Section F

Resource Management Strategies

Section F – Resource Management Strategies

F.1 Introduction

A variety of Resource Management Strategies (RMS) are provided by the California Water Plan to help local agencies and governments manage their water resources. RMS should be selected based on regional needs, project objectives, and cohesivity with existing water systems. RMS are grouped into 8 management objectives.

1. Reduce Water Demand
2. Improve Flood Management
3. Improve Operational Efficiency and Transfers
4. Increase Water Supply
5. Improve Water Quality
6. Practice Resource Stewardship
7. Other

In Compliance with the 2016 IRWMP Guidelines, this section will discuss a range of RMS considered to meet the IRWM objectives and identify the process in which RMS were incorporated into the IRWM Plan. Additionally, the effects of climate change will be assessed in consideration of RMS.

F.2 Resource Management Strategies

The 2013 California Water Plan Update describes 32 different RMS. It is not anticipated that all strategies are applicable to every region of the State, but encouragement is given to foster and implement as many strategies as practical to diversify water management efforts. This section evaluates all 32 strategies contained in the 2013 California Water Plan Update and considers the following:

1. Description of the RMS
2. Discussion of the current applicability to the Tule River Basin
3. Evaluation of the current use of the strategies to the Tule River Basin
4. Discussion of constraints to implementation or constraints to enhancement
5. Discussion of potential impacts of climate change on the strategy
6. Ability of the strategy to help adapt to climate change impacts.

F.2.1 Agricultural Water Use Efficiency

The agricultural water use efficiency strategy aims to use scientific processes to reduce agricultural water demand while maintaining or increasing total agricultural output. Agricultural water use efficiency is expressed in terms of crop yield for a given unit amount of water. As mentioned in previous sections, agriculture accounts for a large majority of total water use within the IRWMP region. As such, this resource management strategy is highly applicable to water management in the region. The 2009 California Water Plan Update lists 16 Efficient Water Management Practices (EWMPs). These are as follows:

<u>Critical EWMPs</u>

1. Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of California Water Code Section 531.10 and to implement EWMP #2.
2. Adopt a pricing structure for water customers based at least in part on quantity delivered.

<u>Other EWMPs</u>

3. Facilitate alternative land use for lands with exceptionally high-water duties or whose irrigation contributes to significant problems including drainage.
4. Facilitate use of available recycled water that otherwise would not be used beneficially, meet all health and safety criteria, and do not harm crops or soils.
5. Facilitate the financing of capital improvements for on-farm irrigation systems.
6. Implement an incentive pricing structure that promotes one or more of the following goals:
    - More efficient water use at the farm level.
    - Conjunctive use of groundwater.
    - Appropriate increase of groundwater recharge.
    - Reduction in problem drainage.
    - Improved management of environmental resources.
    - Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.
7. Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage.
8. Increase flexibility in water ordering by, and delivery to, water customers within operational limits.
9. Construct and operate supplier spill and tailwater recovery systems.
10. Increase planned conjunctive use of surface water and groundwater within the supplier service area.
11. Automate canal control structures.
12. Facilitate or promote customer pump testing and evaluation.
13. Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.
14. Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following:
    - On-farm irrigation and drainage system evaluations.
    - Normal year and real-time irrigation scheduling and crop evapotranspiration information.
      o Surface water, groundwater, and drainage water quantity and quality data.

- Agricultural water management educational programs and materials for farmers, staff, and the public.

15. Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.
16. Evaluate and improve the efficiencies of the supplier's pumps.

Most of these EWMPs are employed throughout the Tule River Basin. For example, where conveyance system piping occurs, it is often within an area converted to urban use where impact fees have been paid allowing for construction of an offsetting recharge area. In some areas where piping has been employed, the piping is actually laid in the prior open channel section. Only dry-year supplies are conveyed through the pipeline system, whereas normal and above-normal year supplies are still conveyed in the open channel sections, thus allowing for groundwater recharge to occur. For some of the EWMPs, implementation is on a Basin-wide basis. These include water management services to water users wherein on-farm advice is made available to growers in the entire region.

Likewise, several entities within the Tule River Basin are signatory to the Memorandum of Understanding of the Agricultural Water Management Council. Said organization is a non-profit that promotes improvements in agricultural water efficiency and provides technical assistance in the preparation of plans which detail implementing policies, outlines the methods by which assistance is provided and documents efforts to implement the goals associated with EWMPs.

For those areas which have surface water supply service through a contractor from the Friant Division, CVP, Water Management Plans meeting the requirements of the U.S. Bureau of Reclamation and the Agricultural Water Management Council have been prepared. Annual reports and 5-year updates to these plans are required by the repayment contracts associated with the allocation of CVP Project Water.

The majority of the water supply entities within the Tule River Basin are public in nature, thus greatly reducing obstacles to EWMP implementation. However, funding of efficiency related projects is often an obstacle. Local conditions such as topography, micro-climates and flood control channel maintenance issues also impede implementation of EWMPs.

Elevated temperatures and irregular precipitation patterns resulting from climate change hasten the need for strategies targeted towards agricultural water use efficiency. Temperature is highly correlated with evapotranspiration, and increasing temperatures will lead to increased agricultural water demand. Increasing temperatures will also lead to a reduction in snowpack, California's largest "reservoir." Agricultural water use efficiency strategies will improve the region's ability to adapt to these changes.

Although agricultural water use efficiency projects are critical to the region's ability to adapt to climate change, implementation of these projects may result in a temporary increase in GHG emissions. This would be offset in time, as the reduction in water demand would reduce energy use related to water infrastructure systems.

F.2.2 Urban Water Use Efficiency

Principal to urban water use efficiency is the issue of behavioral improvements that lead to the decrease of indoor and outdoor residential, commercial, industrial and institutional water use. To a lesser degree, unlike agricultural water use efficiency, technological improvements are readily employed as only cash expenditures are required to be made, in lieu of modification of behavioral patterns. Best management practices (BMPs) or demand management measures (DMMs) are the measures typically set forth by regulatory and advisory authorities with the more common practices and measures being as follows:

1. Water use survey programs;
2. Residential plumbing retrofits;
3. Water system audits;
4. Water metering;
5. Large landscape conservation programs;
6. Clothes washing machine rebate programs;
7. Public information programs;
8. School educational programs;
9. Conservation programs for non-residential users;
10. Wholesale agency assistance programs;
11. Inverse tiered conservation pricing procedures;
12. Availability of Conservation Coordinator;
13. Water waste prohibition ordinances; and
14. Reduced-flow water closet replacement.

Most of these BMPs and DMMs are in place within the Tule River Basin. The level of implementation and the practice varies, however, based principally on the implementing agency. The City of Porterville has extensive urban water conservation goals, policies and programs, well funded and properly administered. New conservation measures are constantly being examined and some, as demonstrated in current drought conditions, implemented with relative ease.

State legislation, in the form of SBx7-7, also known as the Water Conservation Act of 2009, established a goal of reducing per-capita water use of 20 percent by 2020. That goal has been required to be met earlier by an implementing executive order related to the current drought situation, implemented principally by actions to require mandatory reduction in outside watering. Where landscape conversions are taking place in order to reduce consumption, most have the capability of being accomplished on a permanent basis which could result in a long-term reduction in water demand. Obstacles to implementation of urban efficiency measures include a lack public acceptance, inadequate public funding, and improperly structured water meter rates.

The relationship between climate change and urban water use efficiency is similar to that of climate change and agricultural water use efficiency. Increased temperatures will increase evapotranspiration, which will increase the amount of water demand for landscaping. Irregular precipitation will make water resources less dependable. Improving urban water use efficiency will increase the region's ability to adapt to these changes.

As with agricultural water use efficiency projects, urban water use efficiency projects would likely result in a temporary increase in GHG emissions as a result of project construction. However, this would eventually be offset as the reduction in water demand would lead to reduced energy use related to water infrastructure systems.

F.2.3 Crop Idling for Water Transfers

Crop idling is practiced within some private stock ditch companies within the IRWM boundaries. In some cases, public agencies allow growers to fallow land for a season and transfer water to another grower within the same entity boundaries. Crop idling is typically an extreme measure within the Tule River Basin in response principally to drought conditions. As such, it does not exist on a large scale basis. As previously referenced under the transfers discussion of this chapter, procedures and agreements are already in place to deal with the transfer of entitlement generated from crop idling (single-year land retirement) related activities. It is acknowledge that there are a number of social and economic impacts associated with crop idling which have not been significant, to date, on the limited basis for which these retirement procedures have occurred. Expanding such activities to a larger basis will require examination of the social and economic impacts to determine if they must be addressed in the future.

F.2.4 Irrigated Land Retirement

The U.S. Bureau of Reclamation, in conjunction with the Bureau of Land Management has retired a significant number of acres in the southwest portion of Tulare County, outside the boundaries of the IRWM. No such land retirement steps have been taken within the IRWM boundaries, nor are there any currently under discussion. As drainage impaired lands do not exist within the IRWM Planning Area, funding for such land retirement steps does not currently exist.

As the objective of irrigated land retirement is the removal of farm land from irrigated agricultural production to provide water supplies elsewhere, or to take unproductive land out of production, examination has to be made of the value of the lands within the IRWM boundaries for the productive differential between lands within the boundaries as compared to other lands where the water supply resulting from land retirement would be made available. As the lands within the IRWM boundaries are all high-value, high-soil class and microclimate lands, it is unlikely that lands within the Tule River Basin would be a replacement target for lands external to the subject boundaries. As some of the most significant agricultural land in the world exists within the IRWM boundaries and as the gross farm gate receipts are reflective of one of the top counties in the nation, it is not likely that the area will be the subject target for this program in the short-term or long-term. The land parcels which have been identified to be marginal with respect to agricultural production have been the primary targets for acquisition for groundwater recharge areas. As previously noted, the opportunities for purchase of these types of land to enhance the groundwater recharge basin inventory have significantly diminished over time. As the opportunity nonetheless exists for retirement potential, this strategy has not been determined to be not applicable. It will remain on the “watch” list for future policy examination efforts related to the IRWM Plan.

F.2.5 Conveyance – Delta

Conveyance through the Sacramento-San Joaquin Rivers Delta includes the management, movement and diversion of water from that area. Approximately 5,309 acre-feet of Delta-base supply is applicable to the County of Tulare, with 100 acre-feet being contracted for by the Saucelito Irrigation District and 45 acre-feet by Styro-Tek. Four hundred acre-feet is also contracted for delivery by the Strathmore Public Utility District. This contract supply is not currently being employed for other than groundwater recharge purposes and thus a significant reliance on Delta related diversions only exists within the Tule River Basin by Friant Division, CVP contractors. The majority of the supply coming into the Tule River Basin which is of a Friant Division, CVP nature, is split between Class 1 and Class 2 supply, with the Class 2 supply principally from Purchased Water Contract supplies from the natural flows of the San Joaquin River, not connected with diversions from the Delta.

F.2.6 Conveyance – Regional/Local

Conveyance is that action to move water from its source to areas of need. Conveyance within the Tule River Basin consists principally of utilization of natural channels and earthen constructed facilities, many of which incorporate significant elements of historic natural channels. At the district and ditch company level, constructed facilities, such as diversion facilities and canals, exist with, as previously noted, limited employment of pipelines and pumping facilities. These conveyance facilities range in size from larger systems employing relatively high capacity earthen channels to small, local, end-user distribution systems that deliver water to specific landowners/growers. Urban related deliveries are only those associated with groundwater recharge with two surface water treatment facilities existing within the Planning Area serving Strathmore and Terra Bella. For the most part, larger conveyance systems utilized for delivery of agricultural supplies are also facilities utilized for flood control purposes and management and maintenance activities are principally oriented toward the flood control aspect. As a result, only during times of high Tule River releases from Success Reservoir are these facilities inadequate to convey water to areas for distribution for use and/or recharge and few problems exist distributing available volumes to meet peak summer demands.

The same systems are utilized to convey storm waters during the winter periods and coordination efforts must be employed to ensure proper conveyance and disposal of storm water related flows, along with Tule River entitlement flows mandated to be released from Success Reservoir for flood control purposes. Based on the fact that improved automation and controls can increase operational flexibility, some steps have been made to begin to automate controls on the Tule River system and further, telemetry systems to monitor diversions to ensure that any losses associated with spills are reduced to as close to a zero level as possible.

Climate change may affect this paradigm wherein demand for higher conveyance capacity may increase if the timing and volume of flows changes due to atmospheric warming trends. In addition, increased capacity may be needed to deliver water during periods of the year which are not the prime growing season, as well as to deliver higher volumes of water than are currently experienced for short periods of time.

F.2.7 System Reoperation

System reoperation is defined as actions taken with respect to existing operational procedures related to reservoirs and conveyance facilities to alter water related benefits. System reoperation is typically examined in the context of improving the delivery of water to improve the efficiency related to existing uses or to impose improvement in one use over another. For instance, operation of reservoir releases for power production would be enhanced if releases were during a defined period of peak power use, as compared to running a generator on a run-of-the-river basis, where releases are dictated by agricultural water demands.

Water rights on the Tule River are managed by the Tule River Association (Association). Agreements exist between all of the pre-1914 water users associated with the Tule River and the major riparian users of River water. These agreements define the operational policies for the member units and have proven to be instrumental in reducing conflicts between water users, in establishing guidelines for management of available supplies and ensuring compliance with State law relative to water rights priorities.

Significant system reoperation procedures are felt to be limited with respect to existing systems. Storage limitations associated with Success Reservoir exist, particularly from November 15 to May 1 of the following year as the reservoir is operated exclusively for flood control purposes. The balance of the year, system operations are tuned to the desires of the water rights holders and the demands of stockholders to meet the requirements of their existing demands. Individual entities currently are experimenting with operational changes, some due to power generation enhancement, as compared to water use efficiency modifications.

Changed conditions in the future could result in a basis for reoperations and, thus, the issue needs to be periodically evaluated. These changes could include impacts related to proposed changes in groundwater regulations, as well as climate change induced conditions.

F.2.8 Water Transfers

Established California legal statutes define water transfers as temporary or long-term changes in the point of diversion, place of use or purpose of use resulting from the transfer or exchange of water or related water rights. Water transfers are a recognized beneficial water management tool within the Tule River Basin, with specific guidelines established for both in-Basin and external Basin transfers and exchanges having been developed over the years. Such guidelines development has been based on the demonstrated capability of transfers and exchanges to accomplish the securing of new supplies, to increase supply reliability, to assist in maintenance of the groundwater basin and addressing droughts and associated overdraft conditions. Water transfers are a particularly important tool in response to climate change, which is anticipated to cause extreme precipitation events followed by long drought periods. In some cases water transfers have been used to generate revenue during certain market conditions to be leveraged to future water purchases during the existence of more ample water supply conditions. For instance, a reduced period run during dry year conditions can result in income being generated sufficient to allow for purchase of external Basin supplies sufficient to run for weeks in length. Foregoing a few days of water run and associated loss patterns, in exchange for recovery of all water lost and a multiple supply imported with funds generated from the initial transfer are recognized as significant water management tools within the Tule River Basin.

These transfers and exchanges are not without constraint. Many ditch companies with pre-1914 water rights have long established boundary restrictions for delivery of their water rights. Many adhere to an unwritten Basin water transfer policy which restricts the conditions under which transfers can take place and requires findings by the Water master and the Association Board of Directors prior to a transfer being approved. To a limited extent, additional constraints are imposed based on costs established for water being made available for transfer, Groundwater Management Plan Memorandum of Understanding constraints and restrictions and facility related issues. For out-of-Basin transfers, additional restrictions are imposed by the U.S. Bureau of Reclamation as Federal facilities are required to be utilized in out-of-Basin transfers. Mechanisms are currently in place to allow these transfers and exchanges to take place, to invite proposals related to water banking and to hopefully comply with requirements associated with recent groundwater legislation. In exchange, obtaining tangible, measurable water supply benefits is fundamental to any program of this nature.

F.2.9 Flood Risk Management

The City of Porterville and the County of Tulare have been invited to become signator to the Memorandum of Understanding providing the basis for the IRWM Plan and and do play a role in the management structure. These agencies, in combination with the State and County Offices of Emergency Services, are those principally responsible for flood risk management. In this case, management is defined as assisting individuals and government infrastructure agencies and departments with assistance in and response to preparing for, responding to and recovering from a flood event. Solutions which are offered are both structural in nature and include policy issues such as land use zoning and flood plain zoning. At the current time, considerable dialogue is at the forefront involving the activities of the Federal Emergency Management Agency (FEMA) with respect to their determination of what constitutes an adequate flood control levee. Mitigating flood management is a crucial component of climate change adaption, as flood risk is expected to increase as storm events and wildfire increase in severity causing reduced infiltration and increased runoff. An increase in either the severity or intensity of flooding may require modifications to monitoring systems and improvements in flood plain protection structures. Land use planning policies may also need to be re-examined under this paradigm.

F.2.10 Agricultural Lands Stewardship

In cooperation with landowners/growers, the DCTRA, along with the Agricultural Commissioner of the County of Tulare and the University of California Extension are heavily engaged in agricultural lands stewardship. In this context, agricultural land stewardship involves the conservation of natural resources and protection of environmental features associated with agricultural lands. The joint practice of conducting land operations for food production while recognizing considerations such as soil preservation, air quality, energy conservation and threatened and endangered species habitat development and maintenance, are all elements of agricultural land stewardship. The accepted definition also extends to protection of open space characteristics, as well as the buffer zone between agricultural operations and rural communities. As Tule River Basin lands are fully developed, the impacts associated with conversion of agricultural land to urbanized land further impacts agricultural lands to accommodate issues such as storm water management, flood control, water conservation, carbon sequestration and habitat preservation. Within the Basin, preservation of the remaining examples of riparian oak forest and riparian oak savannah has been undertaken, as well as vernal pool preservation.

Agricultural lands stewardship contributes to the region's climate change mitigation efforts by promoting energy conservation, which reduces GHG emissions, and encouraging native vegetation, which increases carbon sequestration. Additionally, this management strategy increases the region's adaptability to climate change through the enhancement of biodiversity, which increases ecosystem resilience to climatic changes.

Constraints obviously exist to further implementation of these stewardship activities. Principal among these is funding, not just for initial purchase and maintenance, but also for security related functions. Illegal drug activities and steps necessary to avoid intentionally set fires compete with the desire to utilize the settings for public access and related educational purposes.

F.2.11 Economic Incentives (Loans, Grants and Water Pricing)

Economic incentives related to water management efforts run the gamut from policy development to implementation. Water marketing, water banking and water pricing policies are all driven by economic considerations and economic incentives play a significant role in the degree to which these activities take place. Direct financial assistance or water pricing, in conformance with the statutory requirements associated with Proposition 218, are fundamental to the offering of incentives. These criteria are typically deeply engrained in economic incentives associated with loans, grants and rebates. Other economic incentives can involve the granting of free services, timing of the use of power, availability of treated wastewater for reuse and costs associated with easements associated with access to sources of water supply. On the periphery, economic incentives can also produce benefits of an environmental or social type and influence the construction of new facilities through delay and/or avoidance alternative procedures.

Particular to the IRWM Area, specific incentive examples include tiered water pricing, rebate programs for installing conservation devices and exchanges of treated wastewater for high quality surface water for recharge and/or direct reuse. Additional incentives are available to landowners/growers relative to on farm irrigation efficiency in the form of system conversion financial assistance.

Economic incentives are the most powerful way to encourage efficient water use. As such, they are a useful tool to address climate change mitigation and adaption. Incentivizing water consumers to limit water use when water supplies are unreliable increases the region's adaptability to climate change. The reduction in water demand will also reduce energy use related to water infrastructure systems, which will ultimately reduce GHG emissions.

F.2.12 Ecosystem Restoration

Ecosystem restoration provides numerous water management related benefits. Restored ecosystems can increase the quality and quantity of water supplies, which benefits urban and agricultural water users as well as a variety of ecosystem dependent species. Improved water quality associated with ecosystem restoration can reduce the energy demand and monetary costs associated with water treatment. The reduction of energy demand ultimately reduces the region's GHG emissions. GHG emissions are further offset as native vegetation is restored, increasing the rate of carbon sequestration.

In addition to climate change mitigation, ecosystem restoration contributes to climate change adaption by increasing infiltration, which reduces the risk of flood and water quality impacts resulting from high runoff. Additionally, native ecosystems are adapted to natural fire and will be more resilient in response to the increased wildfire risk associated with climate change.

A principal water management element which exists within the adjacent Kaweah River Basin IRWM Planning Area is the implementation of the outcomes related to the Kaweah River Corridor Study. The focus of this study was on the development of lands within the Basin on which could be developed projects which were multi-purpose in nature. The targeted purposes included groundwater recharge, storm water control and habitat preservation/restoration. To date, a number of examples now exist within the Kaweah Basin of multipurpose projects involving water management where habitat preservation, habitat development or a combination of both, are principal elements of project development. Under the leadership of the City of Visalia and the KDWCD, groundwater recharge and storm water basin design has left the era of the sterile engineered levee configuration for a design which accommodates re-vegetation of both trees and native grasses and incorporates significantly different maintenance activities than those associated with the sterile levee type of approach.

Parallel to these efforts, the DCTRA has constructed basins with the groundwater recharge and environmental benefits. DCTRA has also been engaged in discussions related to restoration projects associated with Deer Creek sand mine sites which are now in the reclamation phase, or are anticipated to enter that phase in the near-term.

There are a number of recognized constraints to development of ecosystem restoration projects, which include sufficient funds to acquire property, high costs associated with property acquisitions, impacts on adjacent parcels which are farmed where introduction of endangered species may be a potential, rodent control and weed control activities. The degree to which protection and restoration has been implemented within the Basin demonstrates that the majority of these obstacles can be successfully overcome.

F.2.13 Forest Management

There are no forests located within the IRWM Planning Area. A significant portion of the Tule River Watershed is, however, forested up to the high-altitude tree line. The management of these forest lands is split between the U.S. Forest Service and the National Park Service and a recognized Tule River Indian Reservation. As a result, water management entities located within the Tule River Basin have no governance authority over activities within these forests. Acknowledging, however, the fact that activities such as water management, timber management, native and invasive vegetation management, outdoor recreation and stock grazing occur within the forested areas, has led to an active input position to the agencies charged with overseeing watershed quality related issues. The input takes the shape of communication with the governing agencies with respect to their proposed policies and procedures and is anticipated to expand to include a cooperative effort in this regard with the recently formed Southern Sierra IRWM.

F.2.14 Recharge Area Protection

Protection of land uses for specific purposes are enveloped in law for a number of topics. Most significant of these are policies related to mineral resources where lands containing identified mineral resources which have been determined to exist by the State are required to be protected from encroachment by land uses which may impede their development. To date, no such procedures exist within the IRWM Planning Area for candidate water management sites, even though groundwater recharge and banking programs may be of benefit to the urban development of lands currently in agricultural production. No rules currently exist which would ensure that area suitable for development for recharge purposes are protected from an agricultural to urban environment conversion. In addition, pollutant loads from urbanization are not currently subjected to the same water quality criteria as exists for agricultural areas. The potential thus exists for groundwater recharge areas to be subject to contamination. The topic is one which was discussed during development of the recent General Plan update by the County of Tulare, however, policies were not introduced into said update reflecting requested area protection measures. Based on the current lack of policy development and implementation, entities developing recharge areas are left to their own devices with respect to protection of prime recharge areas.

This necessitates a significantly higher financial investment in land than would just basin site acquisition and development. Thus, the buying power of the funds associated with groundwater recharge are diminished as land must be purchased for protection of the recharge area from contamination, in addition to purchasing the recharge area itself. One of the current policy suggestions to improve this situation has been to begin development of mapping on which is depicted the prime recharge areas within the IRWM Planning Area.

F.2.15 Sediment Management

Improper sediment management can lead to poor water quality and habitat degradation. Sediment management, as described by the California Water Plan 2016 update, involves the assessment of the cumulative impacts of all past, present, and proposed human activities in predicting the impacts of sediment on surface waters. Sediment management in water bodies typically focuses on addressing three issues:

1. The type and source of sediment.
2. The systems transporting sediment.
3. The location where sediment deposits

Preventing erosion and the transport of sediment on a regional level is the preferred sediment management strategy in the IRWMP area. In the Tule River Basin, proper farming and urban development practices are required to encourage soil conservation and limit sediment pollutants. Erosion control through the use of low impact development techniques and vegetative or man-made ground cover to stabilize top soil is an effective way to prevent excess sedimentation. Source management techniques are enforced by the Regional Water Quality Control Board and documented in the 2015 Tule Basin Water Quality Coalition Sediment Discharge and Erosion Assessment Report. Parcels within the region with an annual soil loss risk value over 15 tons/acre/year are also required to submit a Sediment Discharge and Erosion Control Plan. Because the IRWM planning area is generally flat, the NRCS classifies the Erosion Hazard for a majority of the IRWMP region as slight.

When erosion occurs, sediment is transported downstream where it is eventually deposited into water bodies. The transport of sediment is managed by leveraging natural functions that create optimal sediment transport. This can include diverting sediments into settling ponds or wetlands where they can provide beneficial use. Measures to reduce adverse sediment transport are required in Sediment Discharge and Erosion Control Plans.

Once deposited, sediment can have both positive and negative impacts on waterbodies and surrounding ecosystems. The goal of sediment deposition management is to limit the negative impacts of sedimentation in waterbodies while preserving positive impacts. In the Tule River Basin, high sediment loads can reduce the storage capacity behind Success Dam. In addition, uncontrolled stream systems feeding into the IRWMP area are sensitive to high volume sediment loads. The recharge capability of the Tule River, its distributaries, and the uncontrolled stream system beds are the principal locations where effective groundwater recharge occurs. Accumulation of sediments in these channels is averse to their effective percolation capability.

Sediment extraction or dredging can be an effective way remove excess sediment once deposited, however this can directly affect water quality, habitat quality, and contaminant distribution by increasing turbidity and suspended solids. This method is best used in limited areas where an excessive amount of sediment is deposited.

Climate Change would have adverse effects on sedimentation. Increased risk of wildfire and drought could limit vegetative cover and increase erosion. A severe storm event following the loss of vegetative cover would further exacerbate erosion and result in high sediment loads, which could then impact water quality, water storage capacity, and groundwater recharge. As a result, stricter regional sediment management strategies may need to be enforced. Additionally, sediment extraction or dredging may be required where excess sediment is deposited to preserve water resources.

F.2.16 Outreach and Engagement

The use of outreach and engagement in water management is intended to educate on and encourage good water management to enable the public and various industries to make good water management decisions. Outreach and engagement efforts range from informing and educating the public to empowering the public to take an active role in their local water management. As identified by the California Water Plan 2016 Update, a successful outreach and engagement strategy must be:

- Relevant – Contributes to the missions, goals, and objectives of partner organizations.
- Focused – Establishes goals that are measurable, achievable, and targeted toward improving social, economic, environmental, or civic conditions.
- Scale-appropriate – Creates designs at local, state, multi-state, or national scales that effectively address the program's focus.
- Innovative – Integrates research findings and collegial knowledge and experience.
- Collaborative – Cultivates and nurtures authentic and appropriately diverse partnerships.
- Factually and Scientifically Sound — bases strategy on integrated or incorporated knowledge and methods derived from research, and brings together the relevant components of the knowledge system (i.e., research, education, and application) around the problem or issue at stake.

- Adaptive – develops and implements continuous feedback and improvement strategies that include strong program planning and evaluation components, and exchanges information about processes, outputs, and outcomes with colleagues at local, state, multi-state, and national levels.
- Visible – Interprets processes, outputs, and outcomes in a format that is understandable and accessible to partners and decision-makers.
- Effective – Achieves outcomes that meet intended and unanticipated program objectives.
- Sustainable – Develops and implements mechanisms to sustain the production of impacts over time, as appropriate to the duration and priority of a public need.
- Measurable – Creates a difference that can be tracked and measured

In the Tule River Basin, collaboration between the agricultural community, policy makers, and the public is especially critical when making decisions related to water resources. Currently, multi-disciplinary outreach and engagement takes place in the development of water resource plans and water management projects through public meetings, focus groups, workshops and advisory groups.

Climate change increases the urgency for successful outreach and engagement strategies to manage water resources. Adapting to climate change requires a multi-disciplinary approach to be successful. However, the polarizing nature of climate change makes multi-disciplinary collaboration a challenge. Additionally, miss-information about climate change can lead the public to see climate change as a global, rather than local, issue. Increasing efforts to educate the public on the local impacts of climate change will increase public understanding and encourage multi-disciplinary collaboration.

Although cost, opposing stakeholder viewpoints, and a general lack of understanding of water management can challenge outreach and engagement activities, public outreach and engagement should continue to play a significant role in Water Management within the Tule River Basin IRWMP area.

F.2.17 Conjunctive Management and Groundwater Storage

Due to the variable nature of supply within the Tule River Basin, conjunctive use is the fundamental water management strategy which is employed. By definition, conjunctive use is the coordinated and planned management of both surface and groundwater sources of water supply in order to most efficiently use both supplies. Conjunctive Management entails replenishing groundwater resources with excess surface water during wet years for use during dry years, which increases the reliability of water supplies from year to year. This strategy is an important climate change adaption too by increasing the region's resiliency to drought.

Conjunctive management is the device utilized to maximize water supply reliability, to reduce the impacts on the groundwater reservoir, to avoid subsidence associated with overdraft and to manage water quality related issues. Each of these issues involves the potential for conflicts. Managing supplies to optimize reliability can vary by crop type and soil type. Timing of delivery of available surface water supplies may be optimum for one landowner/grower, while not providing the same benefit to another. Timing of deliveries to lands on the east side of the Tule River Basin, where citrus crops are dominant, is often different than exists in the center of the Basin and even different yet for uses associated with the westerly lands within the Basin. Timing of deliveries to lands in the west portion of the Basin are critical with respect to dealing with overdraft and resulting subsidence impact issues. Reasons for management for water quality related purposes can range from reducing impacts of adverse conditions by virtue of quantity of flows available for dilution purposes and for purposes of managing salt accumulations below the root zone of permanent plantings.

In practice, conjunctive use involves numerous procedures and facilities, allowing for recharge during times of available surface water supplies, followed by groundwater extraction, either during times of reduced groundwater deliveries to supplement same, or as the entire supply during periods of time when surface water is unavailable for delivery.

Monitoring of groundwater conditions is a critical component to a properly conducted conjunctive use program. Specifically, monitoring of groundwater levels, accumulation of knowledge related to area lithology and performance runs of groundwater models are all required to provide a proper basis for groundwater management to occur. The need for adequate funds to conduct these programs is also of significance.

In an area such as the Tule River Basin, groundwater balance can only be achieved through the employment of proper conjunctive use procedures. Increasing storage in groundwater during times of available surface supplies, in excess of then current demands, is the only mechanism available to offset withdrawals during periods of time when insufficient surface water flows are available to meet demands.

Entities within the Tule River Basin have caused the creation of a groundwater model to assist in the monitoring effort. A model exists for the entire basin with the capability to build a smaller cell size model for use in urban areas. These models allow for changes in land use and crop types to be introduced into the input side of the models and variable supply inputs to be employed to determine the impact on the volume of groundwater in storage as a result of land use or cropping pattern change.

Friant Division, CVP contractors have also engaged in a process to perform an overall examination and inventory related to water resources, identified as their Water Management Plans. Approximate 5-year updates have currently been mandated by the federal government, thus allowing for the most current information technology to be employed. Efforts to improve the basis for the groundwater resource inventory are anticipated to continue in the future based on policy and budget instructions provided by the DCTRA governing board.

To assist in the system balance efforts, DCTRA and its member units have currently in inventory, several hundreds of acres of groundwater recharge basins. This acreage is in addition to the natural channel acreage which is continuously employed as a recharge vehicle. Not satisfied with this level of facilities, DCTRA member units have in development additional areas with funds budgeted, accompanied by outside grant funds and input from other participants in the form of land and/or funding to further augment recharge capabilities.

Currently the water management efforts within the Tule River Basin must allow for management of flows resulting from flood year events such as 1969 and 1983 and provide groundwater benefits in the driest of years. The extent to which climate change may affect the adequacy of the current facilities to deal with the variable nature of runoff, from both timing and volume of flow perspective is a challenge that the local water management entities feel they are up to. Active participation in response to hydrologic and regulatory change exists.

Notwithstanding the success of implementation of conjunctive use operations within the Planning Area, constraints do exist to development of additional conjunctive use facilities. Most obviously amongst these constraints is the availability of land on which to place recharge facilities. Historic efforts have oriented this effort toward lands which are marginal for agricultural purposes due to the quality of the soils or the high-water requirement associated with same. As a significant portion of these lands have already been developed to recharge areas, additional effort must be undertaken to both identify additional areas and to examine incorporation of same into the existing development program without adverse impacts on the agricultural community. Issues associated with additional land purchases continue to rise in significance as land purchase prices have increased dramatically in the last several years and fuel, equipment and labor costs associated with construction of, or improvement to, conveyance facilities to bring water to recharge facilities have also escalated. In addition, power costs related to recovery of recharged water have significantly increased and risk continues to escalate that recharged water flows westerly to areas outside of the target area for benefit. This is principally as a result of significantly decreased entitlement allocations of the Central Valley Project and the State Water Project to contract holders. Declining groundwater conditions, to a significant degree based on reduction of outflows to the west, are again returning and where groundwater balance was thought to be achievable a decade ago based on existing cropping patterns and water supply availability programs it is now starting to diminish based on the drastic changes in opportunity to pump project supplies from the Sacramento-San Joaquin Rivers Delta. While deliveries of supply from the Delta are not made to any significant degree for the benefit of landowners specifically within the Tule River Basin, outside of Friant Division, CVP exchange supplies, the withdrawal of deliveries from lands to the west has historically had a significant impact on groundwater conditions within the Basin and it appears that a return to those pre- westside project conditions is returning.

Additional constraints to recharge related programs include recognition of third-party impacts in any planning process and increased participants from local agencies and landowners/growers. Discussions are ongoing with local domestic water purveying entities with respect to altering their historic nonparticipation in groundwater recharge related efforts due to the quantity/quality impacts on their current supply. Principal among those impacts is the movement of contaminants from one area to another based on groundwater gradients introduced as a result of differential pumping based on available surface water supplies.

F.2.18 Desalination

The treatment process for water involving the removal of salts is identified as desalination. This practice involves treating a source of water high in salts to remove said salts and to have as a result, usable water. Within the Tule River Basin, neither sea water nor brackish water from groundwater exists. There currently is, therefore, no available source for desalination within the IRWMP Planning Area. The ability of this method to be a source of water supply is, therefore, not applicable.

F.2.19 Precipitation Enhancement

Weather modification in the form of precipitation enhancement, commonly called “cloud seeding”, has been utilized successfully within the Kings River and the Kaweah River Basin for decades. Utilizing this technology, clouds are artificially stimulated to produce more rainfall or snowfall than they would normally yield over a specific land mass. The technology employed with this enhancement methodology occurs by injecting particles which act as a nucleus into clouds, thereby seeding the clouds with a nucleus around which water molecules can form to enable snowflakes and/or raindrops to form. While cloud seeding has been employed within the adjacent watersheds for decades, it has limited use in dry periods as storm containing water particles are absent and, in years of extreme precipitation, additional precipitation would only augment potential flood damaging flows. For the intervening weather conditions, however, contracted weather modification services involving aircraft seeding storms as they approach the foothills east of the Basin, upwind of the target are available. These aircraft efforts can be augmented by ground-level generators located in foothill and low elevation mountain locations. The primary target is usually the available low-altitude super cooled liquid water that develops in cloud on the east side of the foothill and mountain slopes, those being the windward and upslope areas associated with foothill and mountain barriers. Current estimates of long-term additional runoff are in the neighborhood of five (5) percent.

Of all of the current water supply augmentation steps, climate change could affect the weather modification program to the greatest degree. Disruption of the historic weather patterns around which cloud seeding activities are centered could be significant, thus destroying the forecasting base which has been established and further leading to changes in seeding conditions, the results of which are currently unknown. Of significant impact is the fact that the current nucleus forming agents which are utilized may no longer be applicable if high-altitude temperature patterns change. Nucleus forming agents which operate at temperature conditions well below freezing would be rendered ineffective if these temperature conditions cease to exist or diminished in their frequency.

F.2.20 Recycled Municipal Water

At the current time and for some time, discharges from municipally owned wastewater treatment works have been completely recycled into the environment. For the most part, these supplies are utilized in substitution of groundwater pumping for agricultural purposes and little opportunity has been seen to further enhance the reuse paradigm as it has been complete. Recently, modifications to discharge requirements, particularly to natural streams, have changed such that discharges to natural channels have changed to the extent that such discharges are in a phase of planned obsolescence. They are being replaced with either discharge patterns to adjacent lands where waters of the State are not involved or, in the alternate, discharges are being upgraded to a tertiary level and their use then directed toward new beneficiaries to the exclusion, for the most part, of the traditional pathways.

Significant in the Tule River Basin in this changed paradigm is the availability of a program wherein reclaimed wastewater can be discharged to irrigation canals for direct reuse on a year-round basis. In exchange, entitlement waters of a local irrigation entity, which is the recipient of the treated water, can be rerouted and recharged upstream of a domestic groundwater contractor is a contract position which has not historically existed. While the Tule River Basin, as a whole, would remain in the same balance, the shifting of available surface supplies within the Basin can be altered with the benefits redirected to defined areas within the Basin. The extent to which withdrawal of the treated effluent will have on the historic place of use remains to be seen. In addition, the extent to which such programs will be pursued in the future by discharging entities remains to be seen.

F.2.21 Surface Storage – CALFED

The CALFED Bay-Delta Program, identified as CALFED, was a department within the government structure of the State of California that was focused on Sacramento-San Joaquin Rivers Delta water problems, both in-Delta as well as export based. In 2009, CALFED was replaced by the Delta Stewardship Council. “CALFED

Surface Storage" is a legacy title for a RMS designed to improve surface storage while improving conditions in the Delta on a parallel basis. The CALFED Surface Storage strategy includes five (5) potential surface storage reservoirs in California. It is not anticipated that any of these efforts will have a significant impact on the Tule River Basin and potentially only an incidental impact on Friant Division-CVP contractors peripheral to the Tule River Basin. It has been determined that this element is not applicable to the subject IRWM Plan.

F.2.22 Surface Storage – Regional/Local

The Tule River Basin seeks to be the recipient of a modification to its surface storage capabilities. Spillway modifications associated with Success Dam would result in an overall increase in storage in the reservoir, along with additional yield development. The reservoir now provides improved downstream flood protection benefits, principally to the City of Porterville and the Tulare Lakebed areas. Additional storage opportunities have been evaluated on Deer Creek and White River, said studies resulting in a lack of feasibility due to environmental constraints and/or economic constraints. While an off-stream storage site was initially investigated as a part of the East-Side Division-CVP, no additional feasibility studies have been initiated, nor are there any likely significant storage opportunities existing within the Tule River Basin. The water rights on the Tule River are fully appropriated, based on action by the State Water Resources Control Board and, as a result, additional storage may result in some reregulation capability, but little to no additional yield capability.

From a climate change perspective, a change in precipitation and/or runoff patterns may result in reduced snow pack and alteration of winter runoff. These changes would require a re- examination of the development of surface storage for water supply purposes during peak growing months and flood control purposes could also change. This would require a re- examination of potential sites, few of which exist based on examinations which have been undertaken to date.

F.2.23 Drinking Water Treatment and Distribution

Principal in Tule River Basin IRWM planning activities is that related to the provision of potable drinking water. Significant participation by both disadvantaged community and environmental justice representatives in the Stakeholder Advisory Committee structure has resulted in identification of drinking water problems and pursuit of solutions to these problems utilizing the IRWM structure as a potential solution vehicle. Within the Tule River Basin, groundwater related treatment facilities currently exist for the unincorporated community of Terra Bella and numerous services of the Terra Bella Irrigation District.

Historic efforts have been related to water quality associated with discharges from agricultural uses, with that program having been memorialized in the Irrigated Lands Regulatory Program of the Regional Water Quality Control Board. The local orientation has the potential to change to examining those opportunities which exist for construction of surface water treatment
facilities in identified areas with poor groundwater quality characteristics and potential dedication of portions of agricultural surface water supplies to those facilities. These efforts are in the infant stages and are being supplemented by efforts of the County of Tulare related specifically to the unincorporated area of East Porterville.

Primary constraints to pursuit of this method of altering the landscape of domestic water quality include the development of water treatment and distribution systems to serve any candidate areas, elevated operation and maintenance costs, opposition to higher water rates, or in this case, the payment of a water rate at all and the lack of qualified water treatment plant operators.

Factored into the surface water treatment plant equation will have to be impacts of climate change on mineralization and increased turbidity. In addition, if storage of water is required, elevated water temperatures, both as an aesthetic issue, as well as an adverse plant growth inducement cause, will be factors to be dealt with.

Based on experiences currently being generated through similar examinations in out-of- Basin areas, these facilities are felt to be economic to an acceptable degree only if they are regional in nature and resolve many of the identified adverse problems, such as operations problems on a collective basis.

F.2.24 Groundwater Remediation/Aquifer Remediation

Groundwater remediation takes place in specific and infrequent locations within the Tule River Basin. Virtually all of these locations are associated with a vadose zone consisting of a specific plume of contamination caused by a prior surface related activity such as a leaking underground fuel storage tank. This contamination has traveled to free groundwater in the soil profile and requires extracting the contaminated groundwater from an aquifer, or multiple aquifers, treating it and then discharging to an approved location. These discharge locations vary from adjacent water courses, to re-injecting to the ground, to reuse for a beneficial purpose. Remediation does not provide for a new quantity of water, but does provide for a source of water from a previously contaminated source. While a remediated supply is made available, the principal purpose is to prevent the further spread of the specific contaminant, thus rendering additional supply unusable.

F.2.25 Land Use Planning and Management

Historically, land use planning has been conducted by different agencies, on different time schedules and was based on differing policy directives from governing bodies. To a significant extent, this remains the case. Attempts to integrate water management related concerns into land use planning is based on a recognition that there is a direct relationship to water supply and water quality, flood and storm water management and impacts on agricultural water conveyance facilities where urbanized development is involved. While history has proven that many of these relationships are contentious and do not always result in agreement with regard to policy development, the interface nonetheless exists. The principal tool utilized in the Tule River Basin to overcome these differences is education. Coupled with an attitude inviting cooperation, successes have been achieved which overcome the previously predominant aggressively opinionated and argumentative processes. Development of water management related tools such as the numeric groundwater model has offered a new forum for interface between water management agencies and land use planners. In addition, the IRWM forum is being opened to the governmental agencies who carry the charge of land use planning as one of their principal purposes and their involvement, to date, in the IRWM process has led to improved relationships between the participants.

Also assisting in the barrier reduction efforts has been the requirement of State and local agencies associated with water supply planning related to land developments to reflect adequacy of supply. This requirement has caused an improvement in relationships between the water management entities and the land development participants as certification of adequacy of water supply is now statutorily required as part of the land development process.

The IRWM process offers a unique forum for this relationship to be further improved. The Stakeholder Advisory Group currently includes individuals responsible for land use planning policy development and implementation , as well as representatives of Disadvantaged Communities, where improvement is needed in the relationship between water managers and land use planners. The types of projects which have been developed and pursued through the IRWM process demonstrate the success of this cooperative approach.

F.2.26 Matching Quality to Use

The strategy of matching water quality to specific beneficial use has little application in the Tule River Basin. Typically, the strategy is to avoid utilizing a higher quality of water for a beneficial use than is required by that beneficial use. As agricultural is the major consumer of water within the Basin, the surface water and groundwater currently available within the Basin are both suitable for agricultural use. Treated wastewater is directed toward lands which meet the requirements for reuse of said supply and surface waters are of very high quality, only requiring treatment for removal of turbidity and bacteriological contamination if utilized for human consumption. If such supplies were to become available in a recognized usable quantity, issues of acceptance of using a lower quality water than otherwise available and the matching of the location of use to the location of availability would become major issues to be evaluated.

F.2.27 Pollution Prevention

Current and applicable water quality guidelines, including Basin Plan criteria, are driven by avoidance of contamination as the principal objective. Reliance on treatment following contamination or pretreating water to allow for “space” to introduce contaminants are, for the most part, discouraged. Where pollution is unavoidable, such as the case with certain municipal and industrial related discharges, regulatory programs exist for removal or reduction of contaminants to an acceptable level based on the beneficial use objectives in existence related to the specific discharge. Current activities related to pollution prevention have started to extend up into the contributory watershed based on drinking water requirements and introduction of flood flows into facilities such as the Friant-Kern Canal, waters in which are utilized for human consumption, following conventional treatment. Extension of efforts into the upper parts of the watershed allows for avoidance of pollutants being introduced into the runoff, further avoiding any significant level of treatment being required.

F.2.28 Salt and Salinity Management

Importation of surface water into the Tule River Basin, domestic discharges such as those associated with home water softening units and certain agricultural practices result in additional salts being discharged, principally to groundwater. High salinity in surface water, soil, or groundwater can have significant negative impact on critical organisms and agricultural productivity.

Options to manage salt and salinity include on-farm drainage management, which involves the placement of crops based on their salt tolerance in conjunction with existing drainage patterns, as well as methods to treat or store salt deposits.

The DCTRA is engaged in several arenas designed to address salinity management. In particular, the DCTRA is engaged in the CV Salts Program and in activities related to Basin Plan Modifications related to the salt topic. The position of the Association with respect to the Irrigated Lands Regulatory Program (ILRP) has recently been handed over to the newly-formed Tule Basin Water Quality Association. Salts management is an issue within the structure of the ILRP to be addressed by the third-party coalition groups covering the irrigated lands within the jurisdiction of the Central Valley Regional Water Quality Control Board.

F.2.29 Urban Runoff Management

Runoff from urban areas is handled within the single incorporated city within the Planning Area by the governing municipality and in unincorporated areas by the County of Tulare. While in all cases, irrigation water conveyance facilities play a major role in conveyance to disposal facilities of urban runoff, it is nevertheless the responsibility of the urban entity to properly address disposal of urban runoff. Urban runoff within the Planning Area typically is comprised of two different sources. The first, and most obvious, is that of storm water runoff comprised principally of rainfall falling on impervious surfaces within the municipality and gathering of that runoff in facilities designed for that purpose with most disposal actions contributing to groundwater recharge.

The second form of water to be managed is that related to nuisance discharges during dry weather periods. These flows are placed in the nuisance category for three (3) principal reasons. The first of these is that they have to be managed during a period of time when facilities utilized for irrigation purposes need the available capacity or occur at a time when maintenance activities need to be conducted and the nuisance flows interfere with such activities. The second issue related to these flows is that many accrue to local storm water facilities where they pond in a shallow depth configuration and pose vector breeding problems which have to be managed at a significant cost, in comparison to the water involved with the discharge activity. The third issue is that related to contamination. While the volume of these flows is low, discharges from urban landscape have been demonstrated to carry significant elevations of contaminants and activities where water is washed into urban gutters carries with it petroleum and petroleum byproducts contamination which often accrues to groundwater.

While principal actions are directed at preventing groundwater contamination, most actions, under current conditions, are limited in nature and, for the most part, ineffective as compared to the total contamination picture. Land conversion based on increased development further exacerbates this condition, less specifically addressed in the new development as compared to the previous agricultural use.

F.2.30 Water-Dependent Recreation

As the Tule River and its distributaries flow for only a portion of a given calendar year, little water-dependent recreational opportunity exists. The sole exception is tubing and rafting excursions on a portion of the Tule River during irrigation release periods. Points of ingress and egress for these recreational opportunities are typically associated with public road rights-of way, as little or no access is available through private lands.

With the exception of impacts of climate change which may modify this paradigm in the future, the opportunity is factually limited due to the limited quantity of surface water existing within the Basin. Future updates to the IRWM Plan will need to consider examination of this issue and a determination of whether or not opportunity events have changed to the point where the inclusion of this objective into IRWM Planning needs to be accomplished.

F.2.31 Watershed Management

The watershed feeding Success Reservoir and forming the Tule River exists completely outside of the IRWM Planning Area. As previously noted under the forest related section, planning in this area is almost exclusively under the control of the U.S. Forest Service, U.S. Park Service and the Tule River Indian Reservation.

Normal watershed management functions of evaluating policies, land use planning, management of land and resources and fire prevention and fire suppression efforts are all outside the purview of any participating entity in the IRWM process. Input with respect to watershed management from the standpoint of watershed management is virtually nonexistent. Vegetative management, controlled burns and water quality related impacts are dealt with by the agencies of jurisdiction with entities involved in the IRWM process only allowed input in a public forum approach. In most cases, responsible agency status is not invited, nor accepted when requested. The IRWM process is designed to continue to seek input with respect to the programs of the governing agencies and opportunities to coordinate efforts, when appropriate.

F.2.32 Water and Culture

This resource management strategy refers to the consideration of culture when developing and implementing water management strategies, and encourages collaboration with local communities, groups, and Native American tribes to manage water in a way that protects and enhances cultural resources.The Tule River Basin IRWMP area is home to historical and tribal resources. The Tule River Tribe is the most notable cultural entity within the Tule River Basin. The Tule River Tribe has ancient ties to water within the IRWMP area and can provide traditional knowledge to better sustain and integrate water management practices. Native American Tribes must be included in the water management decision process to create sustainability and continue the passage of traditional practices and knowledge to future generations.

A variety of factors can lead to the disruption of cultural resources. In the Tule River Basin, private land owner considerations and a lack of information regarding cultural resources can be major implementation issues when protecting culturally sensitive water resources.

Climate change is projected to have a significant impact on water and water dependent resources. Fire, flooding, habitat degradation, and drought resulting from climate change all have the potential to significantly impact cultural resources and the ability of tribal communities to continue their traditional practices. Including tribal communities, such as the Tule River Tribe, in discussions related to climate change adaption and mitigation will contribute to the development of culturally sensitive and sustainable water management practices.

F.3 Resource Management Strategy Review

The RWMG considered the DWR Resource management strategies to expand and diversify the Tule River Basin water management portfolio. RMS were reviewed and selected for incorporation into the IRWM Plan based on their applicability to the region, potential to address climate change impacts, and ability to meet at least one of the IRWMP objectives. If an RMS was not relevant to the region or did not support IRWMP Objectives, a decision was made to not include the RMS into the IRWM Planning process.

Through this process, the following were discluded from the IRWM Planning process.

- Conveyance – Delta
- System Reoperation
- Desalination
- Surface Storage – CALFED
- Forest Management

As shown in Table F-1, the RMS that were selected for incorporation into the IRWMP are interrelated, and each contribute to a variety of IRWMP objectives.

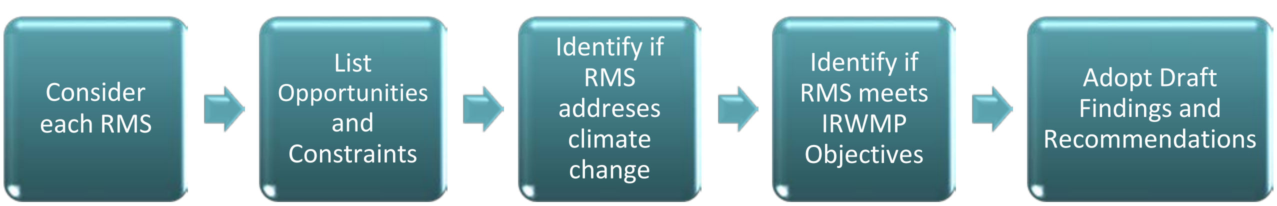

Figure F-1. RMS Review Process

Table F-1. Tule River Basin Objectives Satisfied by the State Resource Management Strategies

Tule River Basin Objectives \ State Resource Management Strategies	Agricultural Water Use Efficiency	Urban Water Use Efficiency	Conveyance – Delta	Conveyance – Regional/Local	System Reoperation	Water Transfers	Flood Risk Management	Agricultural Lands Stewardship	Economic Incentives (Loans, Grants and Water Pricing)	Ecosystem Restoration	Recharge Area Protection	Sediment Management	Outreach and Engagement	Conjunctive Management and Groundwater Storage	Precipitation Enhancement	Recycled Municipal Water	Surface Storage – Regional/Local	Drinking Water Treatment and Distribution	Groundwater Remediation/Aquifer Remediation	Land Use Planning and Management	Matching Quality to Use	Pollution Prevention	Salt and Salinity Management	Urban Runoff Management	Water-Dependent Recreation	Watershed Management	Water and Culture
Conserve, Enhance and Regenerate Riparian Habitats								X		X		X	X		X				X	X		X	X	X	X	X	X
Conserve and Restore Native Species and Related Habitats								X		X		X	X		X					X		X	X	X	X	X	X
Protect Water Resources that are critical to Native American Tribal Communities							X	X		X		X	X					X	X			X	X	X	X	X	X
Evaluate and Modify Water Diversion and Conveyance Infrastructure	X		X	X	X	X	X								X		X				X			X		X	
Meet Applicable Regional Water Quality Control Board Basin Plan Objectives	X		X				X	X	X		X	X		X	X	X	X	X	X	X			X	X	X	X	X
Management of Recreational Activities to Minimize Impacts on Water Resources												X	X					X		X		X		X	X		X
Promote City, Community and Regional Storm Water Management Plans		X					X				X	X	X			X				X	X	X		X			X
Evaluate and promote strategies to reduce arsenic, nitrate, and perchlorate contamination to levels below maximum contaminant level								X				X						X	X	X		X		X		X	X
Increase Monitoring and Promote Research Programs to Better Understand the Effects of Climate Change on Ecosystems in the Region								x		x												x				x	
Plan for Potential Regional Impacts of Climate Change on Water Quality and Quantity			x	x		x	x				x			x	x	x	x									x	
Identify and Promote Strategies for Hydroelectric Generation Facilities					X																					X	
Protect and Improve Water Resources through Land Use Practices		X					X	X		X	X		X							X		X		X		X	X
Optimize Efficient Use, Conservation and Recycling of Water Resources	X	X		X	X	X		X	X		X		X	X		X	X				X			X		X	X
Increase Knowledge Regarding Groundwater Related Conditions and Establish Groundwater Management Practices								X	X		X	X	X	X				X	X			X			X	X	X
Reduce Impacts and Optimize Benefits from Assisting Other Drought-Related Areas with Basin-to Basin Transfers of water	X			X	X	X								X			X										