate Stampede Dam. The total generating capacity of Stampede Powerhouse is 3.65 megawatts. Excess electricity sold on the open market by the Stampede Powerhouse is not a significant source of electricity for the Region or surrounding areas.

7.2 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?

- Energy needs are expected to increase in many locations as the climate warms. This increase in electricity demand may compound decreases in hydropower production, increasing its priority for a region.

No, there are no plans for new hydropower generation facilities in the Region. Projected growth in the Region is low.