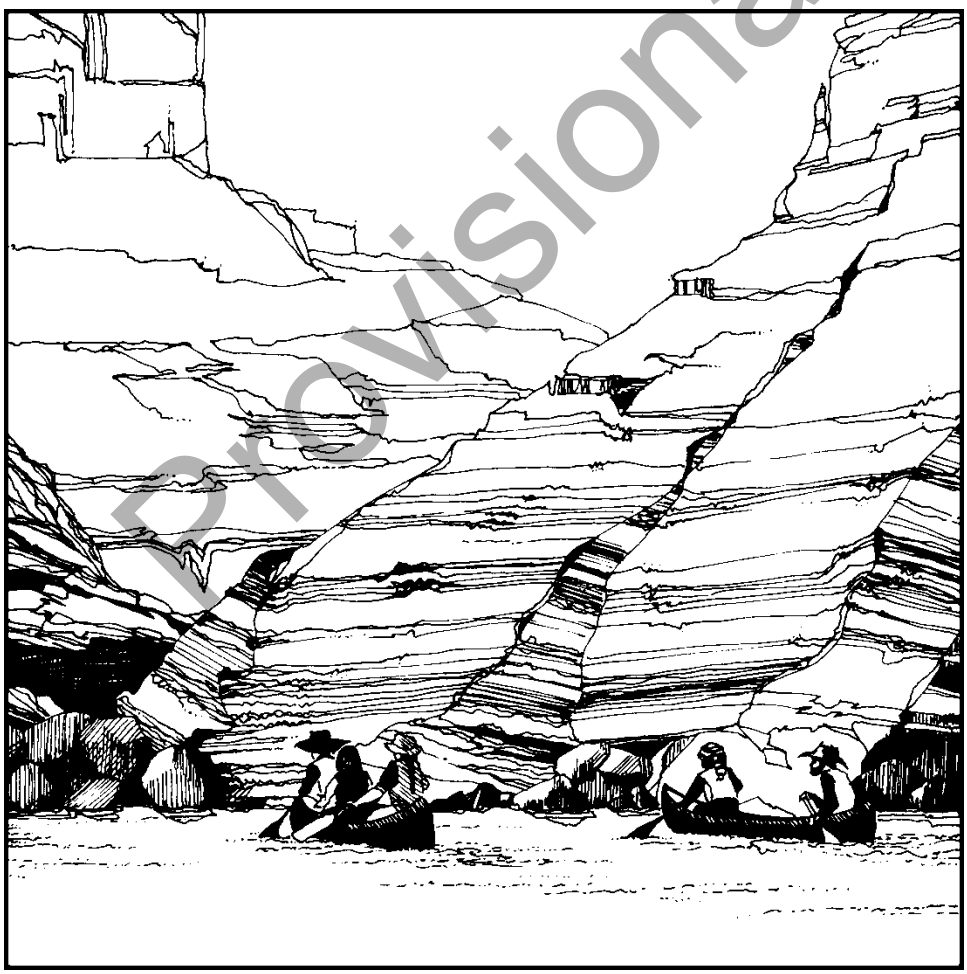
PROVISIONAL

Upper Colorado River Basin Consumptive Uses and Losses Report 2011-2015

RECLAMATION

Managing Water in the West



U.S. Department of the Interior
Bureau of Reclamation

February 2017

PROVISIONAL
Upper Colorado River Basin Consumptive Uses and Losses Report 2011-2015

(Currently updated through 2015)

UPPER COLORADO RIVER BASIN

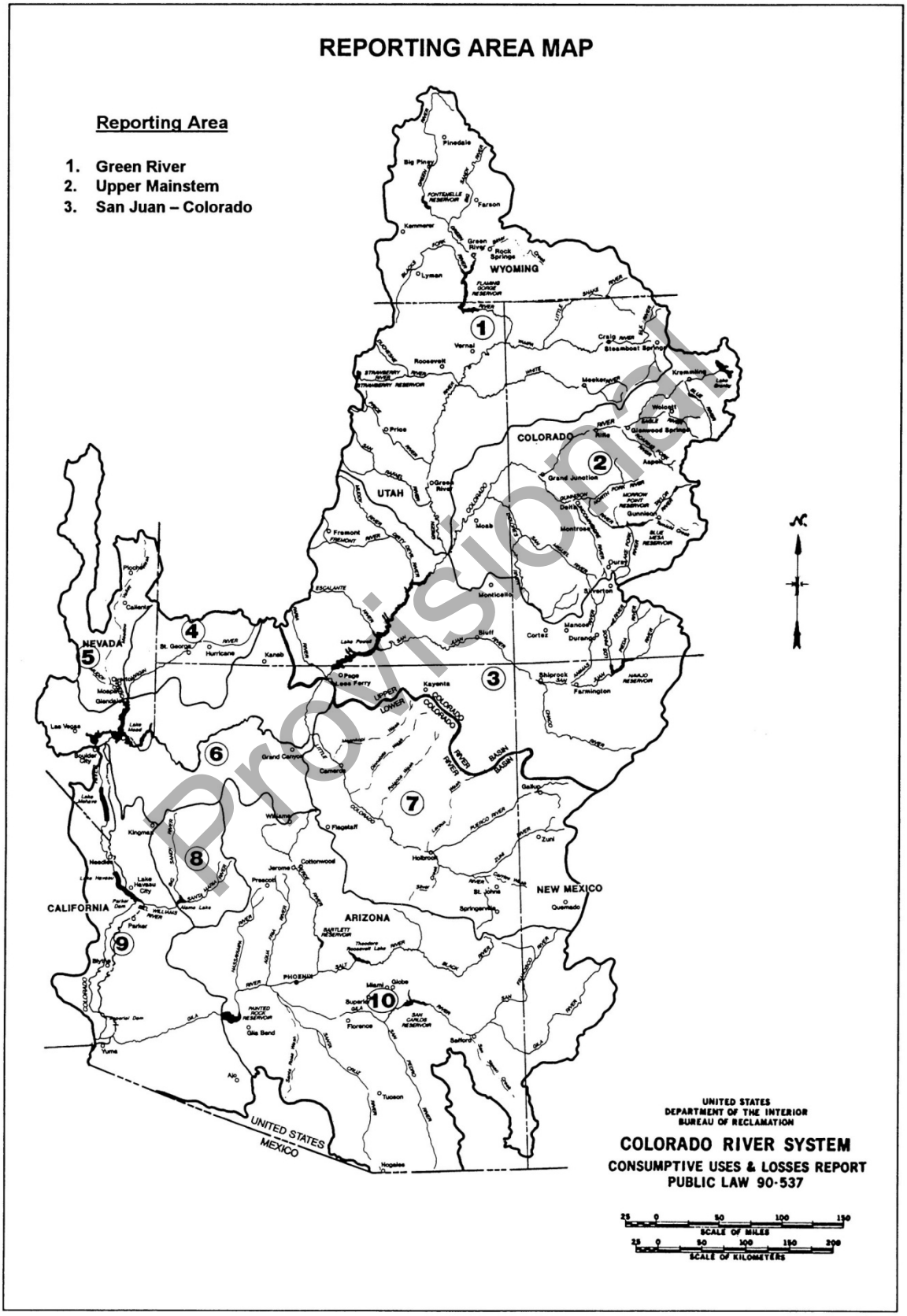
CONSUMPTIVE USES AND LOSSES

2011-2015

Provisional Data (Subject to change)

FOREWORD

This report reflects the Department of the Interior's best estimate of actual consumptive uses and losses within the Upper Colorado River Basin. The reliability of the estimate is affected by the availability of data and the current capabilities of data evaluation.



SUMMARY

This report shall present the provisional estimates of the consumptive uses and losses from the Upper Colorado River System for each calendar year from 2011 through 2015. Currently, this report contains data through 2015. As further data are available this report shall be updated. This report includes a breakdown of the beneficial consumptive use by major types of use, by major tributary streams, and, where possible, by individual States.

The Colorado River rises in the Rocky Mountains of Colorado, flows southwesterly about 1,400 miles and terminates in the Gulf of California. Its drainage area of 242,000 square miles in this country represents one-fifteenth of the area of the United States. Its water is used for irrigation, municipal and industrial purposes, electric power generation, mineral activities, livestock, fish and wildlife, and recreation. Large amounts are exported from the system to adjoining areas. The following tables summarize annual water use from the system by basins and States. Distribution of water use by types of use from the various reporting areas is contained within the body of the report.

Table: Summary
Upper Colorado River Sysytem: Water Use by States, Basins, and Tributaries[1]
(1,000 acre-feet)

STATE AND BASIN OF USE	2011	2012	2013	2014	2015	Average 2011-15
ARIZONA						
Upper Basin	35	34	35	36	29	34
COLORADO						
Upper Basin	2,268	2,632	1,952	1,925	1,644	2,450
NEW MEXICO						
Upper Basin	401	347	341	358	392	374
UTAH						
Upper Basin	815	921	962	803	758	868
WYOMING						
Upper Basin	398	372	370	355	354	385
OTHER[2]						
Upper Basin Colorado River Storage Project Reservoir Evaporation	570	517	424	424	461	544
UPPER COLORADO RIVER SYSTEM						
Upper Basin	3,916	4,306	3,659	3,476	3,177	4,111
Other: Reservoir Evaporation and Channel Losses	570	517	424	424	461	544
Grand Total	4,486	4,823	4,083	3,900	3,638	4,655
UPPER COLORADO RIVER SYSTEM GRAND TOTAL	4,486	4,823	4,083	3,900	3,638	4,655

[1] Onsite consumptive uses and losses includes water uses satisfied by groundwater.
[2] Mainstem reservoir evaporation in the Upper Basin

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Colorado River Basin

Upper Colorado River

PROVISIONAL

UPPER COLORADO RIVER BASIN CONSUMPTIVE USES AND LOSSES 2011-2015

INTRODUCTION

The Colorado River System is composed of portions of seven States--Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. It has a drainage area of about 242,000 square miles and represents about one-fifteenth of the area of the United States.

This report incorporates provisional annual estimates of consumptive uses and losses of water from the Upper Colorado River Basin from 2011 through 2015. Currently, this report contains data through 2015, and will be updated when data is available. Wherever available, water use reports prepared in accordance with legal requirements concerning the operation of the Colorado River were utilized. Base data needed to estimate onsite consumptive uses were taken largely from existing reports and studies and from ongoing programs. Where current data were not available, estimated values were developed by various techniques and reasoned judgment. In general, methodology followed the techniques normally used within the system for estimating water use.

Nothing in this report is intended to interpret the provisions of the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 with the United Mexican States (Treaty Series 994; 59 Stat. 1219), the decree entered by the Supreme Court of the United States in Arizona vs. California, et al. (376 U.S. 340), the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774; 43 U.S.C. 618a), the Colorado River Storage Project Act, (70 Stat. 105; 43 U.S.C. 620), or the Colorado River Basin Project Act (82 Stat. 885; 43 U.S.C. 1501).

STUDY REPORTING AREAS

The drainage area of the Upper Colorado River Basin in the United States is approximately 110,000 square miles. The river originates in the Rocky Mountains of Colorado and Wyoming, flows southwest about 640 miles, and terminates at Lee Ferry, Arizona. The system consists of portions of five states: Arizona, Colorado, New Mexico, Utah, and Wyoming. The drainage area was divided into three subbasins for the purposes of this report.

The Colorado River Compact, signed November 24, 1922, was established because the Upper Basin States were concerned that any storage on the river would be put to use more rapidly by the Lower Basin States, thus allowing them to claim prior appropriative rights. The Upper Basin States wanted provisions for their future development.

The term "Upper Basin States" refers to the States of Colorado, New Mexico, Utah, and Wyoming. "Lower Basin States" refers to the States of Arizona, California, and Nevada. However, the Upper Colorado River Basin refers to the hydrologic boundaries. Lee Ferry is the division point between the Upper Colorado River Basin and the Lower Colorado River Basin.

The major tributary streams selected as reporting areas in the Upper Colorado River Basin are: Green River (Wyoming, Colorado, Utah), Upper Main Stem (Colorado, Utah), and San Juan-Colorado (Colorado, New Mexico, Utah, Arizona).

The boundaries of the reporting areas are shown on the map on page iii. A brief description of each reporting area follows.

Upper Colorado River Basin

Green River (Wyoming-Colorado-Utah)

The Green River reporting area comprises approximately 44,800 square miles in southwestern Wyoming, northwestern Colorado, and northeastern and east-central Utah.

Principal tributaries of the Green River are Blacks Fork, New Fork, and Big Sandy Creek in southwestern Wyoming, Yampa and White Rivers on the western slope of the Continental Divide in northwestern Colorado, and the Price, Duchesne, and San Rafael Rivers in eastern Utah. These streams are fed by numerous headwater lakes.

The largest towns in the reporting area are Rock Springs and Green River in Wyoming, Vernal and Price in Utah, and Craig, Steamboat Springs, and Meeker in Colorado.

Mineral production is the major industry. Oil and natural gas are of primary importance, as are coal, gilsonite, asphalt, and trona (soda ash). Thermal electric power production is becoming an increasingly important industry.

Agriculture ranks near mineral production in importance to the local economy. Agricultural development is centered around livestock production, primarily beef cattle and sheep. Because of a short growing season, crop production is limited largely to small grain, hay, and pasture. These crops are used as winter livestock feed and complement the vast areas of public grazing lands.

Irrigation consumptive use accounts for about 72 percent of the total water use in the Green River reporting area exclusive of any share of main stem evaporation. Nearly 509,600 acres of land are irrigated on average during the reporting period (2011 - 2015). Some exports of water are made to the Great Basin in Utah.

Upper Main Stem (Colorado-Utah)

The Upper Main Stem reporting area is drained by the Colorado River and its tributaries above the mouth of the Green River. Principal tributaries are the Roaring Fork, Gunnison,

and the Dolores Rivers. The Upper Main Stem reporting area consists of 26,200 square miles, with about 85 percent of the area in Colorado and the remainder in Utah.

Grand Junction, Montrose, and Glenwood Springs are the principal towns in the Colorado portion of the upper main stem of the Colorado River. Moab is the only major community in the Utah portion of the upper main stem of the Colorado River.

Mineral production is the predominant industry. This area is the Nation's chief source of molybdenum and is a major source of vanadium, uranium, lead, zinc, coal, and gilsonite. On the Upper Main Stem reporting area, as in that of the Green River, agriculture centers around production of livestock which feeds on irrigated lands to complement the large areas of rangeland. Somewhat increased diversification of crops occurs in the Upper Main Stem, however, with some major land areas devoted to corn, beans, potatoes, table vegetables, and fruit. This diversification is made possible by climatic and topographic conditions that create favorable air drainage and minimize frost damage.

Irrigation consumptive use accounts for about 59 percent of the water use in the Upper Main Stem reporting area exclusive of any share of main stem evaporation. Approximately 547,700 acres of land were irrigated on average during the reporting period (2011-2015). Approximately 33 percent of the water is exported to serve agricultural and municipal needs on the Eastern slope of the Continental Divide in Colorado.

San Juan-Colorado (Colorado-New Mexico-Utah-Arizona)

The San Juan reporting area is drained by the Colorado River and its tributaries below the mouth of the Green River and above Lee Ferry, Arizona. The largest of the tributary streams is the San Juan River which heads on the western slope of the Continental Divide in southwestern Colorado. Principal tributaries of the San Juan River are the Navajo, Piedra, Los Pinos, Animas, and La Plata Rivers. The other main tributaries in the basin are the Dirty Devil, Escalante, and Paria Rivers, which drain a portion of the Eastern slope of the Wasatch Plateau in Utah. The reporting area includes about 38,600 square miles in portions of Utah, New Mexico, Arizona, and Colorado.

The largest towns are Durango and Cortez in Colorado, Monticello and Blanding in Utah, Farmington in New Mexico, and Page in Arizona.

Mining and agriculture form the economic base for the San Juan-Colorado reporting area. The agricultural development is similar to that of the Upper Main Stem where most of the cropland is devoted to livestock feeds except for the production of diversified market crops on lands with favorable air drainage. The main market crops are fruit, vegetables, and dry beans. Oil, natural gas, and coal are the most important minerals produced. Thermal electric power production is increasingly important to the economy of the area.

Irrigation accounts for the largest use of water, about 75 percent of the San Juan reporting area use, exclusive of any share of main stem evaporation. About 411,000 acres of land are irrigated on average during the reporting period (2011-2015).

TERMINOLOGY

The Colorado River is not only one of the most highly controlled rivers in the world, but is also one of the most institutionally encompassed. A multitude of legal documents, known collectively as the "Law of the River," effect and dictate its management and operation. Major documents include:

Colorado River Compact--1922
Boulder Canyon Project Act--1928
California Limitation Act--1929
California Seven Party Agreement--1931
Mexican Water Treaty--1944
Upper Colorado River Basin Compact--1948
Colorado River Storage Project Act--1956
United States Supreme Court Decree in Arizona vs. California--1964
Colorado River Basin Project Act--1968
Minute 242 of the International Boundary and Water Commission, United States and Mexico--1973
Colorado River Basin Salinity Control Act--1974, amended 1984, 1995, and 1996

The Colorado River System is defined in the Colorado River Compact of 1922 as "...that portion of the Colorado River and its tributaries within the United States,", whereas the Colorado River Basin is defined as "...all of the drainage area of the Colorado River System and all other territory within the United States of America to which waters of the Colorado River System shall be beneficially applied.". The compact divided the Colorado River Basin into two subbasins--the "Upper Basin" and the "Lower Basin," with Lee Ferry as the division point on the river. Lee Ferry, located in Arizona, is a point in the main stem 1 mile below the mouth of the Paria River. For the purpose of this report, the Great Divide Basin, a closed basin in Wyoming, and the White River, also a closed basin, in Nevada have not been considered as part of the Colorado River System since flows from these basins never reach the Colorado River. Diversions from the system to areas outside its drainage area are considered herein as exports and have not been classified by types of use.

Beneficial consumptive use is normally construed to mean the consumption of water brought about by human endeavors and in this report includes use of water for municipal, industrial, agricultural, power generation, export, recreation, fish and wildlife, and other purposes, along with the associated losses incidental to these uses.

The storage of water and water in transit may also act as losses on the system although normally such water is recoverable in time. Qualitatively, what constitutes beneficial consumptive use is fairly well understood; however, an inability to exactly quantify these uses has led to various differences of opinion. The practical necessity of administering the various water rights, apportionments, etc., of the Colorado River has led to definitions of consumptive use or depletions generally in terms of "how it shall be measured." The Upper Colorado River Basin Compact provides that the Upper Colorado River Commission is to determine the apportionment made to each State by "...the inflow- outflow method in terms of manmade depletions of the virgin flow at Lee Ferry...".

There is further provision that the measurement method can be changed by unanimous action of the Commission. Nearly all the water exported from the Upper Colorado River System is measured; however, the remaining beneficial consumptive use, for the most part, must be estimated using theoretical methods and techniques.

Reservoir evaporation loss is a consumptive use associated with the beneficial use of water for other purposes. For the purpose of this report, main stem reservoir evaporation is carried as a separate item for the Upper Basin.

Channel losses within the system are normally construed to be the consumptive use by riparian vegetation along the stream channel (or conveyance route) and the evaporation from the stream's water surface and wetted materials. Seepage from the stream normally appears again downstream or reaches a groundwater aquifer where it may be usable again. A decided lack of data and acceptable methodology, along with the intermittent flow characteristics of many Southwest streams, combine to make a reasonable determination of channel loss difficult. Channel losses have not been estimated for this report within the Upper Basin.

METHODOLOGY AND DATA ADEQUACY

This report is based almost entirely on data obtained from ongoing programs and current reports. Quantitative measurements of water use were used wherever available, but the majority of the basin water use was theoretically calculated. The following sections describe these calculations for the Upper and Lower Colorado River Basin.

Colorado River Basin Tributaries

In the tributary areas of the basin, records of diversions and return flows are not complete enough to allow direct calculation of consumptive water use. Theoretical and indirect methods of estimating consumptive use must then be relied upon. In the New Mexico portion of the Colorado River Basin, the annual consumptive use of water is reported by the New Mexico Interstate Stream Commission. For the Arizona, Colorado, Utah and Wyoming portions of the Colorado River Basin, the annual consumptive use of water was estimated using the following methodologies.

Agriculture

The percent of irrigation consumptive use is 68 percent for the Upper Basin tributaries. The percent excludes main stem evaporation. The annual irrigated acreage of most crops grown within each reporting area was estimated from information published in the yearly State Agriculture Statistics, 2007 and 2012 National Census of Agriculture (since the State statistics do not include pasture land), and from Geographic Information System (GIS) irrigated acreage data available for Colorado (2005, 2011, 2012), Utah (2005, 2011, 2012), and Wyoming (2005, 2011, 2012).

Since most of these data were reported on a county basis, it was necessary to separate them into smaller reporting areas to represent the area denoted by the 8-digit Hydrologic Unit Code (HUC), county, and State boundary intersections. This was accomplished using the irrigated acreage delineation available from GIS and intersecting the coverage with the HUC, county and state boundaries.

These reporting areas generally follow tributary stream basin and State boundaries. One or more representative weather stations were selected to represent mean weather conditions for agricultural lands within for each reporting area. Using records of temperature, precipitation, and frost dates, a consumptive use rate is computed for each major crop in each of the reporting years using the modified Blaney Criddle evapotranspiration formula in the version described in the Soil Conservation Service Technical Release No. 21, "Irrigation Water Requirements," revised September 1970. Irrigation consumptive use rates are determined by subtracting the effective precipitation from the consumptive use rates. Effective precipitation for the Upper Basin was computed using the Soil Conservation Service method. This method is referenced in "SCS Technical Release No. 21." The monthly values of irrigation consumptive use rates multiplied by the estimates of irrigated acreage yield the final values of irrigation consumptive use volumes.

These theoretical consumptive use calculations are based on the assumption of full water supply during the crop growing season. However, it is estimated that in an average year, about 37 percent of the irrigated lands in the Upper Basin receive less than a full supply of water, either due junior water rights or a lack of distribution facilities. The degree to which these lands suffer shortages varies widely from year to year, depending in large part on the magnitude of runoff. An estimate of the short supply service lands was made for irrigation reporting areas covering the Upper Colorado Basin, primarily on the basis of reports and investigations collected for the 1971 comprehensive framework study. A streamflow gauging station was selected within each reporting area and the magnitude of the recessional portion of the annual hydrograph was used as an index to select the date at which consumptive use calculations are terminated for the short supply lands. Estimates of total shortage water volumes (the volume of water that would have been consumed by crops if the shortage criteria were not in place) are displayed in table UC-9.

Comprehensive framework studies of the incidental use of water associated with irrigation indicated that this use varied between 5 and 29 percent of the irrigation consumptive use, depending upon the location of the study area within the Colorado Basin. These percentages were used in the Upper Basin to adjust the calculated consumptive use.

The agricultural data is generally adequate for use in this report. Each state annually prepared State Agricultural Statistics, which include county total acreage estimates (irrigated and unirrigated are not distinguished) of the harvested crops during the reporting period. These statistics are assumed to be reliable. State Agricultural Statistics do not include pasture land in the Basin and do not distinguish between irrigated and unirrigated agricultural lands. Therefore, in the Upper Basin states GIS irrigated acreage data (available approximately every 5 years) in conjunction with the National Census of Agriculture data were used to estimate irrigated pasture lands and to develop a ratio for irrigated versus unirrigated agriculture to determine the portion of State Agricultural Statistics that is irrigated agriculture.. Other areas of agricultural data collection that need to be updated and verified are: (1) the consumptive water use of lands that receive less

than a full seasonal supply of irrigation water and the aerial extent of these lands, and (2) the amount of incidental seepage and phreatophytic losses associated with irrigation. Total irrigated acreages used in the preparation of this report are listed in table UC-7.

Reservoir Evaporation

A comprehensive listing was developed of all reservoirs in the Upper Colorado River Basin primarily based on the National Inventory of Dams database, which included the latitude, longitude, elevation, and surface area at total capacity for each reservoir.

Monthly water-surface area was obtained for those reservoirs for which records are available. For those reservoirs lacking records (unmeasured), a "fullness factor" was estimated on the basis of reservoir use and historical hydrologic conditions. These "fullness factors" were then used to obtain estimates of average annual water surface area for the unreported reservoirs. For all reservoirs without monthly evaporation estimates, annual free water surface (FWS) evaporation rates were used to determine reservoir evaporation.

The FWS evaporation value was taken from NOAA Technical Report NWS 33, “Evaporation Atlas for the Contiguous 48 United States”, June 1982, Map 3 of 4 : Annual FWS Evaporation based on the reservoir location information. An account was taken of precipitation and runoff salvage to determine net evaporation rates. The annual FWS evaporation rates were distributed monthly based on an average basin monthly distribution. For unmeasured reservoirs, the annual net evaporation rates were applied to the estimates of average annual water-surface area to yield the values of annual reservoir evaporation.

An exception to this procedure was the determination of evaporation from what are called the main stem reservoirs shown in table UC-1 and a few additional reservoirs operated by Reclamation. For these reservoirs monthly reservoir evaporation was taken from Reclamation’s hydrologic data base. Records of monthly evaporation rates applied at these sites are based on past pan evaporation studies adjusted based on limited mass transfer method based measurements and maintained by Reclamation’s Upper Colorado Region water operations group.

Groundwater

Currently, all groundwater pumping is counted as consumptive use charged against the Colorado River Basin. Obviously, this is not necessarily true. Depending on the location and depth of the well and what types of soils are present in the area, it is possible that little or none of the water pumped would have contributed to the Colorado River System for hundreds or even thousands of years. If changes to this groundwater accounting structure are desired, a team consisting of personnel from various State Engineers Offices, Bureau of Reclamation, and any other pertinent agencies should be established. This team would establish guidelines for computing what amounts of ground water pumped should be charged against the Colorado River Basin on an area by area basis. The recommendations of this team could then be incorporated in future Consumptive Uses and Losses calculations. Until these guidelines are established, the

Consumptive Uses and Losses Reports will continue to report all groundwater pumping as depletion from the system.

Currently, the Arizona portion of the Upper Basin is the only part of the basin that reports (see the Arizona portion of the Upper Colorado River basin Consumptive Uses and Losses Reports) the portion of consumptive use served via groundwater pumpage.

Stockpond Evaporation and Livestock

Stockpond surface areas were estimated from the May 1975 Soil Conservation Service (SCS) publication, "Livestock Water Use." The subbasin stockpond areas were subdivided by county using the livestock population distribution. The livestock population distribution was further subdivided to State and basin by the irrigated lands average distribution. The same procedure used to calculate the unmeasured reservoir evaporation was used to estimate the stockpond evaporation.

Livestock population data was taken from annual state agriculture statistics and the 2002 and 2007 Census of Agriculture. Livestock population data included cattle, sheep, horses, and hogs. Consumption rates for the various livestock were derived from various reports, including the SCS publication, "Livestock Water Use," May 1975.

Stockpond and livestock data are adequate to prepare an estimate of this consumptive use. Considering the small amount of water use, any refuting effort would be best spent on the irrigation or evaporation categories.

Mineral Resources

The Upper Basin uses water in the production of numerous minerals in addition to energy-related materials such as oil and natural gas.

Estimates of the water consumptively used were based largely on phone surveys conducted by the U.S. Geological Survey and summarized in “Estimated Use of Water in the United States”. These data were reported at an 8-digit HUC level in 1995 and unofficially in 2000. Estimates for 2011-2015 reporting relied on the unofficially reported 2000 water use estimates.

Thermal Electric Power

The net use of water for the production of thermal electric energy from the tributaries of the Colorado River Basin was collected from records obtained from the various power companies in the Basin or estimates from historically reported records. These records have been becoming more difficult to collect and are primarily estimated based on historically reported records.

Municipal and Industrial

The basis for estimating municipal and industrial uses was the urban and rural population within the reporting areas. Preparation of annual population estimates was guided by the 2010 census and the growth rates between 2000 and 2010.

Historically, municipal and industrial consumptive uses were collected by the USGS and summarized in the “Estimated Use of Water in the United States” reporting series (published every 5 years) at an 8-digit HUC watershed scale. These reports have not included consumptive use estimates at this scale since 1995. To estimate 2011-2015 municipal and industrial consumptive use a per capita use rate was derived from data summarized in “Estimated Use of Water in the United States in 1995", USGS Circular 1200, where estimates were last published at the 8-digit HUC watershed scale. The data used included a combination of water supply withdrawal and consumptive use estimates from the domestic, commercial, industrial, and public use categories along with population data. The estimates for 2011-2015 reporting period were computed based on the 1995 per capita use estimates coupled with the 2011-2015 reporting period urban and rural population.

The population of the Upper Colorado River Basin, estimated at nearly 929 thousand in 2010, has increased to just over 1 million in 2015 (table UC-8). Twenty percent of the Upper Basin population was classified as rural with a significantly smaller per capita use of water. Both the urban and rural areas have the mutual problem of providing an adequate current and future water supply for a growing population in a water-short area. As a result of almost continuous studies concerning these problems, adequate production and effluent records are usually available to adequately assess water use.

Transbasin Diversions

Nearly all the transbasin diversions both out of and into the Colorado River System were measured and reported by the Geological Survey, state agencies or local water commissioners and users. The remainder was estimated on the basis of past records and capacity of facilities. Due to the high degree of measurement, this area of basin consumptive use is considered to be quite accurately determined.

BENEFICIAL CONSUMPTIVE USES AND LOSSES

A summary table of the Upper Colorado River System total annual water uses, 2011 through 2015, by states is shown on page v. Water use within the selected reporting areas is discussed below.

Upper Colorado River Tributaries

Summaries of estimated annual consumptive uses and losses in the Upper Colorado River Basin for each of the reporting years, broken down by State, reporting area, and type of use are shown in tables UC-2 through UC-6. The subtotals and totals may not add appropriately because totals were computed before rounding all values to 100 acre-feet. Totals were computed before rounding to ensure values reported, including subtotals and totals, are representative of the values utilized for computation of natural flow in the Upper Colorado Basin.

Estimated main stem reservoir evaporation is shown in table UC-1. Technically, these are not all main stem reservoirs but are reservoirs that participate in the Colorado River Storage Project (CRSP). The Upper Colorado River Commission designates which reservoirs in the CRSP have evaporation losses charged to the State and which have losses charged to the basin as a whole. Reservoirs listed in table UC-1 are those to be charged to the basin as a whole. These reservoir evaporation losses amount to about 12 percent of all Upper Basin losses.

Upper Basin consumptive use averaged 4.2 million acre-feet per year for the reporting period 2011 - 2015. Agricultural uses accounted for about 60 percent of the total Upper Basin consumptive uses and losses (including Main Stem Reservoir Evaporation). Variation in consumptive use during the reporting period was largely due to year-to-year changes in climatic conditions and irrigated acreages.

Transbasin exports, the second largest Upper Basin use, on the average accounted for 16 percent of Upper Basin total use, showed year by year variation during the reporting period. Water uses for thermal electric power generation averaged 161,300 acre-feet per year, which represents about 4 percent of consumptive use in the Upper Basin.

Table UC-1
Upper Colorado River Basin
Estimated Main Stem Reservoir Evaporation[1]
2011-2015

(1,000 acre-feet)

	Evaporation					
Reservoir	2011	2012	2013	2014	2015	Average
Flaming Gorge	81.4	76.6	72.6	78.3	81.8	77.2
Blue Mesa	8.5	7.2	6.5	8.1	8.9	7.6
Morrow Point	0.8	0.8	0.8	0.8	0.8	0.8
Lake Powell	479.2	432.8	343.9	355.4	369.3	402.8
TOTAL	569.9	517.5	423.8	442.6	460.8	488.5

[1] Undistributed by States. Evaporation determined using average historical evaporation rates.

Table UC-2
Upper Colorado River Basin
Estimated Water Use within States, by Major Tributaries and Types of Use
2011 - Provisional data (subject to change)

(1,000 acre-feet)

			Agriculture			Municipal and Industrial				Export		
State	Tributary	Reservoir Evaporation[1]	Irrigation	Stockpond Evaporation & Livestock	Subtotal	Mineral Resources	Thermal Electric Power	Other[2]	Subtotal	Outside System	Within System	TOTAL
Arizona	San Juan - Colorado Rivers	3.6	1.0	1.5	2.6	0.0	24.2	4.5	28.8	0.0	0.0	34.9
Colorado	Green River	7.2	198.0	2.7	200.7	0.2	18.0	3.6	21.8	0.0	5.4	235.1
	Upper Main Stem	70.3	889.5	6.1	895.5	3.1	1.6	34.7	39.5	640.0	283.3	1,928.6
	San Juan - Colorado Rivers	11.5	367.4	5.3	372.7	0.2	0.0	6.6	6.8	1.5	(288.6)	103.9
	TOTAL	89.0	1,454.9	14.1	1,469.0	3.5	19.6	45.0	68.1	641.5	0.0	2,267.6
New Mexico	San Juan - Colorado Rivers	29.0	208.4	4.3	212.7	0.9	46.5	13.4	60.8	98.3	0.0	400.9
Utah	Green River	71.6	472.5	4.5	476.9	0.6	34.9	13.4	48.9	92.1	0.0	689.5
	Upper Main Stem	1.5	18.9	0.2	19.0	0.4	0.0	1.7	2.1	0.0	0.0	22.6
	San Juan - Colorado Rivers	6.6	90.6	3.8	94.4	2.4	0.0	3.9	6.3	(4.7)	0.0	102.7
	TOTAL	79.7	581.9	8.5	590.4	3.4	34.9	19.0	57.3	87.5	0.0	814.8
Wyoming	Green River	35.5	305.6	4.8	310.4	0.7	38.0	6.4	45.1	7.2	0.0	398.3
Upper Basin	Green River	114.3	976.1	12.0	988.1	1.6	90.9	23.4	115.8	99.3	5.4	1,322.9
	Upper Main Stem	71.8	908.3	6.3	914.6	3.5	1.6	36.5	41.6	640.0	283.3	1,951.2
	San Juan - Colorado Rivers	50.7	667.4	15.0	682.4	3.5	70.8	28.5	102.7	95.1	(288.6)	642.3
	TOTAL	236.8	2,551.9	33.2	2,585.1	8.6	163.3	88.3	260.1	834.4	0.0	3,916.4

[1] Excludes reservoir evaporation from Colorado River main stem reservoirs listed in Table UC-1.

[2] Includes rural, urban, and other industrial uses.

Table UC-3
Upper Colorado River Basin
Estimated Water Use within States, by Major Tributaries and Types of Use
2012 - Provisional data (subject to change)

(1,000 acre-feet)

			Agriculture			Municipal and Industrial				Export		
State	Tributary	Reservoir Evaporation[1]	Irrigation	Stockpond Evaporation & Livestock	Subtotal	Mineral Resources	Thermal Electric Power	Other[2]	Subtotal	Outside System	Within System	TOTAL
Arizona	San Juan - Colorado Rivers	3.9	0.6	0.9	1.5	0.0	24.0	4.1	28.1	0.0	0.0	33.6
Colorado	Green River	8.4	276.4	3.1	279.6	0.2	17.9	3.7	21.7	0.0	2.0	311.6
	Upper Main Stem	71.6	1,116.3	6.3	1,122.6	3.1	1.6	35.5	40.2	555.5	287.3	2,077.2
	San Juan - Colorado Rivers	11.2	506.9	5.8	512.7	0.2	0.0	6.7	6.9	1.2	(289.2)	242.7
	TOTAL	91.2	1,899.7	15.2	1,914.9	3.5	19.5	45.9	68.8	556.6	0.0	2,631.6
New Mexico	San Juan - Colorado Rivers	26.0	208.4	4.3	212.7	0.9	46.5	13.4	60.8	47.2	0.0	346.8
Utah	Green River	71.4	549.2	4.5	553.6	0.6	34.4	13.6	48.6	119.5	0.0	793.2
	Upper Main Stem	1.5	19.1	0.2	19.3	0.4	0.0	1.7	2.1	0.0	0.0	22.8
	San Juan - Colorado Rivers	6.6	93.7	3.8	97.5	2.4	0.0	3.9	6.3	(5.1)	0.0	105.3
	TOTAL	79.5	661.9	8.5	670.4	3.4	34.4	19.3	57.1	114.4	0.0	921.3
Wyoming	Green River	37.4	277.5	4.8	282.3	0.7	37.7	6.5	45.0	7.6	0.0	372.3
Upper Basin	Green River	117.2	1,103.1	12.3	1,115.4	1.6	90.0	23.8	115.4	127.1	2.0	1,477.1
	Upper Main Stem	73.1	1,135.4	6.5	1,141.9	3.5	1.6	37.2	42.4	555.5	287.3	2,100.1
	San Juan - Colorado Rivers	47.8	809.6	14.9	824.4	3.5	70.5	28.2	102.1	43.3	(289.2)	728.4
	TOTAL	238.1	3,048.1	33.7	3,081.8	8.6	162.1	89.2	259.8	725.9	0.0	4,305.6

[1] Excludes reservoir evaporation from Colorado River main stem reservoirs listed in Table UC-1.

[2] Includes rural, urban, and other industrial uses.

Table UC-4
Upper Colorado River Basin
Estimated Water Use within States, by Major Tributaries and Types of Use
2013 - Provisional data (subject to change)

(1,000 acre-feet)

			Agriculture			Municipal and Industrial				Export		
State	Tributary	Reservoir Evaporation[1]	Irrigation	Stockpond Evaporation & Livestock	Subtotal	Mineral Resources	Thermal Electric Power	Other[2]	Subtotal	Outside System	Within System	TOTAL
Arizona	San Juan - Colorado Rivers	3.6	1.1	1.3	2.4	0.0	25.0	4.1	29.1	0.0	0.0	35.0
Colorado	Green River	8.4	181.4	3.1	184.5	0.2	17.9	3.7	21.8	0.0	2.4	217.0
	Upper Main Stem	63.2	802.3	6.3	808.6	3.1	1.6	36.2	41.0	455.6	164.4	1,532.7
	San Juan - Colorado Rivers	9.9	344.3	5.2	349.5	0.2	0.0	6.8	7.0	2.2	(166.7)	201.8
	TOTAL	81.5	1,328.0	14.6	1,342.6	3.5	19.5	46.7	69.7	457.8	0.0	1,951.5
New Mexico	San Juan - Colorado Rivers	21.4	208.4	4.3	212.7	0.9	46.5	13.4	60.8	45.8	0.0	340.7
Utah	Green River	67.4	570.4	4.5	574.9	0.6	34.4	13.8	48.9	140.8	0.0	832.0
	Upper Main Stem	1.5	21.4	0.2	21.6	0.4	0.0	1.8	2.2	0.0	0.0	25.2
	San Juan - Colorado Rivers	6.6	93.7	3.8	97.5	2.4	0.0	4.0	6.3	(5.6)	0.0	104.8
	TOTAL	75.4	685.5	8.5	694.0	3.4	34.4	19.6	57.4	135.2	0.0	961.9
Wyoming	Green River	35.0	269.8	4.8	274.6	0.7	37.7	6.7	45.2	14.8	0.0	369.6
Upper Basin	Green River	110.7	1,021.6	12.4	1,034.0	1.6	90.0	24.2	115.8	155.7	2.4	1,418.5
	Upper Main Stem	64.7	823.7	6.5	830.2	3.5	1.6	37.9	43.1	455.6	164.4	1,557.9
	San Juan - Colorado Rivers	41.4	647.4	14.6	662.0	3.5	71.5	28.3	103.2	42.3	(166.7)	682.3
	TOTAL	216.9	2,492.7	33.5	2,526.2	8.6	163.1	90.4	262.1	653.5	0.0	3,658.7

[1] Excludes reservoir evaporation from Colorado River main stem reservoirs listed in Table UC-1.

[2] Includes rural, urban, and other industrial uses.

Table UC-5
Upper Colorado River Basin
Estimated Water Use within States, by Major Tributaries and Types of Use
2014 - Provisional data (subject to change)

(1,000 acre-feet)

			Agriculture			Municipal and Industrial				Export		
State	Tributary	Reservoir Evaporation[1]	Irrigation	Stockpond Evaporation & Livestock	Subtotal	Mineral Resources	Thermal Electric Power	Other[2]	Subtotal	Outside System	Within System	TOTAL
Arizona	San Juan - Colorado Rivers	3.6	1.0	1.2	2.1	0.0	25.8	4.1	29.9	0.0	0.0	35.6
Colorado	Green River	6.8	154.1	3.0	157.1	0.2	17.9	3.7	21.8	0.0	2.3	188.0
	Upper Main Stem	65.1	715.9	6.1	722.0	3.1	1.6	36.9	41.7	449.8	253.4	1,532.0
	San Juan - Colorado Rivers	11.7	433.2	5.2	438.3	0.2	0.0	6.9	7.1	2.9	(255.6)	204.5
	TOTAL	83.7	1,303.2	14.3	1,317.5	3.5	19.5	47.6	70.6	452.8	0.0	1,924.5
New Mexico	San Juan - Colorado Rivers	24.1	208.4	4.3	212.7	0.9	46.5	13.4	60.8	60.0	0.0	357.6
Utah	Green River	67.5	442.2	4.5	446.7	0.6	34.4	14.1	49.1	127.5	0.0	690.8
	Upper Main Stem	1.4	21.0	0.2	21.2	0.4	0.0	1.8	2.2	0.0	0.0	24.8
	San Juan - Colorado Rivers	6.6	74.2	3.8	78.0	2.4	0.0	4.0	6.3	(3.1)	0.0	87.8
	TOTAL	75.5	537.4	8.4	545.8	3.4	34.4	19.8	57.6	124.4	0.0	803.4
Wyoming	Green River	34.5	263.1	4.9	268.0	0.7	37.7	6.8	45.3	7.2	0.0	355.0
Upper Basin	Green River	108.8	859.4	12.4	871.8	1.6	90.0	24.6	116.2	134.7	2.3	1,233.8
	Upper Main Stem	66.6	736.9	6.3	743.3	3.5	1.6	38.7	43.8	449.8	253.4	1,556.9
	San Juan - Colorado Rivers	46.0	716.7	14.4	731.1	3.5	72.3	28.3	104.1	59.8	(255.6)	685.5
	TOTAL	221.4	2,313.0	33.1	2,346.2	8.6	164.0	91.7	264.2	644.4	0.0	3,476.2

[1] Excludes reservoir evaporation from Colorado River main stem reservoirs listed in Table UC-1.

[2] Includes rural, urban, and other industrial uses.

Table UC-6
Upper Colorado River Basin
Estimated Water Use within States, by Major Tributaries and Types of Use
2015 - Provisional data (subject to change)

(1,000 acre-feet)

			Agriculture			Municipal and Industrial				Export		
State	Tributary	Reservoir Evaporation[1]	Irrigation	Stockpond Evaporation & Livestock	Subtotal	Mineral Resources	Thermal Electric Power	Other[2]	Subtotal	Outside System	Within System	TOTAL
Arizona	San Juan - Colorado Rivers	2.9	1.2	1.3	2.5	0.0	19.1	4.5	23.5	0.0	0.0	28.9
Colorado	Green River	7.4	169.3	2.9	172.1	0.2	15.0	3.8	18.9	0.0	2.1	200.6
	Upper Main Stem	68.0	665.4	5.9	671.3	3.1	1.5	37.7	42.3	291.3	230.7	1,303.6
	San Juan - Colorado Rivers	9.9	345.9	4.5	350.4	0.2	0.0	7.0	7.2	4.8	(232.9)	139.4
	TOTAL	85.3	1,180.6	13.2	1,193.8	3.5	16.5	48.5	68.4	296.1	0.0	1,643.6
New Mexico	San Juan - Colorado Rivers	28.2	208.4	4.3	212.7	0.9	46.5	13.4	60.8	90.6	0.0	392.3
Utah	Green River	66.6	418.0	4.4	422.4	0.6	34.4	14.3	49.4	124.3	0.0	662.7
	Upper Main Stem	1.4	9.1	0.2	9.3	0.4	0.0	1.8	2.2	0.0	0.0	12.9
	San Juan - Colorado Rivers	6.4	69.3	3.3	72.6	2.4	0.0	4.0	6.4	(3.1)	0.0	82.3
	TOTAL	74.4	496.4	8.0	504.3	3.4	34.4	20.1	57.9	121.2	0.0	757.8
Wyoming	Green River	37.2	258.3	4.9	263.2	0.7	37.7	7.0	45.4	8.5	0.0	354.4
Upper Basin	Green River	111.2	845.6	12.2	857.8	1.6	87.1	25.1	113.7	132.9	2.1	1,217.6
	Upper Main Stem	69.4	674.5	6.1	680.6	3.5	1.5	39.4	44.5	291.3	230.7	1,316.5
	San Juan - Colorado Rivers	47.4	624.8	13.5	638.3	3.5	65.6	28.8	97.9	92.2	(232.9)	643.0
	TOTAL	228.0	2,144.9	31.8	2,176.6	8.6	154.2	93.3	256.2	516.4	0.0	3,177.2

[1] Excludes reservoir evaporation from Colorado River main stem reservoirs listed in Table UC-1.

[2] Includes rural, urban, and other industrial uses.

Table UC-7
Upper Colorado River Basin
Irrigated Acreage
2011 - 2015

(1,000 acres)

State	Tributary	Irrigated Acreage 2011	2012	2013	2014	2015
Arizona	San Juan - Colorado Rivers	0.7	0.7	0.7	0.7	0.7
Colorado	Green River	142.0	155.8	133.8	138.9	139.4
	Upper Main Stem	586.4	577.2	507.8	495.8	482.1
	San Juan - Colorado Rivers	164.2	156.4	133.0	137.7	137.3
	TOTAL	892.6	889.4	774.6	772.4	758.7
New Mexico	San Juan - Colorado Rivers	86.8	86.8	86.8	86.8	86.8
Utah	Green River	107.9	90.6	108.6	73.0	72.2
	Upper Main Stem	21.8	18.9	19.2	15.8	13.4
	San Juan - Colorado Rivers	195.0	178.5	200.5	157.5	157.6
	TOTAL	324.7	288.0	328.3	246.4	243.1
Wyoming	Green River	285.3	295.2	275.2	276.5	253.4
Upper Basin	Green River	535.2	541.7	517.6	488.4	465.0
	Upper Main Stem	608.2	596.1	527.0	511.6	495.4
	San Juan - Colorado Rivers	446.6	422.4	421.0	382.7	382.4
	TOTAL	1,590.0	1,560.1	1,465.6	1,382.7	1,342.8

Table UC-8
Upper Colorado River Basin
Population Estimates
2011 - 2015

(1,000's)

State	Tributary	Population 2011	2012	2013	2014	2015
Arizona	San Juan - Colorado Rivers	47.1	46.9	46.7	46.6	46.4
Colorado	Green River	43.9	44.5	45.0	45.6	46.2
	Upper Main Stem	427.5	436.5	445.5	454.5	463.5
	San Juan - Colorado Rivers	90.6	91.9	93.1	94.4	95.7
	TOTAL	562.0	572.8	583.7	594.5	605.4
New Mexico	San Juan - Colorado Rivers	149.8	151.6	153.4	155.2	157.0
Utah	Green River	86.2	87.7	89.2	90.8	92.3
	Upper Main Stem	9.6	9.7	9.8	9.8	9.9
	San Juan - Colorado Rivers	20.9	21.0	21.1	21.2	21.3
	TOTAL	116.7	118.4	120.1	121.8	123.5
Wyoming	Green River	69.3	70.8	72.3	73.7	75.2
Upper Basin	Green River	199.4	203.0	206.5	210.1	213.7
	Upper Main Stem	437.1	446.2	455.3	464.5	473.5
	San Juan - Colorado Rivers	308.4	311.4	314.3	317.4	320.4
	TOTAL	944.9	960.5	976.1	992.0	1,007.6

Table UC-9
Upper Colorado River Basin
Agricultural Water Shortage Estimates
2011 - 2015

(1,000's)

State	Tributary	Shortage 2011	2012	2013	2014	2015
Arizona[1]	San Juan - Colorado Rivers					
Colorado	Green River	5.9	15.7	5.7	2.9	4.3
	Upper Main Stem	7.6	9.0	5.0	5.0	5.7
	San Juan - Colorado Rivers	4.0	6.6	2.3	3.8	3.8
	TOTAL	17.5	31.2	13.0	11.7	13.8
New Mexico[1]	San Juan - Colorado Rivers					
Utah	Green River	79.0	121.8	85.1	49.6	63.6
	Upper Main Stem	6.1	8.7	3.9	0.8	2.3
	San Juan - Colorado Rivers	17.6	19.0	21.2	9.4	5.8
	TOTAL	102.8	149.6	110.2	59.8	71.7
Wyoming	Green River	34.8	86.9	67.5	30.9	43.1
Upper Basin	Green River	119.8	224.3	158.3	83.4	110.9
	Upper Main Stem	13.7	17.7	8.8	5.8	8.1
	San Juan - Colorado Rivers	21.6	25.6	23.5	13.3	9.6
	TOTAL	155.1	267.7	190.6	102.5	128.6

[1] Shortages not reported