TRUCKEE MEADOWS WATER AUTHORITY

STAFF REPORT

TO: TMWA Board of Directors
FROM: John Erwin, Director of Natural Resources
DATE: November 10, 2014
SUBJECT: **Presentation on Drought Planning – Water Resource Planning and Demand Management**

Introduction

At its October 15th Strategic Planning Session, the TMWA Board requested staff to bring back FY15 goals related specifically to enhancing water conservation activities, given the region is in its third year of a drought cycle, Lake Tahoe went below its natural rim on October 15th (the last such occurrence was October 9, 2009), and TMWA used a portion of its upstream drought reserves beginning August 20 through October 20 to meet customer demands. About 18% of our reserves were used during this timeframe, and based on past experience, these reserves are expected to completely refill this winter.

This report is one of three reports on the topic under this Agenda Item. This report provides the necessary context related to understanding the Truckee River system; its complexity, constraints, and challenges; the variable nature of its supply characteristics as a function of annual precipitation; and how TMWA balances and times the use of alternate water sources into an operating strategy to create a potable water supply for the region. With this understanding a discussion of how TMWA's demand management program and activities assist in creating a potable water supply is presented.

For planning purposes, a demand management ("conservation") program ("DMP") consists of strategies, actions, measures, processes or programs undertaken by water utilities to influence the use of water by its customers so as to achieve efficient, responsible and sustainable use of water resources. The utility is trying to change a customers' use of water, such as decrease the daily amount used, decrease the annual amount used, change the manner in which water is used, change the time in which water is used, or any combination of these. TMWA's DMP is one tool used by TMWA that helps address timing the use of raw water supplies to customer demands while meeting TMWA's revenue/cost targets, working within the constraints of various rules and regulations of the river system, and meeting the stated needs of the local community (i.e., economic vitality, quality of life, and response to local entity land use objectives). TWMA seeks to influence customer consumption so as to reduce investment in new facilities to meet higher demands, to avoid waste of water, to minimize disruption of the community's quality of life, and depending on the amount of water available from its water sources in a given year, principally the Truckee River, to reduce the amount used to preserve upstream water storage reserves in case water is not available from the Truckee River the next year.

Before one can understand how the DMP is utilized by TMWA as part of its management strategy to meet customer demands and community goals, it is necessary to understand TMWA's role

in water planning for the Truckee Meadows area; the components of the Truckee River system and how they work; and how TMWA creates a potable water supply from Truckee River (river flows and reservoir releases) and groundwater sources.

Key "Take-Away" Concepts

1. The annual flow of water from the Truckee River system is dependent on the amount or size of the previous years' snowpack and can be highly variable from year-to-year.

2. The Truckee River is one of the more highly regulated rivers in the United States. When water is available, water in Lake Tahoe and/or Boca Reservoir ***must*** be released to meet a daily flow requirement at the California-Nevada Stateline.

3. Beginning in September of each year, water ***must*** be released by November from ***all*** upstream reservoirs to make room for the upcoming snow season to capture potential winter storm/flood events and runoff that will occur next spring.

4. Starting with a full Lake Tahoe, when there are successive below-average snowpack years, it takes about three (3) years before Lake Tahoe is at its rim and unable to release any water.

5. TMWA's current sources of supply include:
    a. Annual flow of water from the Truckee River system
    b. Pumping of groundwater, both native and recharged water, in the Truckee Meadows, Spanish Springs and Lemmon Valley
    c. Releases of stored water from TMWA's upstream reservoir supplies

6. TMWA's demand management programs target (a) responsible water use education; (b) water waste; (c) maximum day demand reduction to reduce new investment in facilities; (d) distribution system leak detection, water theft, and repair; and (e) low-water-year river supply or an on-river emergency.

7. Demand management programs balance annual flow of water from the Truckee River system against TMWA's customer demands, its contractual obligations, and their negative impact on revenues.

8. TMWA's annual DMP educates consumers through all media forms as well as on-site service visits on the efficient and responsible use of water and is flexible to respond to annual water supply variations during drought cycles.

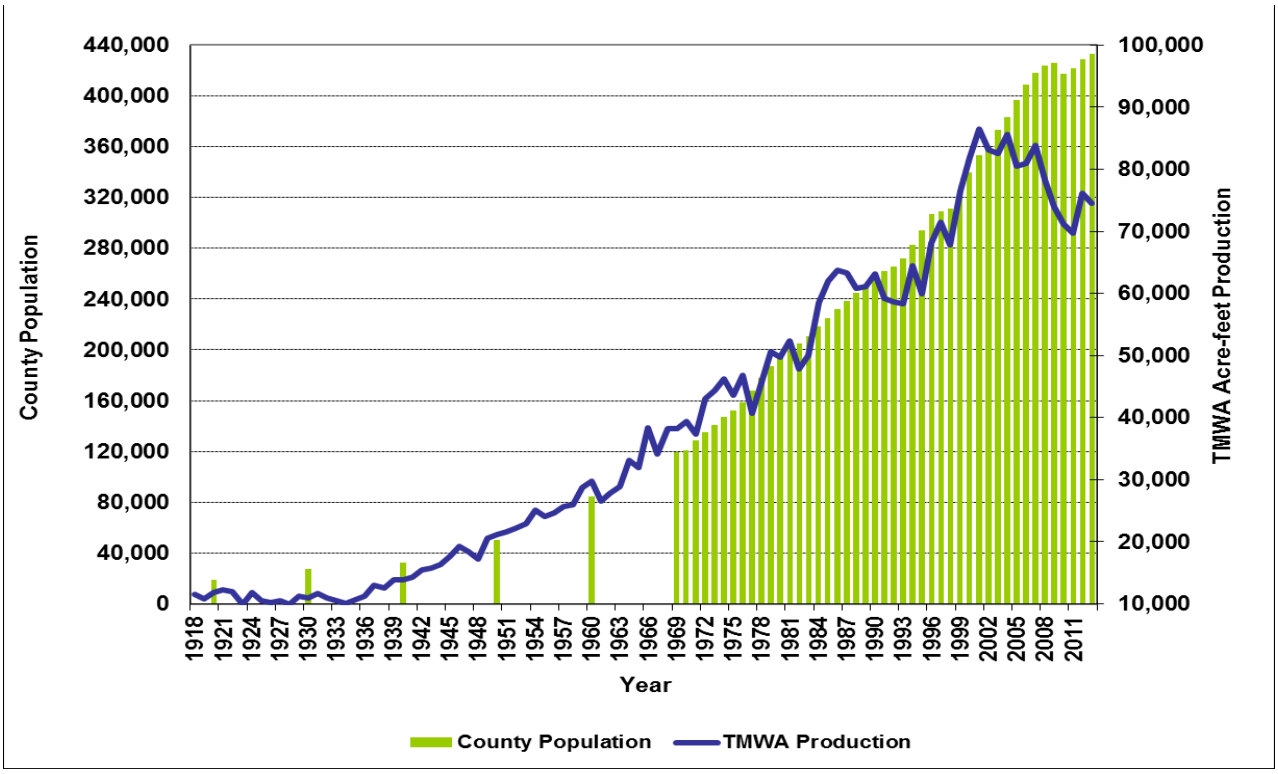
9. Aggressive demand reductions are timed to achieve reductions in water use that minimize customer disruption while achieving the local community's quality of life and/or economic objectives and minimizing use of dry-year supplies should successive dry years occur.

Background

The Truckee Meadows Water Authority ("TMWA") was formed in direct response to a September 2000 announcement by Sierra Pacific Resources ("Sierra") of its intention to sell its water utility business serving water to the greater Reno/Sparks area in Washoe County, Nevada. On October 20, 2000 Reno, Sparks and Washoe County ("RSW") submitted a joint "Proposal to Purchase the Water Utility Assets of Sierra Pacific Resources." RSW indicated intent to form a Joint Powers Authority ("JPA") and to have the JPA in existence upon selection as the successful bidder. On November 13 and 14, 2000, a Cooperative Agreement was executed between RSW forming TMWA. TMWA was officially born by RSW's execution of the "Cooperative Agreement among City of Reno, City of Sparks, and County of Washoe" on December 4, 2000 pursuant to the provisions of Chapter 277 of the Nevada Revised Statutes ("NRS").

After the successful launch of TMWA, RSW subsequently submitted and was awarded the successful bid to acquire Sierra's water utility business. On January 13, 2001, TMWA approved the Asset Purchase Agreement, and Sierra approved it on January 15, 2001. Efforts to transfer the water assets and business from Sierra to TMWA began in earnest early in 2001 following these approvals. On June 5, 2001 TMWA sold $452.3 million in bonds pledged against its revenues and the sale of Sierra's water utility business with the transfer of title to all diversion, treatment, conveyance, water transmission, wells and distribution related facilities was completed. When TMWA opened for business on June 11, 2001, 127 employees, all former water division employees of Sierra, continued managing and operating the water utility business for the greater Truckee Meadows area, and began the process to meet the business objectives established by the JPA, TMWA's Board of Directors and its management team.

TMWA's predecessor Sierra, having been the water purveyor since before the turn of the century, planned for and managed its water resources to meet growth requirements for the greater Reno and Sparks metropolitan areas as early as 1929. Generally, throughout the history of water delivery in the Truckee Meadows, water demands have grown at a pace that the water purveyor has been able to meet by converting agricultural water rights and augmenting water supplies from privately owned storage water ("POSW") in Independence Lake and Donner Lake in dry years. Prior to significant population increases beginning in the late 1960's (see the graph below), the utility was able to rely on the combination of the conversion of irrigation lands with their associated water rights to municipal use and upstream storage.



The use of groundwater supplies came into play in the 1960's to help balance demands within TMWA's outward expansion away from the central portions of Reno/Sparks up onto the foothills which created challenges for the distribution system. During the late 1960's and early 1970's, as the community began to expand at a rate faster than previously experienced, Sierra planned on utilizing Stampede Reservoir ("Stampede") to provide future drought supplies necessary to serve growth in the Truckee Meadows. However, with the passage of the Endangered Species Act, storage of water in Stampede reservoir was set aside solely for the conservation of the endangered Cui-ui fish in Pyramid Lake. In 1979, Sierra informed local governments that without the availability of storage space in Stampede, new service commitments would need additional water resources and drought-year supplies. In 1981, Sierra implemented "Rule 17," requiring developers who wanted immediate water service to provide water rights. A review of "Rule 17" in 1984 confirmed the earlier findings that additional water resources would be needed which subsequently triggered the formal process of water-resource-planning for the service area then served by Sierra under regulation by the Nevada Public Utility Commission. Also in the late 1980's and into the 1990's Washoe County started accumulating small groundwater based water utilities. Several regional planning commissions or boards were created in the 1980's and 1990's to address land use and eventually water-related planning issues. The first regional water plan covering Washoe County was published in 1990 which has been subsequently revised and republished over the years by various forms of a regional water planning commission[1].

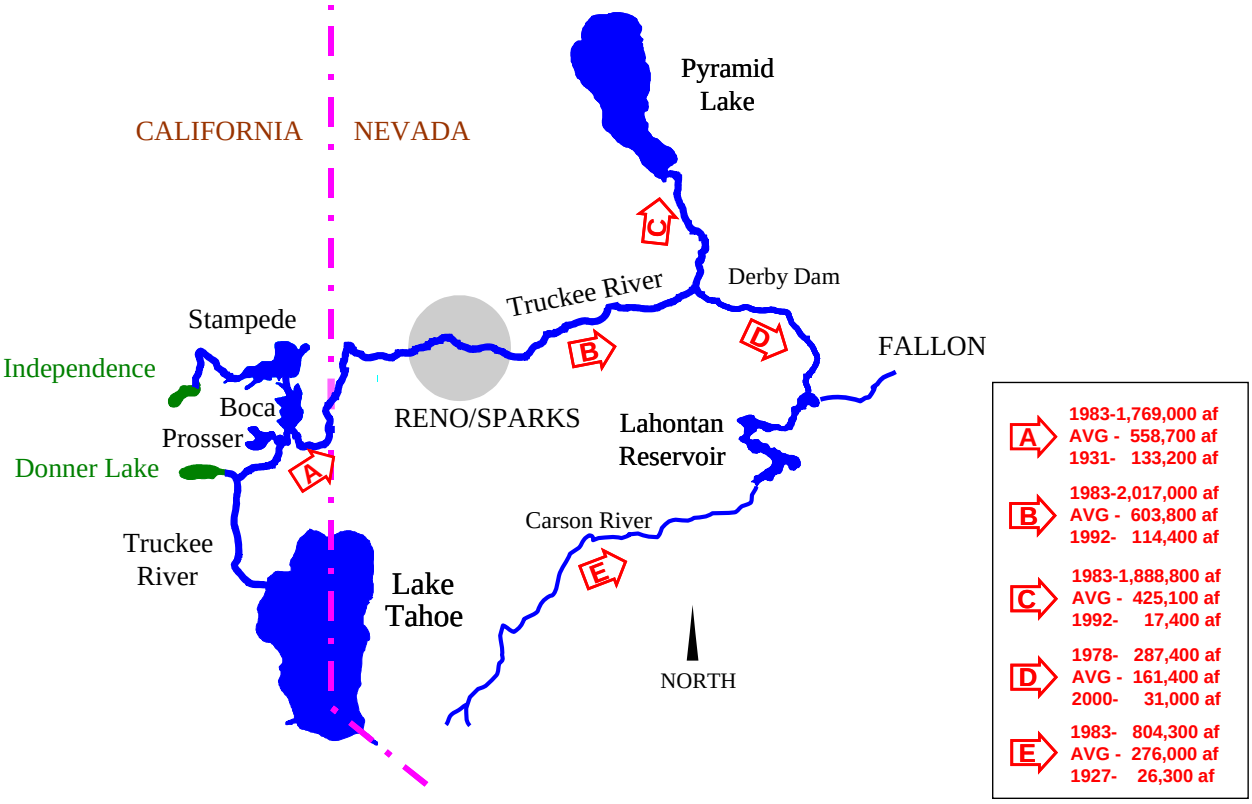
[1] The first water planning commission was called the Regional Water Planning and Advisory Board of Washoe County, then renamed and reformed as the Regional Water Planning Commission of Washoe County, and again reconfigured in 2007 as the Western Regional Water Commission.

The water planning process begun with Sierra Pacific Power and has been continued on by TMWA in cooperation with the Western Regional Water Commission (WRWC), goes through an extensive analytic process using the expertise of internal and external personnel. In addition to its internal experts, TMWA employs professional engineering, hydrologic and hydrogeologic services who are experts in California and Nevada water resources, watershed management of the east and west flanks of the Sierra Nevada Mountains, and modeling of water supply integration to assist in the development of its water resource plans. TMWA has engaged numerous professionals from UNR and DRI to help evaluate drought year probabilities, climate change impacts, river spill contamination probabilities, Truckee River channel flow modeling, population modeling, etc., continually examining the viability and sustainability of water resources in western Nevada and the Truckee River system. The results of Sierra's and TMWA's efforts have been scrutinized over the years by consultants/experts with/for the US Bureau of Reclamation, Pyramid Lake Paiute Tribe, and States of Nevada and California which confirmed Sierra's prior analyses and TMWA's analyses as to the efficacy of TMWA's drought storage sources and plans. The results of these past efforts served as the foundation for the Negotiated River Settlement which led to the formulation and soon the implementation of TROA.

Over its 13 year experience, TMWA's Board has adopted two water resource plans (2005-2025 WRP and 2010-2030 WRP) that have examined a variety of historical and current issues that influence the ability of TMWA to create a water supply for its customers. Primary themes of water planning include an evaluation of current resources and their production; changing regulation affecting use of water rights/resources; effects of changing weather on snowpack, run-off and annual water availability; economic trends and their effects on local population, development, future water demand projections, and water rights availability/costs; future water resources; water resource management during extended low precipitation years; source water protection and reliability; and demand-side management or conservation, which is the topic of this report.

Truckee River System

The Truckee River is the principal source of water for the Truckee Meadows. The river, approximately 110 miles in length, begins at the outlet of Lake Tahoe in California, flows northerly to the California – Nevada state line, easterly through the Truckee Meadows and the Truckee Canyon to the vicinity of the town of Wadsworth, and then turns northerly terminating in Pyramid Lake as shown in this graphic.



Three natural lakes with regulated outlets and three man-made reservoirs, all located in California, control Truckee River flows and provide storage for watershed runoff. On the Carson River, Lahontan Reservoir is a vital element in the operation of the Truckee and Carson River systems, because Truckee River water is diverted at Derby Dam into Lahontan Reservoir for the Newlands Project. A brief description of the lakes and reservoirs used to manage Truckee River flows is presented here:

- *Lake Tahoe*. Lake Tahoe is the most significant and largest controlled body of water in the Truckee River drainage basin. The lake is a natural lake with a drainage area of 503 square miles and its outflow is regulated by the natural rim and a dam at Tahoe City, California. The dam, located 400 feet downstream from the undisturbed natural rim of the Lake, was first constructed in 1870 and rebuilt with completion in 1913. The natural rim is at elevation 6,223.0 above sea level ("ASL"). Decrees and agreements permit the storing of 6.1 feet of water above the natural rim, creating a useable capacity of 744,600 acre-feet. By Federal Court decree of June 4, 1915, the United States obtained the right to maintain, and operate the Lake Tahoe dam and outlet works for the purpose of controlling the release of stored water to maintain Floriston Rates.

- *Donner Lake*. Donner Lake is tributary to the Truckee River via Donner Creek and is located immediately to the west of the town of Truckee, California. The upper 12 feet of Donner Lake is regulated by a control structure in the outlet channel. Donner Lake drains an area of approximately 15 square miles. In 1943 Sierra and Truckee Carson Irrigation District ("TCID") jointly purchased the storage rights in Donner Lake from the Donner

Lake Company. Under the provisions of the 1943 purchase agreement, Sierra and TCID acquired rights to water stored in Donner Lake by virtue of the construction and operation of the original dam built in the 1877. California Water Law recognizes uses of water that were legally established and exercised prior to 1914 pursuant to a vested water right. Provisions in the deed by which Sierra and TCID acquired the Donner Lake water require that the Lake not be drawn below 5,932.0 feet ASL (or 6,310 acre-feet) during the months of June, July, and August. The California Department of Water Resources, Division of Safety of Dams, requires that the lake be drawn down so that the outer slidegates are fully open by November 15 of each year and the gates shall not be closed until April 15 unless a waiver is granted for early closure.

These requirements somewhat limit the use of Donner Lake as a municipal and industrial water source. During prior drought periods, Sierra requested and received seasonal approval from the Division of Safety of Dams to begin storage in Donner Lake prior to April 15. This early storage is important to ensure that as much runoff as possible can be stored in Donner Lake and used to augment Truckee River flows during drought periods. TMWA is joint owner with TCID and has rights to store 9,500 acre-feet in Donner. Utilization of these rights is also covered by the privately owned stored water provisions ("POSW") of the Truckee River Agreement.

- *Martis Creek Reservoir*. Martis Creek, with a drainage basin of 40 square miles, is tributary to the Truckee River immediately downstream from Truckee. Martis Creek Dam, with a reservoir capacity of 20,000 acre-feet, was constructed in 1971 by the U.S. Army Corps of Engineers ("USCE") and is operated by the USCE for flood control purposes. This reservoir has been considered for carryover storage in recent years but due to lack of water rights to fill the reservoir and poor reservoir construction it cannot be used for storage purposes.

- *Prosser Creek Reservoir*. Flows in Prosser Creek are controlled by Prosser Creek Reservoir located almost due north of the city of Truckee, CA. The reservoir, completed in 1962 by the United States Bureau of Reclamation ("USBR") as part of the Washoe Project has a useable capacity of 28,640 acre-feet with a drainage basin of approximately 50 square miles. The reservoir is operated for flood control and for storage of water exchanged with Lake Tahoe to ensure minimum releases from Tahoe under the Tahoe-Prosser Exchange Agreement dated June 15, 1959.

- *Independence Lake*. Independence Lake is located on Independence Creek upstream of its confluence with the Little Truckee River, approximately 15 miles due north of Donner Lake. Independence Lake and surrounding lands (2,200 acres) were acquired by Sierra in 1937 by direct purchase from the Hobart Estate Company. Currently, the surrounding lands are owned by The Nature Conservancy; however, the water rights and the provisions necessary to operate the lake, dam, and outlet works were deeded to TMWA. The outlet works have undergone recent upgrades over the past 3 years. In 1939 the dam and outlet works were reconstructed and enlarged. The dam currently controls the top 28 feet of the lake, which impounds 17,500 acre-feet of usable storage. The lake drains an area of approximately 8 square miles, and the rights to store water are wholly owned by TMWA. Utilization of these rights is also covered by the POSW provisions of the Truckee River Agreement.

By virtue of the original dam constructed at Independence Lake in 1879, TMWA can store the first 3,000 acre-feet of runoff from Independence Creek. Additional runoff cannot be stored in Independence Lake until Floriston Rates are met and the diversions in the Truckee Canal are being met according to operating procedures and Boca Reservoir has been filled. TMWA has the right to store and use 17,500 acre-feet of water from Independence Lake.

- *Stampede Reservoir*. Stampede Reservoir, also on the Little Truckee River, was completed in 1970 by the USBR as part of the Washoe Project for the purposes of flood control; irrigation; municipal, industrial, and domestic water supply; recreation; and fishery propagation. The Reservoir has a useable storage capacity of 221,490 acre-feet and a permit to store 126,000 acre-feet. The drainage basin of Stampede Reservoir is 136 square miles. Since its completion, the operation of Stampede Reservoir has been the subject of extensive litigation. Even though municipal and industrial use became an authorized purpose of the reservoir by virtue of the Water Supply Act of 1958, the then Secretary of the Interior and his successors have refused to sign a contract for the sale of water from the reservoir to the Carson-Truckee Water Conservancy District ("CTWCD"), a public agency established to be the contracting entity with the United States. The refusal to sign a contract was based on the possible negative impacts the sale of water could have on the endangered species of Pyramid Lake. In 1976 the CTWCD, the State of Nevada, and Sierra filed suit in Federal Court asking that the Secretary be ordered to sign the water sale contract. The Court held that the U.S. had the right to use the yield of Stampede Reservoir for fishery management in the lower river so long as the Cui-ui remains an endangered species. The decision was ultimately appealed to the United States Supreme Court. In 1985, the U.S. Supreme Court refused to consider the appeal and the lower court decision stood.

- *Boca Reservoir*. Boca Reservoir, also located on the Little Truckee River near its confluence with the Truckee River, has a useable capacity of 40,800 acre-feet and was constructed by the United States in 1937. Water released from Boca Reservoir is used along with natural flow and Lake Tahoe releases to meet the Floriston rates. The rights to store are owned and the reservoir is operated by the Washoe County Water Conservation District ("WCWCD"). TMWA shares with WCWCD the annual operation and maintenance costs in proportion to its storage rights, which in addition to the irrigation rights supported by this reservoir includes 800 acre-feet of Boca pondage capacity.

- *Lahontan Reservoir*. Lahontan dam and reservoir, constructed by the United States as part of the Newlands Project, was completed in 1915. The dam, located on the Carson River approximately 18 miles west of the city of Fallon, Nevada, has a maximum storage capacity of 317,000 acre-feet (with flashboards) and stores water diverted from the Truckee River at Derby Dam, via the Truckee Canal, along with the natural flow of the Carson River. The drainage basin of Lahontan Reservoir is approximately 1,950 square miles. The capacity of the Truckee Canal which takes water from the Truckee River to Lahontan is 900 cubic feet per second ("cfs"). However, since the breach of the canal in January 2009, the maximum flow allowed in the canal at this time in 350 cfs.

The first diversion of water in the Truckee Meadows area was some time in 1858, prior to Nevada becoming a state. From then until the turn of the century, numerous canals were constructed

to deliver water to agricultural lands within the Truckee Meadows. Water not diverted for irrigation purposes flowed to Pyramid Lake.

A new demand for Truckee River water was created when on July 2, 1902, the United States withdrew from public entry the lands required for the government's first reclamation project, to be known as the Newlands Project located in and around the vicinity of Fallon, Nevada. A condemnation lawsuit ensued beginning in 1917 which resulted with the 1944 issuance of the final decree in the water rights adjudication lawsuit for the Truckee River known as the Orr Ditch Decree. In 1983, the United States Supreme court affirmed that the Orr Ditch Decree was binding on all parties of interest to Truckee River water. The Pyramid Lake Paiute Tribe ("PLPT") and the United States also filed suit in California claiming that all the California water rights including TMWA reservoir rights to Donner and Independence should be secondary to the PLPT claim of right. The rights established in the Orr Ditch Decree include irrigation rights for the Pyramid Lake Indian Reservation; for the United States to divert water to the Newlands Project and to store and release water from Lake Tahoe; rights for hydroelectric power generation; rights for municipal, industrial, and domestic use; and rights for the irrigation of private agricultural lands. The Orr Ditch Decree also incorporates the Truckee River Agreement in the Decree, which sets forth specific flow rates that must be maintained in the Truckee River at the Farad gauging station. These flow rates are known as the "Floriston Rates." The Floriston Rates are dependent upon natural flows and the level of Lake Tahoe and Boca Reservoir. Water from Lake Tahoe or Boca Reservoir must be released to meet the Floriston Rates[2]. These releases will continue until Boca is out of water and Lake Tahoe is below its natural rim. On October 15, 2014 the water level at Lake Tahoe went below the rim, which is the fourteenth time since record keeping began in 1900.

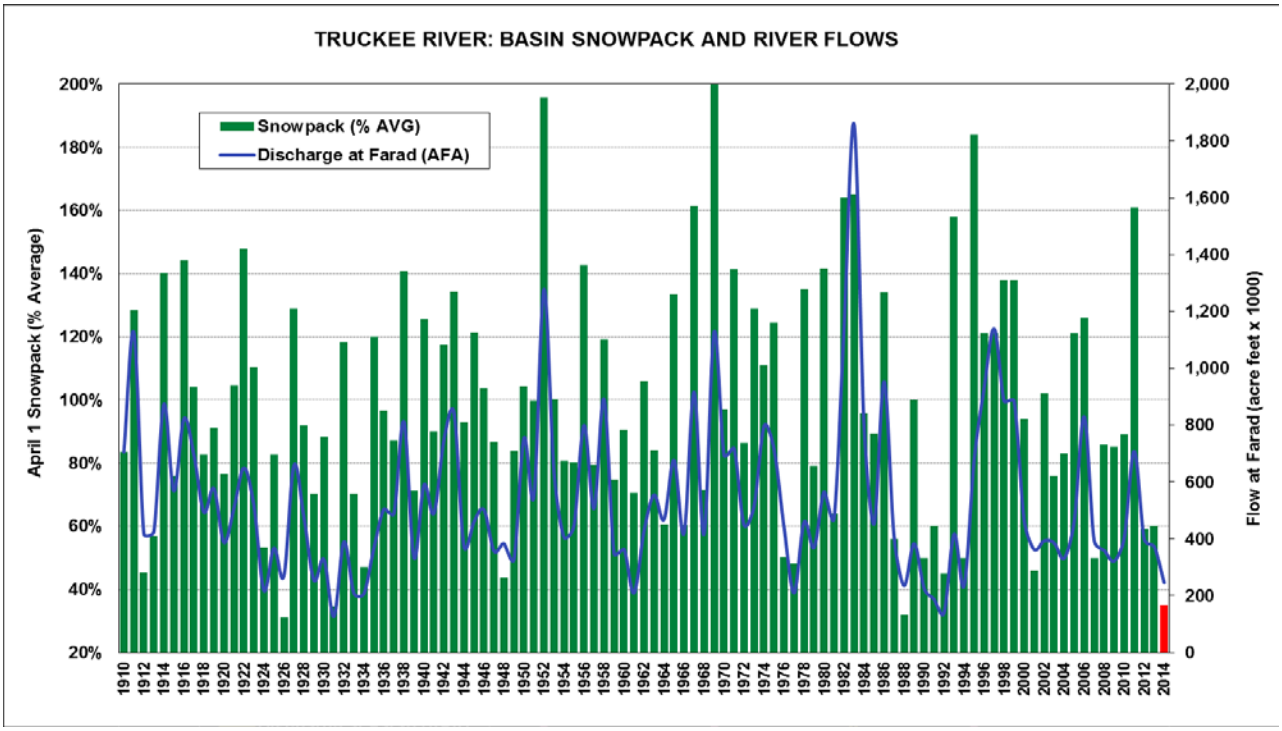
The reader can see that despite what appears to be a large number of upstream reservoirs of combined capacity of over 1,000,000 acre feet, the various operating requirements and constraints affect the use of a given reservoir. The lakes and reservoirs upstream of the Truckee Meadows are managed to provide flood protection and regulate river supplies in accord with numerous decrees, agreements, rights, State and Federal regulations and laws. It has been said that the Truckee River is the most litigated river in the United States.

An important fact to remember is that weather is the key to having water in a reservoir before any benefit can be derived from upstream reservoir operations.

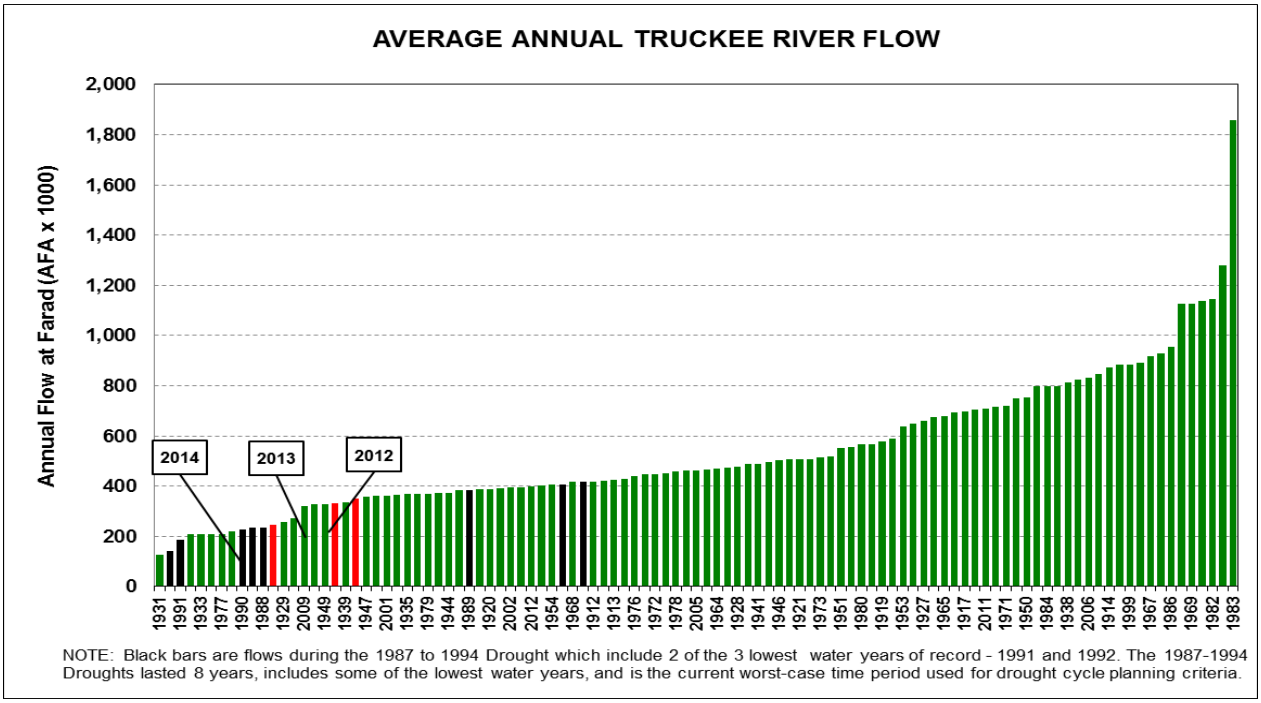
A. Truckee River Water Supplies

Like all rivers, the Truckee is wholly dependent on the amount of precipitation -- snow and rain -- that falls in any year which has direct influence on TMWA's ability to create a potable water supply from the Truckee River. The following graphic illustrates the annual variability of Truckee River supplies compared to annual snowpack measured on April 1 of each year. Simply, the larger the snowpack the greater the Truckee River flows; conversely, the smaller the snowpack the smaller the Truckee River flows.

[2] In addition to the criteria specified in the Orr Ditch Decree, there are other constraints that affect the operation of the Truckee River system. The natural rim located some 400 feet upstream from the dam controls the amount of water that can be discharged from Lake Tahoe at its lower elevations. For example, when the water surface elevation of the lake is one foot above the rim (which equals approximately 122,000 acre-feet of water in storage), only 211 cfs can be discharge over the rim into the Truckee River. When the lake elevation is one-half foot above the rim, the maximum rate of outflow is 55 cfs.

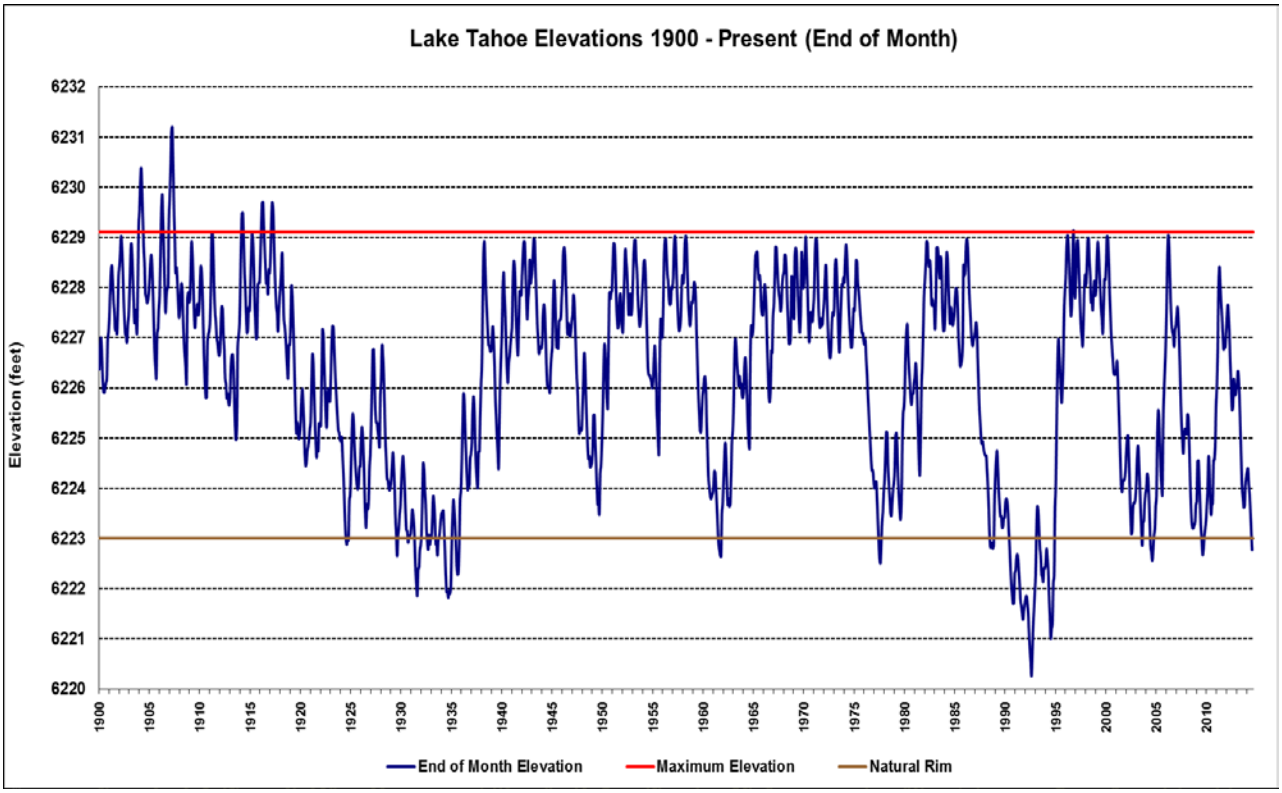


To get a perspective of the range of flows produced by the Truckee River system, the following graphic compares 113 years of record of Truckee River flows from lowest to highest.



Lake Tahoe is the largest reservoir on the Truckee system. The level of stored water in Lake Tahoe is directly affected by the variability in annual precipitation. Water captured during annual

Spring run-off increases the level of stored water in the lake while mandatory releases and direct evaporation from the lake's surface reduce the level of stored water in the lake. The next graphic displays 113 years of record of the end-of-month elevations for Lake Tahoe.

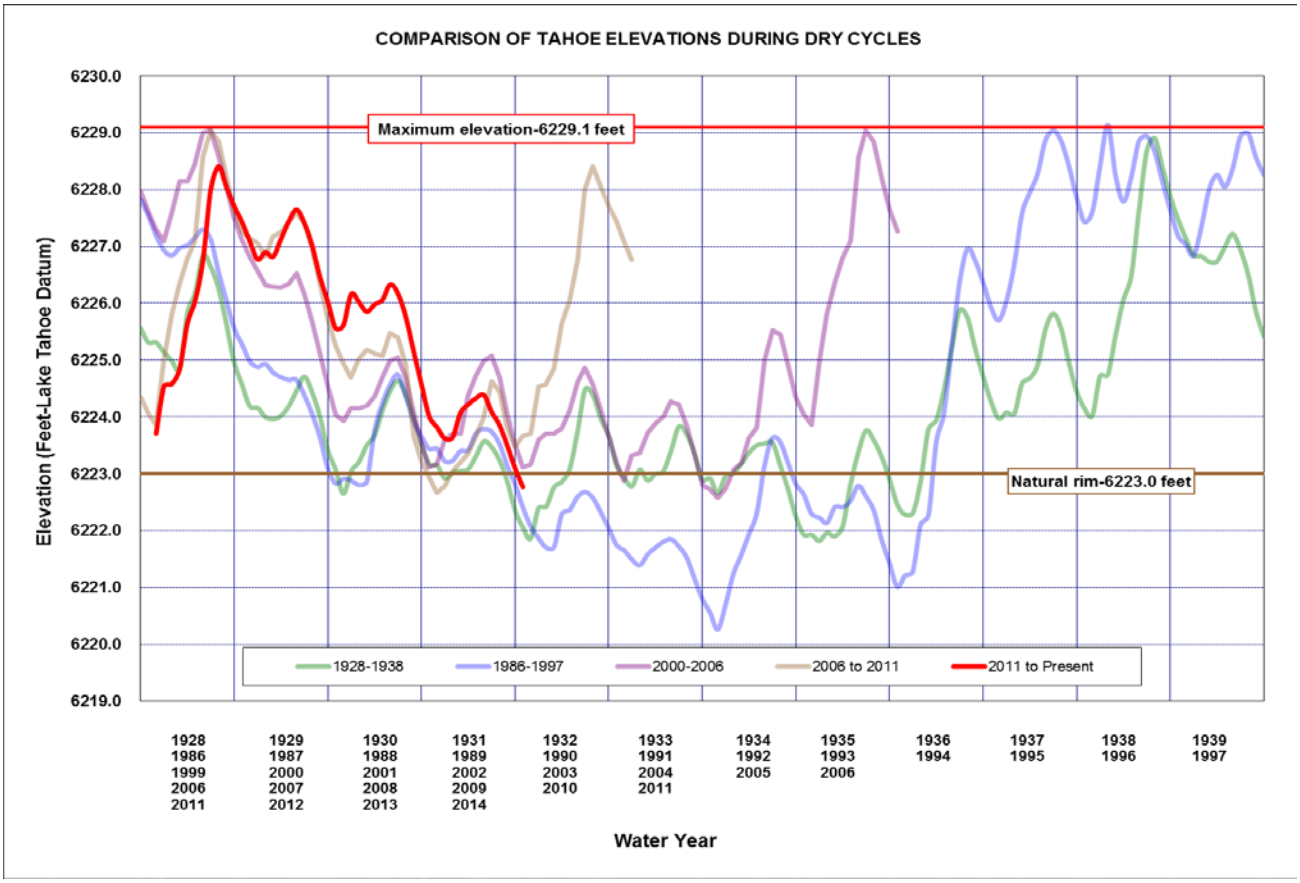


Some immediate observations about Lake Tahoe elevations include:

- Lake levels rise annually when the snow melts.
- Lake levels decline each year due to evaporation and required releases.
- Lake levels fluctuate moderately year-over-year when average or above average snowpacks occur.
- Post 1928-1934 drought and the completion of Boca Reservoir, Lake Tahoe levels are better maintained.
- Big declines occur when the dam is out of service for repair (1976 and 1987), which also occurred the season prior to low water years.
- Lake levels can recover in one good snowpack year (most recently 1995, 2005, and 2011).
- Starting with a full Lake Tahoe it takes about 3 years of consecutive less-than-average snowpacks for the level to drop to or below the natural rim of the lake.

The last graphic compares multiple years of Lake Tahoe elevations during several drought cycles. It is striking how similar the drought patterns are to one another. Each drought begins with a full or near full Lake Tahoe, then over a three year period of consecutive less-than-average snowpack

years the level of the lake falls to at or near its natural rim. Then, in one good snowpack season, the lake may recover to at or near its capacity and at some future time, the cycle begins again. Over the 113 years of record, the longest length of a drought cycle experienced has been eight (8) years, followed by recovery/maintenance years. It is impossible to say whether the current cycle began in 2006 with an interruption by the 2011 tremendous snowpack, or whether the region is experiencing two back-to-back short cycle droughts, or whether the region is in the middle of another 8-year cycle.



From the previous discussion annual flows in the Truckee River are both weather dependent and reservoir level dependent. The fluctuation in river flows can vary significantly. Annually, the Truckee River system always produces a flow that TMWA is able to divert as part of its resource mix. However, when the region experiences consecutive years of below average snowpack, flows in the river can diminish to levels that TMWA must increase its groundwater pumping and/or begin releasing water from its upstream reserves. That process began this past August.

A brief description of how TMWA creates a potable water supply follows these key concepts on the Truckee River system:

1. The annual flow of water from the Truckee River system is dependent on the amount or size of the previous years' snowpack and can be highly variable from year-to-year.

2. The Truckee River is one of the more highly regulated and litigated river systems in the United States.

3. When water is available, the waters in Lake Tahoe and/or Boca Reservoir must be released to meet a daily flow requirement at the California-Nevada Stateline.

4. Beginning in September of each year, water must be released by November from all upstream reservoirs to make room for the upcoming snow season to capture potential winter storm/flood events and runoff that will occur next spring.

5. Lake Tahoe elevation is a key indicator of the severity of drought cycles.

6. In some cases, low levels at Lake Tahoe coupled with less than average snowpack/precipitation years can cause loss of river flows during the summer/irrigation months.

7. Starting with a full Lake Tahoe, when there are successive below-average snowpack years, it takes about three (3) years before Lake Tahoe is at its rim and unable to release any water.

8. Lake Tahoe can fill 4 to 6 feet as a result of an exceptional snowpack year.

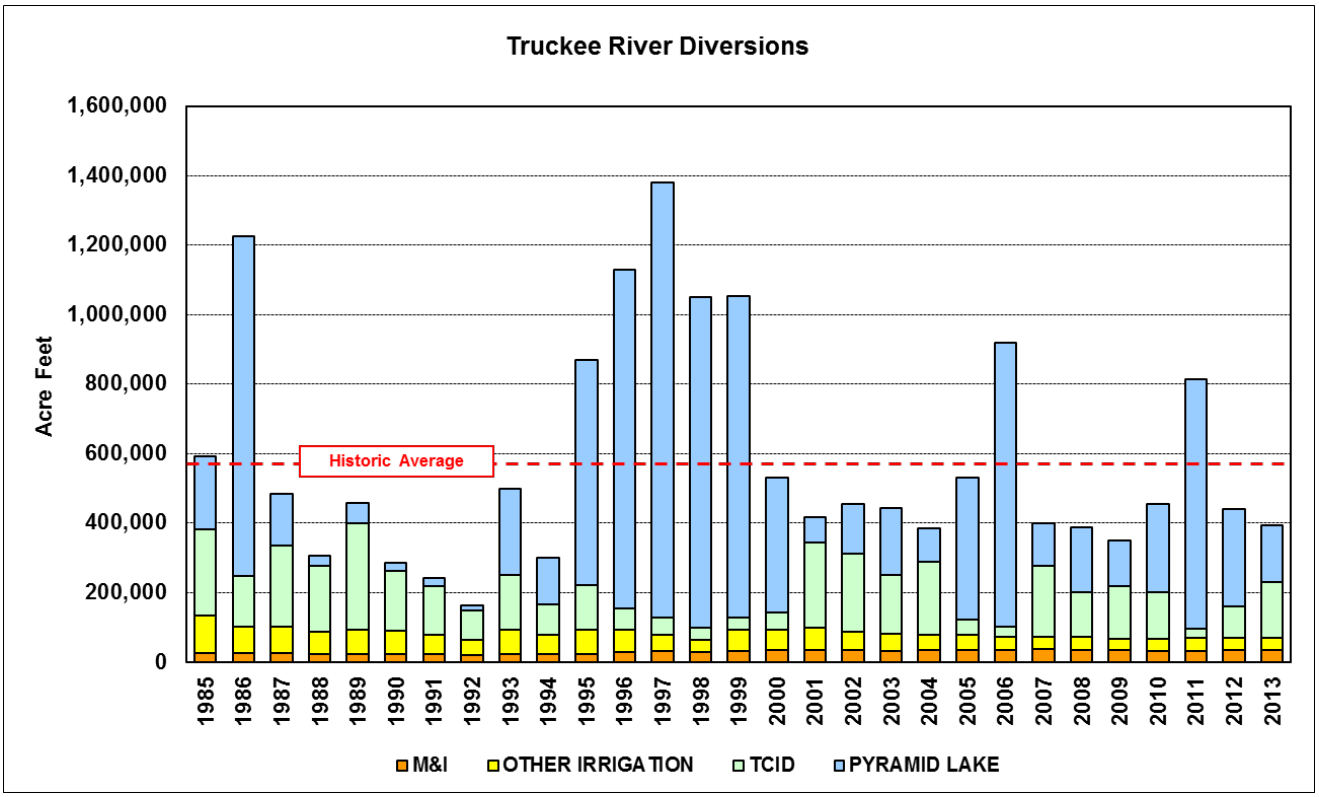
9. Drought cycles are interrupted and typically end with average or above average snowpack years.

10. The region has completed its third consecutive year of below average snowpack (i.e., precipitation).

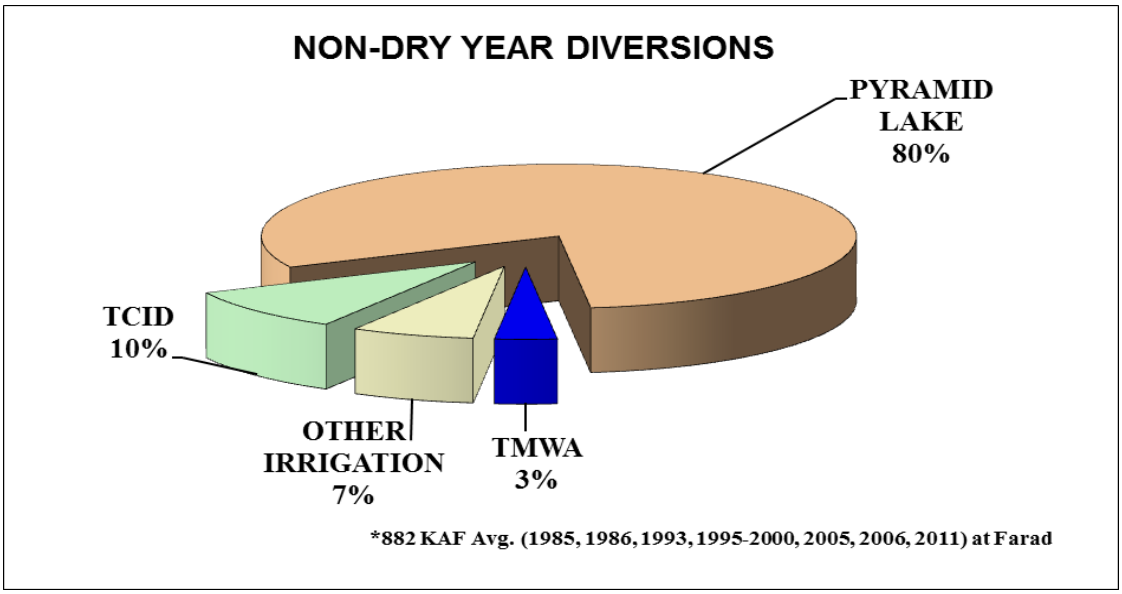
B. Creating a Potable Supply on the Truckee River System

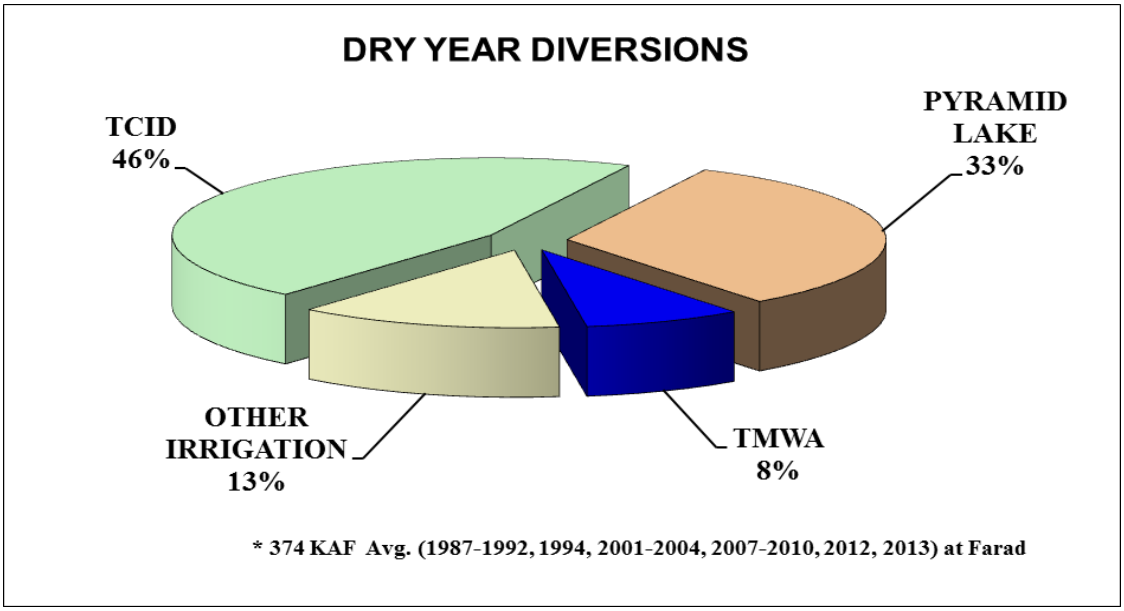
There are two components that are required to create a water supply from the Truckee River system: the water right to divert water from the Truckee River and an alternate supply to back-up the Truckee River water right when the river cannot produce enough water at any time during the year. Water rights are not a topic of this report's discussion. What follows is a discussion of how TMWA manages available Truckee River supplies with its alternate back-up or reserve supplies of upstream storage or groundwater.

TMWA is not the only user of the Truckee River flows. The next graphic shows the primary user groups of Truckee River flows. TMWA, represented by "M&I" on the graph, is one of the smallest diverters of Truckee River flows.



It should be noted that of TMWA's annual diversions of approximately 70,000 acre feet, approximately 40-50 percent of the water is returned to the river via the Truckee Meadows Water Reclamation Facility (TMWRF), which amounts net to an average of 3 to 8 percent of total Truckee flows depending on non-dry vs dry year precipitation as shown in the next set of graphics.





The Chalk Bluff and Glendale Treatment Plants make it possible for TMWA to operate a surface water treatment plant year-round thereby eliminating the need for winter groundwater pumping. TMWA manages its plants to take full advantage of available Truckee River flows in order to maximize surface water production and limit or compress its groundwater pumping to meet summer and early fall demands. By compressing the groundwater pumping into the summer months, TMWA is able to reduce its operating costs, meet peak day requirements with wells rather than investing in expensive surface water plant expansions, and have groundwater available at times when the Truckee River supplies are no longer able to meet full demands.

This conjunctive operation of surface and groundwater supplies presents the opportunity for TMWA to increase its ability to meet drought-year supplies since more permitted groundwater is available in dry years during the summer months. Not only does this operational procedure reduce facility use and overall cost of water production, it creates the opportunity to aggressively pursue an aquifer storage and recovery ("ASR") program. During the winter months, TMWA is able to use and treat its surface water resources to meet demands and to inject treated surface water through existing production wells into the aquifer for later extraction during a drought or as other operating conditions dictate. TMWA has injected an average of 1,500 acre-feet a year into the aquifers in the Truckee Meadows, Lemmon Valley and Spanish Springs over the past decade.

In any given water year, including less-than-average-precipitation years, the Truckee River is the primary source of TMWA's potable water supplies. In non-dry years, up to 90 percent of TMWA potable supplies are from diversions of the Truckee River and 10 percent from groundwater with no use of reserves. In drier years, 80-85 percent of TMWA potable supplies are from the Truckee River and the balance is from groundwater with no use of reserves. The term "conjunctive use" is applied to supply operations that time the use and optimization of various resources to meet demands. Other benefits include:

- The conjunctive management of surface and groundwater resources reduces, over the long-term, the average-annual pumping of the Truckee Meadows aquifer.

- Maximizing the use of TMWA's surface resources allows reduction in annual groundwater extraction.
- Through the combination of minimizing groundwater extractions over an average period, ASR, and conjunctive use TMWA builds up a credit of underground reserves for later extractions during droughts.
- Increased groundwater extraction during droughts increases the ability of TMWA to meet its drought-year demands without extreme stress on the Truckee Meadows aquifer.

By extracting groundwater in the critical months of a drought year, the releases from upstream reserves in those months is reduced which: (1) delays the use of limited reservoir storage, (2) improves drought year supply capability, and (3) increases the yield of TMWA's combined resources. Taking all that has been described into account over the past 40 plus years of formal water resource planning, TMWA's resource management strategy ("RMS")[3] can be summarized as follows:

Non-Dry Year:

- Maximize surface water diversions every month. Surface water production is the first supply to use.
- Limit groundwater use to the critical months: July, August, and September, and eliminate its use as early as possible in October. No groundwater should be used in April, and if possible, delay its use until May or June preferably.
- Maximize opportunities to establish or add to TMWA reserves and credit water.
- Maintain upstream reserves and credit stored water during the year.
- Artificial recharge should occur as early in October as possible and continue through April to store water underground for future use.

Dry Year:

- Maximize surface water diversions every month while available. Surface water production is the first supply to use. This may include bringing the Glendale Water Treatment Plant on-line earlier in the spring and implementing artificial recharge operations early in the fall.
- Maximize opportunities to store water upstream including requesting early filling of reservoirs.
- Maximize groundwater use during the months of June through October, which reduces the use of upstream reserves and any other TMWA storage in surface reservoirs.
- If necessary and to the extent possible, meet remaining demand with groundwater use. Some groundwater supplies will need to be reserved to meet peaking demands later in the year.
- Some upstream reserves or credit water may be required to meet summer peak day demands in extended droughts, but this use should be delayed and minimized if possible to the months of June through October.

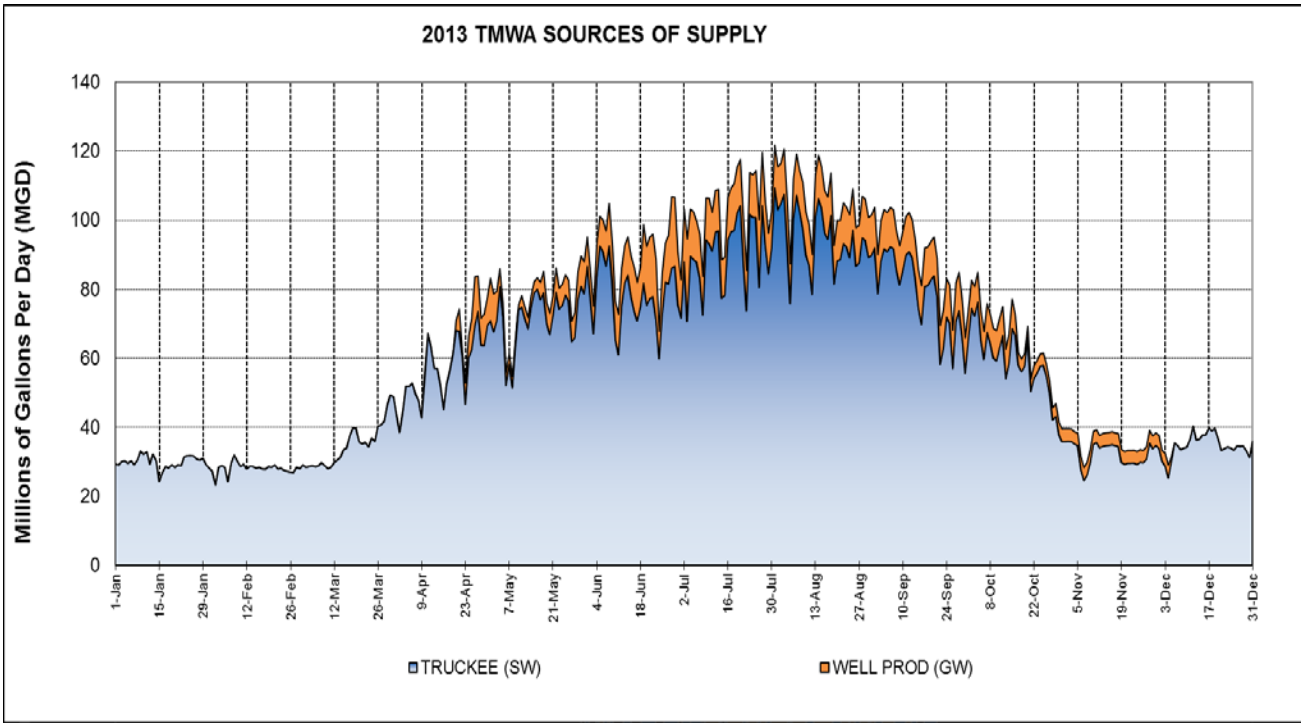
[3] SOURCE: Board adopted 2010-2030 Water Resource Plan.

- Time enhancement of water conservation measures to reduce customer use thereby delaying use of dry-year reserves.

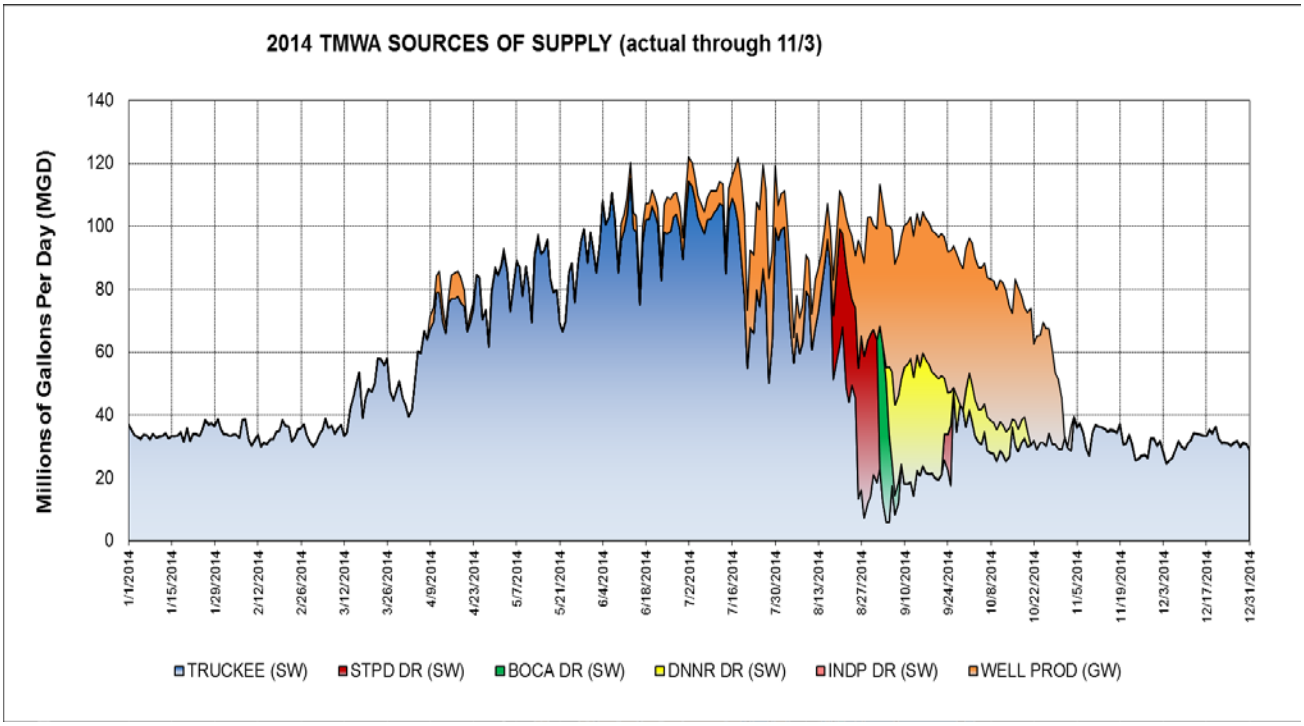
In extended drought conditions such as the region has been experiencing since 2012, TMWA has deployed its RMS. Only in this third year of the current drought cycle has TMWA had to use any of its upstream reserves which is a direct result of the fact that 2014 ranks as the twelfth lowest Truckee River flow of record. This occurrence is not very different than what occurred in the 1987-1994 drought cycle, the worst on record, which serves as the basis of TMWA's current water resource planning criteria.

Through October 2014, 78 percent of TMWA's potable supplies came from the Truckee River, 15 percent from groundwater, and about 7 percent (~4,900 af) from upstream reserves. Knowing that approximately 20 percent of TMWA's approximate 27,500 acre feet of upstream reserves fill every year, use of the upstream reserve water was timed to be used after water stored to meet Floriston Rates was exhausted and when the water ***had to be released*** from TMWA's upstream reserves during the Fall/Winter release season to create storage in all upstream reservoirs for the upcoming snow season. TMWA targeted for use only that portion of its upstream reserves that has a high probability of replenishment during the upcoming winter. From August 20 to October 20 TMWA released 800 acre feet from Boca, 1,495 acre feet from Stampede, and 2,612 acre feet from Donner, approximately 18 percent of our upstream reserves. It was not necessary to release water from Independence.

The following two graphics compare the sources of supply TMWA used in 2013 and 2014. Although 2013 was a below-average precipitation year, groundwater pumping did not exceed average pumping rates and no releases of upstream reserves were necessary to meet customer demands.



In contrast to 2013, the 2014 graphic depicts the various sources used to make a potable water supply. Releases of upstream reserves were timed as close as possible to occur when typical releases are made during the Fall release season. Besides increases to groundwater pumping, releases of TMWA reserves in Boca, Stampede and Donner were needed between mid-August to mid-October to meet customer demands. The impact to TMWA's reserves was *not* an extraordinary event anticipating that the volumes of water release from upstream reserves will likely refill in Spring 2015.



Some key concepts to understanding how a potable water supply can be created using the Truckee River system include:

1. TMWA is one of many users of the Truckee River.

2. TMWA's annual diversions of the water of the Truckee River are small in comparison to other users of the river.

3. TMWA's net use of the Truckee River averages about 3% in non-dry years and about 8% in dry years.

4. TMWA customers return between 40-50% of the water they use to the Truckee River via TMWRF.

5. Because of the variability in annual precipitation, alternate water resources (e.g., groundwater and/or upstream storage) are needed to back-up the Truckee River supply in low precipitation years.

6. TMWA's conjunctive use strategy optimizes the use of Truckee River flows when available in order to avoid or delay the use of groundwater and/or upstream reserves.

7. TMWA used less than 20 percent of its upstream reserves in 2014 which reserves are anticipated to refill in Spring 2015.

TMWA's Demand Management (or Conservation) Plan

The previous narrative was provided to give the reader a sense of the Truckee River's complexity, constraints, and challenges when it comes to making a potable water supply for the citizens of the Truckee Meadows. The balance of this report discusses TWMA's DMP purposes, goals and programs.

Care must be taken to define the purposes of seeking to reduce overall water use through water conserving actions along with consideration of the consequences to customers, TMWA and the community. Water conserving actions, or lack of thereof, undertaken by customers have a direct impact on a customer's utility bills, the need for future facilities or timing of those facilities, TMWA's revenues, drought protection for the community, and the rate at which new resources are needed.

Demand management programs reap many benefits, the most obvious of which are:

- Delayed need for future facilities or deferred timing of those facilities, and the cost associated with those facilities
- Increased drought protection for the community as conserved water can be stored in upstream reservoirs when storage space is available.
- Environmental benefits as a result of increased river flows (benefits riparian habitat and wildlife)
- Less water consumed means less energy required to produce and deliver water to customers as well as less energy consumed to process wastewater
- More stable and predictable consumption of water
- Reduction in system leaks and losses thereby reducing operating costs

Some utilities deploy demand management programs to conserve water that is then reallocated to serve new growth (a common practice in California and southern Nevada). However, with this approach to conservation there is no reduction in the use of water since the water is used to serve new consumers. TMWA's demand management program, particularly when it is anticipated that back-up or reserve supplies may be used/impacted, seeks to conserve water and save it so it can be used later during a dry-year. Additionally, TMWA's DMP must fulfill certain specific provisions of the Nevada Revised Statutes ("NRS"), the Truckee River Operating Agreement, and Western Regional Water Commission ("WRWC"). The WRWC is charged with overseeing and coordinating water resource planning and management in Washoe County including responsible water use planning.

As the largest water purveyor in Washoe County, soon serving over 95% of the region's residents, TMWA is a key player in developing the region's responsible water use mission and will be integral in implementing programs that support that mission. TMWA's programs will continue to serve as the cornerstone of the region's efforts.

TMWA's water demand management strategy is comprised of many measures grouped under three headings:

System Management

Public Education

Other Demand Management Measures

The specific measures, the target audiences, and the primary benefit to TMWA of each program are summarized in this table:

	Primary Benefit	Target Audience
A. System Management		
Coordination of Treated Effluent Use	3, 4	Irrigation
Leaks and System Repairs	1, 4	All users
Meter Replacement	1	All users
Non-Potable Water Service	3, 4	Irrigation
System Pressure Standards	1, 4	All users
Unauthorized Use of Water	1, 4	Construction
B Public Education		
Assigned-Day Watering	1, 2, 3, 4	All users
Distribution of Water Savings Devises & Information	1, 2	Residential
Education Programs for Kids	2	Children
Homeowner Workshops	1, 2	Residential
Landscape Retrofit	1, 3	Irrigation & residential
Water Audits	1, 2	Residential & business
Water Waste Prevention	1	All users
C. Other Measures		
Codes and Ordinances	1	All users
Program Management and Droughts	1, 2, 3, 4	All users
Program Management and Emergency Supply Conditions	1, 2, 3, 4	All users
Water Management Programs	1, 3	Large water users
Water Rates	1, 4	All users

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1 - Reduces water waste
2 - Education
3 - Peak day savings
4 - Minimize operation and maintenance to distribution facilities

Nevada is part of the Great Basin and for the most part is classified as a high desert. Few places in Nevada are as fortunate as the Truckee Meadows which has a river running through it, but that does not change the fact it is a desert with annual average rainfall of 7.5 inches per year. In essence, the region is in perpetual drought interrupted by wetter precipitation years. That is one

reason why it is harder during dry years to explain to customers: (1) how climatological conditions have led to reduced precipitation, reduced snowpack accumulations, and resulting lower Truckee River supplies; (2) the need to use water more efficiently; and (3) the degree to which TMWA water supplies will be affected. In some dry years TMWA's upstream reserves are never used; however, in other years such as 2014 the upstream reserves must be used. It is difficult for customers to understand why "less-than-normal" river flow conditions may or may not have an effect on TMWA water supplies. Except for extreme dry year events, TMWA's conjunctive management (described earlier in this report) of its available raw-water supplies successfully avoids or minimizes disruption to customers and the local economy over the course of a year.

To improve customer understanding between climatologically induced droughts and water supply TMWA adopted a simpler way to explain the impact of Drought Situations based on available water supplies. This classification system suggests enhancements to the annual, baseline conservation measures that can be deployed depending on the water available from the Truckee system as a drought cycle progresses and oscillates year-over-year.

	Non-Drought Situation	*Drought Situation*	
	Supplies are Normal	Supplies are Adequate [River Flows Drop-Off After Labor Day]	Supplies are Impacted [River Flows Drop-Off Before Labor Day]
----------a----------	----------b----------	----------c----------	----------d----------
A *Assigned Day Watering*			
Monday	No water day	No water day	No water day
Even addresses:	Tuesday, Thursday and Saturday	Tuesday, Thursday and Saturday	Tuesday, Thursday and Saturday
Odd addresses:	Wednesday, Friday, and Sunday	Wednesday, Friday, and Sunday	Wednesday, Friday, and Sunday
B *Water Day Time Restrictions*			
Between Memorial Day and Labor Day	12 to 6 PM	12 to 6 PM	11 AM to 7 PM
C *Public Education & Advertising*	Standard programs	Standard programs	Increased programs
D *Water Waste Prevention*	Standard enforcement	Standard enforcement	Increased enforcement
E *Other Actions*			
Though not inclusive, these enhancements could be deployed depending on the severity of the circumstances and the potential impact to supplies			Expand water day time restrictions Reduce the number of watering days Set daily watering allotments Drought rates

NOTE: The term "supplies" refers to (1) Truckee River water available from natural flows plus releases from Federally operated reservoirs to support Floriston Rates and (2) TMWA's Privately Owned Stored Water held in Independence and Donner Lakes and Federal reservoirs.

As staff planned its 2014 source-of-supplies, its upstream reserves were full but it was determined that they could be impacted as river flows were expected to drop-off before Labor Day. It was impossible to determine in the spring of 2014 how early before Labor Day river supplies would diminish. Staff, per the guidelines shown in the table, expanded no watering times from 12-6 PM to 11-7 PM and enhanced its communications to tell customers to be more aware of their water use this

year. This past summer's call for a 10 percent reduction in outdoor water use did not go out until a week before it was anticipated the river flows would decline. Calling for more reductions in water use earlier in the spring or summer would not have added to upstream reserves as they were full and would have had a more negative affect on the community and TWMA's revenues earlier that necessary. The 10 percent target was insurance to safeguard staff's projected use of reserves in 2014 would not exceed the amount expected to refill in Spring 2015. The community responded and although the estimated outdoor water use savings was 7.5 percent at the system level, the goal of not using more reserves than planned was achieved. The companion reports under this Agenda Item discuss the actions and results of the 2014 DMP and recommend actions for the Board to consider in 2015.

Some key concepts to understanding TMWA's DMP include:

1. Educate customers on the efficient and responsible use of water: use what you need and avoid waste.

2. Assist customers with on-site review of water use that eliminates waste and reduces water bills.

3. Detect, repair and maintain the distribution system to avoid leaks and waste.

4. Provide timely and useful information to consumers to achieve reductions in water use that minimize potential use of dry-year reserves in order to maximize dry-year reserves for the next year.

5. Minimize disruption to the local community quality of life and economy.

6. Comply with state law and contractual obligations.

7. Maintain flexibility in DMP to develop appropriate education and action strategies to deploy as water supply conditions change and evolve.

8. Aggressive demand reductions are timed to preserve and protect upstream reserves.