

Supplementary Information

Table SI-1. Water budget accounting for Colorado River including all direct human uses as well as indirect losses to reservoir evaporation and evapotranspiration. All estimates based on 2000-2019 averages unless otherwise noted in Methods section. All units in acre-feet per year.

	UPPER BASIN		EXPORTS - UPPER BASIN		TOTAL UPPER BASIN		LOWER BASIN (w/o GILA)		EXPORTS - LOWER BASIN		TOTAL LOWER BASIN		GILA BASIN		MEXICO		MEXICO - EXPORTS		TOTAL MEXICO		TOTAL COLORADO RIVER	
	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total consumption
Municipal, Commercial & Industrial	257,146	5%	532,884	71%	790,030	13%	1,141,243	13%	984,204	78%	2,125,447	21%	423,618	24%			204,527	100%	204,527	13%	3,543,622	18%
Irrigated agriculture	2,631,816	50%	216,191	29%	2,848,007	48%	5,079,545	59%	279,328	22%	5,358,873	54%	588,214	34%	1,296,197	91%			1,296,197	80%	10,091,291	52%
Alfalfa	1,684,362	32%	110,257	15%	1,794,619	30%	2,590,568	30%	27,933	10%	2,618,501	26%	317,636	18%	306,680	24%			306,680	19%	5,037,436	26%
Other Hay	736,908	14%	19,457	3%	756,365	13%	406,364	5%	7,263	3%	413,627	4%	17,646	1%	12,962	1%			12,962	0.8%	1,200,599	6%
Almonds									28	0.01%	28	0%									28	0.00%
Barley			2,162	0.3%	2,162	0%							17,646	1%							19,808	0.1%
Corn	105,273	2%	60,533	8%	165,806	3%	10,159	0.1%	184	0.1%	10,343	0.1%	17,646	1%							193,795	1%
Cotton							203,182	2%	184	0.1%	203,366	2%	147,054	8%	207,392	16%			207,392	13%	557,812	3%
Dry Beans	26,318	1%	2,162	0.3%	28,480	0%					-		1,176	0.1%							29,656	0.2%
Grapes									1,844	0.7%	1,844	0%									1,844	0.0%
Oats	26,318	1%	649	0.1%	26,967	0%	10,159	0.1%	123	0.0%	10,282	0.1%	5,882	0.3%							43,131	0.2%
Oranges							45,716	0.5%	615	0.2%	46,331	0%	588	0.03%							46,919	0.2%
Pecans									3	0.00%			11,764	1%							11,764	0.1%
Potatoes							5,080	0.1%	56	0.02%	5,136	0.1%	588	0.03%							5,724	0.03%
Sorghum			649	0.1%	649				12	0.0%			5,882	0%	43,682	3%			43,682	3%	50,213	0.3%
Sugarbeets			8,648	1%	8,648		101,591	1%	2,458	1%	104,049	1%									112,697	1%
Sweet Corn							15,239	0.2%	307	0.1%	15,546	0%									15,546	0.1%
Wheat (durum, spring, winter)	52,636	1%	8,648	1%	61,284	1.0%	304,773	4%	3,687	1%	308,460	3%	47,057	3%	589,770	46%			589,770	36%	1,006,571	5%
Other							1,219,091	14%	18,436	7%	1,237,527	12%			18,665	1%			18,665	1%	1,256,192	6.5%
Reservoir Evaporation	923,950	18%			923,950	15%	1,000,950	12%			1,000,950	10%	125,000	7%							2,049,900	11%
Lake Powell	619,500	12%			619,500	10%															619,500	3%
Lake Mead							590,750	7%			590,750	6%									590,750	3%
Riparian & Wetland ET	1,424,682	27%			1,424,682	24%	1,420,968	16%			1,420,968	14%	601,973	35%	121,206	9%			121,206	7%	3,568,829	19%
GRAND TOTALS	5,237,594		749,075		5,986,669		8,642,706		1,263,532		9,906,238		1,738,805		1,417,403		204,527		1,621,930		19,253,642	
PERCENTAGE	27%		4%		31%		45%		7%		51%		9%		7%		1%		8%		100%	

Table SI-2. Water budget accounting for Colorado River including only direct human uses for municipal, commercial, industrial, and agricultural uses. All estimates based on 2000-2019 averages unless otherwise noted in Methods section. All units in acre-feet per year.

	UPPER BASIN		EXPORTS - UPPER BASIN		TOTAL UPPER BASIN		LOWER BASIN (w/o GILA)		EXPORTS - LOWER BASIN		TOTAL LOWER BASIN		GILA BASIN		MEXICO		MEXICO - EXPORTS		TOTAL MEXICO		TOTAL COLORADO RIVER	
	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of total unit	Water consumed	% of direct human consumption
Municipal, Commercial & Industrial	257,146	9%	532,884	71%	790,030	22%	1,141,243	18%	984,204	78%	2,125,447	28%	423,618	42%		0%	204,527	100%	204,527	14%	3,543,622	26%
Irrigated agriculture	2,631,816	91%	216,191	29%	2,848,007	78%	5,079,545	82%	279,328	22%	5,358,873	72%	588,214	58%	1,296,197	100%			1,296,197	86%	10,091,291	74%
Alfalfa	1,684,362	58%	110,257	15%	1,794,619	49%	2,590,568	42%	27,933	10%	2,618,501	35%	317,636	54%	306,680	24%			306,680	20%	5,037,436	37%
Other Hay	736,908	26%	19,457	3%	756,365	21%	406,364	7%	7,263	3%	413,627	6%	17,646	3%	12,962	1%			12,962	1%	1,200,599	9%
Almonds									28	0.01%	28	0%									28	0.0%
Barley			2,162	0.3%	2,162	0%							17,646	3%							19,808	0.1%
Corn	105,273	4%	60,533	8%	165,806	5%	10,159	0.2%	184	0.1%	10,343	0%	17,646	3%							193,795	1%
Cotton							203,182	3%	184	0.1%	203,366	3%	147,054	25%	207,392	16%			207,392	14%	557,812	4%
Dry Beans	26,318	1%	2,162	0.3%	28,480	1%							1,176	0.2%							29,656	0.2%
Grapes									1,844	0.7%	1,844	0%									1,844	0%
Oats	26,318	1%	649	0.1%	26,967	1%	10,159	0.2%	123	0.0%	10,282	0%	5,882	1%							43,131	0.3%
Oranges							45,716	0.7%	615	0.2%	46,331	1%	588	0.1%							46,919	0.3%
Pecans									3	0.00%			11,764	2%							11,764	0.1%
Potatoes							5,080	0.1%	56	0.02%	5,136	0%	588	0.1%							5,724	0.04%
Sorghum			649	0.1%					12	0.0%			5,882	1%	43,682	3%			43,682	3%	49,564	0.4%
Sugarbeets			8,648	1%			101,591	2%	2,458	1%	104,049	1%									104,049	1%
Sweet Corn							15,239	0.2%	307	0.1%	15,546	0%									15,546	0.1%
Wheat (durum, spring, winter)	52,636	2%	8,648	1%	61,284	2%	304,773	5%	3,687	1%	308,460	4%	47,057	8%	589,770	46%			589,770	39%	1,006,571	7%
Other crops & unaccounted							1,219,091	20%	18,436	7%	1,237,527	17%			18,665	1%			18,665	1%	1,256,192	9%
GRAND TOTALS	2,888,962		749,075		3,638,037		6,220,788		1,263,532		7,484,320		1,011,832		1,296,197		204,527		1,500,724		13,634,913	
PERCENTAGE	21%		5%		27%		46%		9%		55%		7%		10%		2%		11%		100%	

Table SI-3. Contribution of study crops to irrigation and water consumption. The model used to estimate crop water consumption is specified as the simple crop model (SCM) or AquaCrop-OS. The last two columns show each crop's percentage of the total national irrigated area and water consumption. National totals for irrigated area and crop water consumption come from USDA¹ and Marston et al.², respectively.

Crop	Model used	% of US irrigated area	% of irrigation consumption
Alfalfa	SCM	18.833	30.172
Other Hay	SCM		
Almonds	SCM	1.599	2.387
Apples	SCM	0.396	0.486
Barley	AquaCrop-OS	1.591	1.304
Canola	SCM	0.051	0.047
Corn	AquaCrop-OS	28.533	20.304
Cotton	AquaCrop-OS	7.522	7.804
Dry beans	SCM	1.127	0.521
Grapes	SCM	0.000	1.791
Lentil	SCM	0.002	0.002

Millet	SCM	0.012	0.012
Oat	SCM	0.113	0.096
Orange	SCM	1.004	0.514
Peanut	SCM	1.013	0.424
Peas	SCM	0.048	0.025
Pecan	SCM	0.382	0.699
Potato	AquaCrop-OS	1.769	1.707
Rice	AquaCrop-OS	5.373	7.051
Sorghum	AquaCrop-OS	1.574	0.976
Soybean	AquaCrop-OS	14.313	9.809
Sugarbeet	AquaCrop-OS	0.801	0.912
Sugarcane	SCM	0.367	0.478
Sunflower	AquaCrop-OS	0.173	0.254
Sweet Corn	SCM	0.000	0.463
Tomato	AquaCrop-OS	0.717	0.769
Walnut	SCM	0.396	1.133

Durum Wheat Spring Wheat Winter Wheat	AquaCrop-OS	6.494	5.201
Total		94.204	95.340

Supplementary References

¹ USDA, National Agricultural Statistics Service. “Quick Stats.” <http://quickstats.nass.usda.gov>

² Marston L.T., Lamsal, G., Ancona, Z.H., Caldwell, P., Richter, B.D., Ruddell, B.L., Rushforth, R.R. & Davis, K.F. Reducing water scarcity by improving water productivity in the United States. *Environmental Research Letters* 15 (2020). <https://doi.org/10.1088/1748-9326/ab9d39>