

Lower Basin System Losses Assessment Approach

October 2022

Objectives

- Quantify system losses for selected Lower Basin reaches extending from Lee's Ferry to the NIB
- Compute assessments for Lower Basin States, individual water users, and MX using 3-yr average annual consumptive use data from Decree Accounting reports

Approach

- 1) Define system reaches from Lee's Ferry to NIB
- 2) Quantify total system loss and distribute losses to specified Assessment Reaches
- 3) Assemble Water User Groups
 - a. Identify water users in each reach
 - b. Compute 3-yr average annual consumptive use (CU) for each user
 - c. Compute 3-yr average annual CU for each State and MX for each reach
- 4) Quantify State Assessments by reach
 - a. "States" include Arizona, California, Nevada, and Mexico
 - b. Compute State Assessment percentages by summing 3-yr average annual CU for each State and dividing by the total CU (all States) for the reach
 - c. Compute State Assessment volumes by multiplying the system loss for each reach by the State Assessment percentages for each State

Approach (cont.)

- 5) For each reach, proportionally assign State Assessments to the individual water users of the corresponding State
 - a. Compute a water user assessment factor (f_{WU}) for each water user by dividing the water user's CU by the total State CU using 3-yr average annual values:

$$f_{WU} = \frac{CU_{3yr}}{\sum CU_{3yr}}$$

Where,

f_{WU} = Water user assessment factor

CU_{3yr} = Three-year average consumptive use for an individual water user, in afy

- b. Compute the water user assessment (A_{WU}) for each water user by multiplying the State Assessment by the water user assessment factor:

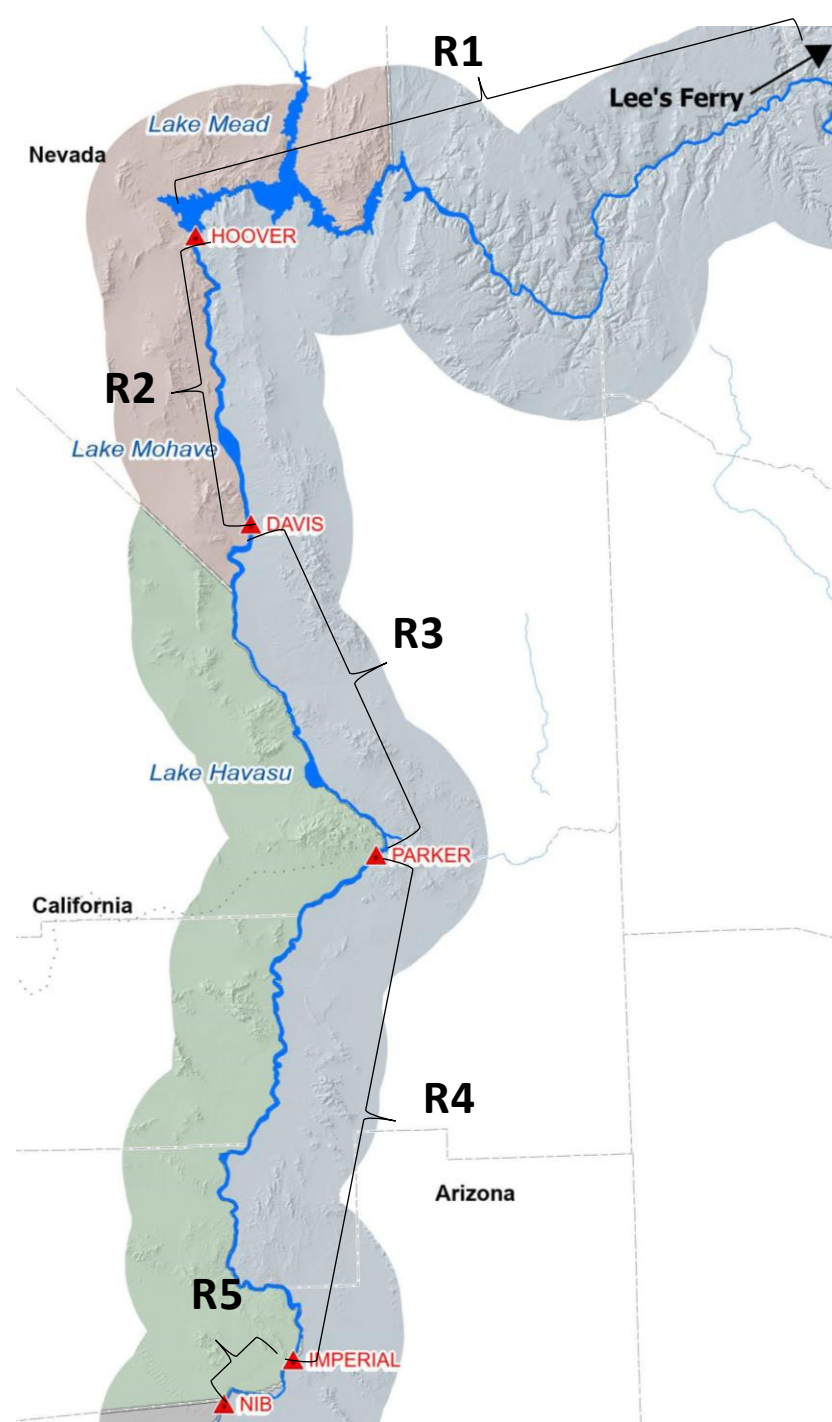
$$A_{WU} = SA_R \times f_{WU}$$

Where,

A_{WU} = Assessment assigned to an individual water user, in afy

SA_R = State Assessment for an individual reach, in afy

f_{WU} = Water user assessment factor



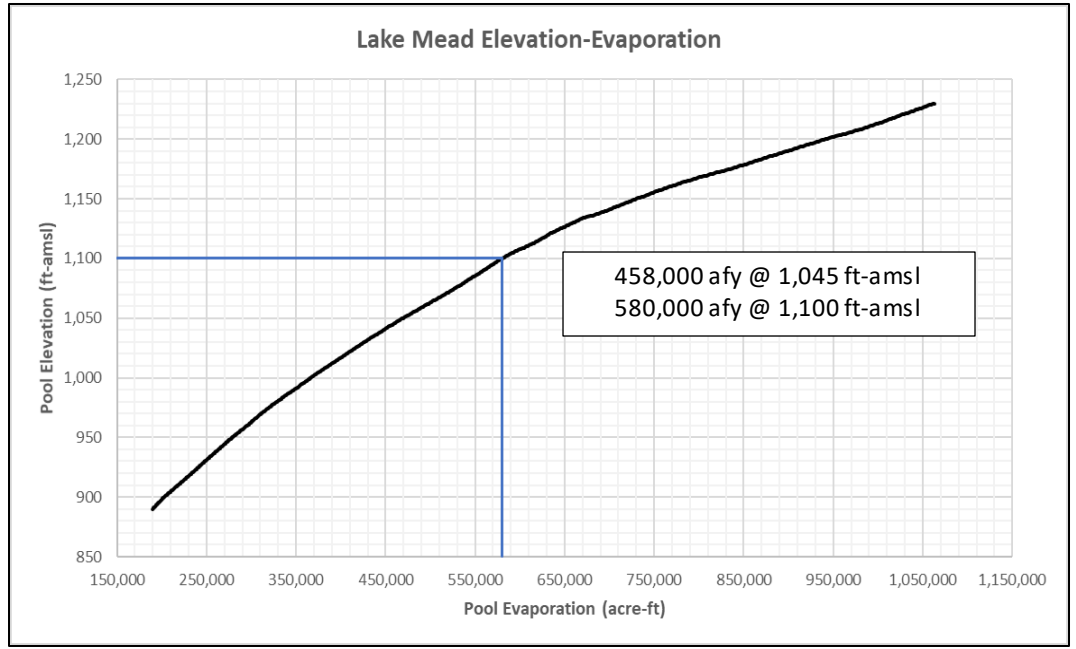
WUG1

WUG2

WUG3

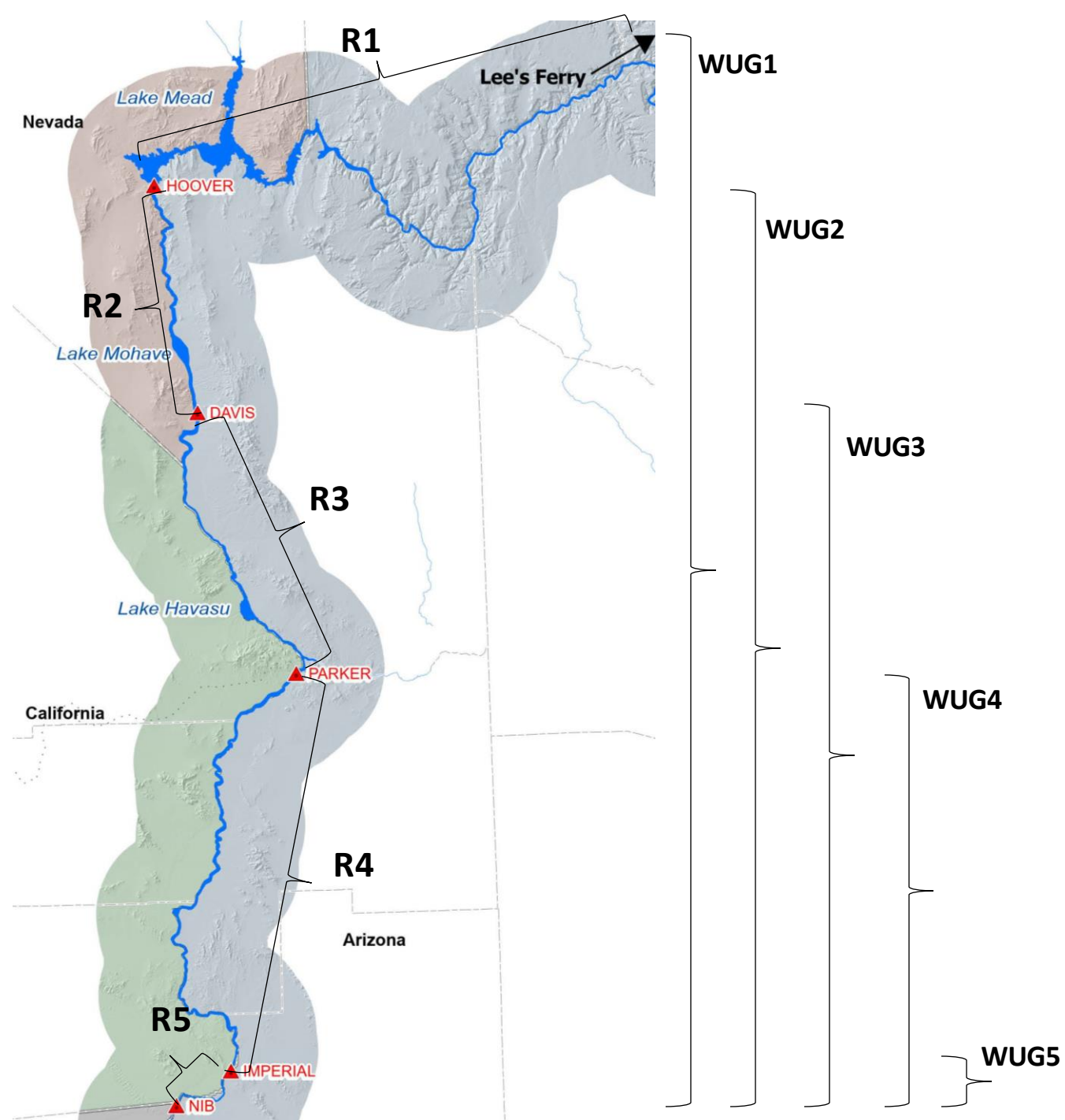
WUG4

WUG5



Lake Mohave				
Month	Target Elevation (ft-amsl)	Area (acres)	Evaporation Rate (ft/yr)	Evaporation (acre-ft)
Jan	641.8	27,015	0.36	9,725
Feb	643.0	27,330	0.36	9,839
Mar	643.0	27,330	0.48	13,118
Apr	643.0	27,330	0.61	16,671
May	645.0	27,750	0.81	22,478
Jun	642.0	27,120	0.93	25,222
Jul	635.0	25,855	0.93	24,045
Aug	633.0	25,505	0.84	21,424
Sep	630.0	24,980	0.68	16,986
Oct	630.5	25,068	0.56	14,038
Nov	634.0	25,680	0.40	10,272
Dec	638.7	26,468	0.35	9,264
TOTAL			7.31	193,000

Lake Havasu				
Month	Target Elevation (ft-amsl)	Area (acres)	Evaporation Rate (ft/yr)	Evaporation (acre-ft)
Jan	445.8	18,120	0.34	6,161
Feb	445.8	18,120	0.41	7,429
Mar	446.7	18,452	0.48	8,857
Apr	448.7	19,114	0.59	11,277
May	449.6	19,444	0.70	13,611
Jun	449.6	19,444	0.81	15,750
Jul	448.0	18,948	0.90	17,053
Aug	447.5	18,782	0.89	16,716
Sep	446.8	18,452	0.81	14,946
Oct	446.3	18,286	0.65	11,886
Nov	446.0	18,286	0.46	8,412
Dec	445.8	18,120	0.35	6,342
TOTAL			7.39	138,000

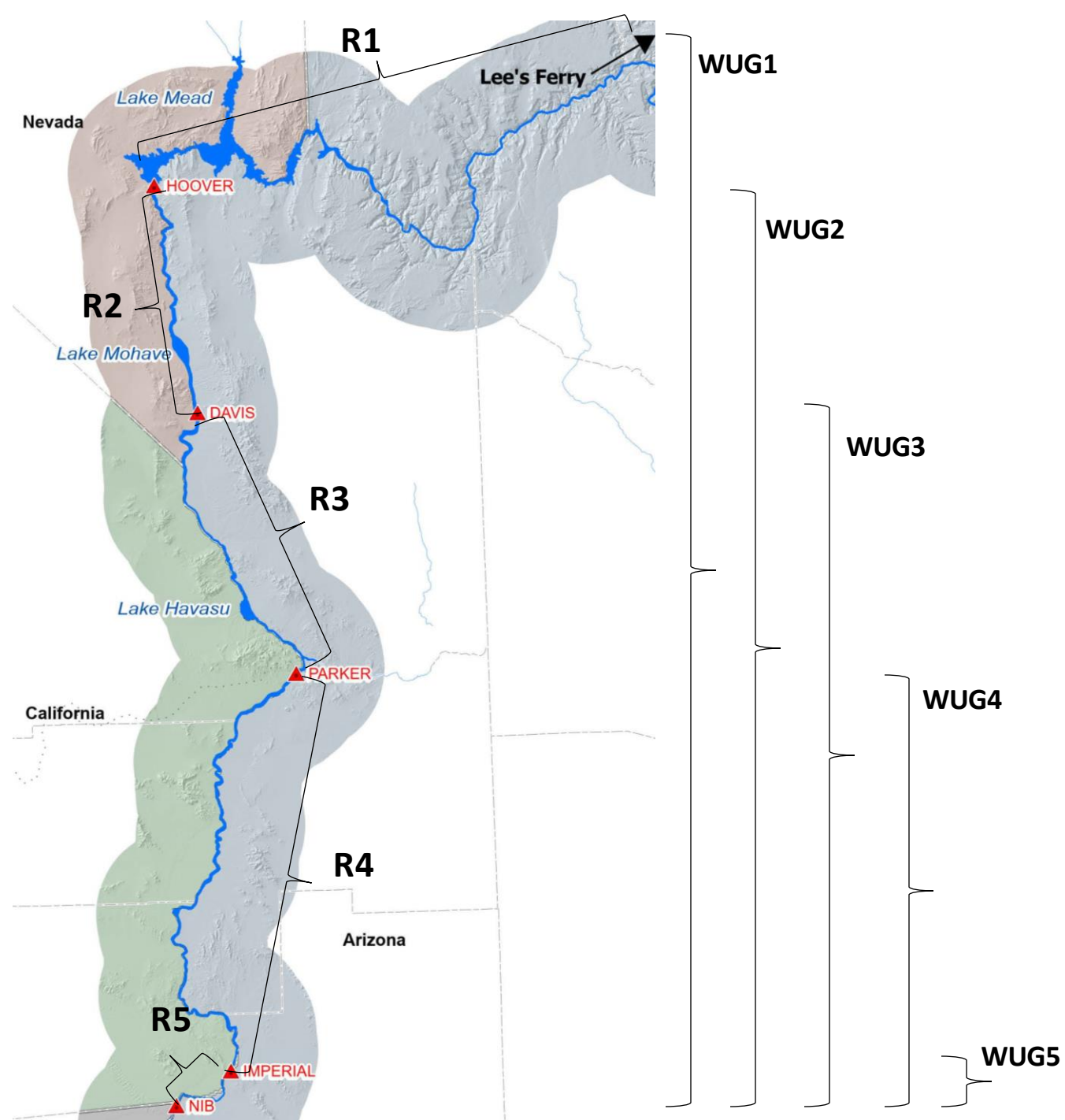


ASSESSMENT REACHES (from CRSS)

Reach	Start	End	System Loss (AFY)
R1 ^{\1}	Lee's Ferry	Hoover Dam	580,000
R2	Hoover Dam	Davis Dam	193,000
R3 ^{\2}	Davis Dam	Parker Dam	329,000
R4	Parker Dam	Imperial Dam	365,000
R5	Imperial Dam	NIB	76,000
TOTAL			1,543,000

^{\1} System Loss is estimated evaporation at elevation 1,100 ft-amsl

^{\2} Includes ET losses of 191,000 afy along riparian corridor from Davis Dam to Parker Dam



WATER USER GROUPS AND STATE / MX ASSESSMENTS

Water User Group	Shared System Loss (afy)	State	No. of Water Users	3-yr Avg. Annual CU (af) ¹	State Assessments	
					%	afy
WUG1	R1 580,000	AZ	67	2,462,740	30.1%	174,367
		CA	24	4,101,775	50.1%	290,414
		NV	10	243,911	3.0%	17,269
		MX	1	1,383,443	16.9%	97,950
		Total	102	8,191,868	100%	580,000
WUG2	R2 193,000	AZ	65	2,462,665	31.0%	59,766
		CA	24	4,101,775	51.6%	99,545
		NV	3	4,693	0.1%	114
		MX	1	1,383,443	17.4%	33,575
		Total	93	7,952,575	100%	193,000
WUG3	R3 329,000	AZ	62	2,462,439	31.0%	101,877
		CA	24	4,101,775	51.6%	169,700
		NV	2	4,518	0.1%	187
		MX	1	1,383,443	17.4%	57,236
		Total	89	7,952,174	100%	329,000
WUG4	R4 365,000	AZ	49	996,522	17.6%	64,216
		CA	12	3,284,219	58.0%	211,635
		NV	-	-	0.0%	-
		MX	1	1,383,443	24.4%	89,149
		Total	62	5,664,183	100%	365,000
WUG5	R5 76,000	AZ	24	480,704	25.2%	19,156
		CA	5	43,014	2.3%	1,714
		NV	-	-	0.0%	-
		MX	1	1,383,443	72.5%	55,130
		Total	30	1,907,161	100%	76,000
TOTAL	1,543,000					1,543,000

¹ 3-yr average CU for 2019-2021 calculated from data reported in Decree Accounting reports

Example: LVVWD/SNWA - SNWP

- LVVWD / SNWA – SNWP diverts all water from reach R1
- NV State Assessment (SA_R) for R1 is 17,268 afy
- Total NV 3-yr average annual CU for R1 is 243,911 afy
- LVVWD/SNWA – SNWP 3-yr average annual CU is 219,119 afy
- LVVWD/SNWA – SNWP Water-user assessment factor, $f_{WU} = 219,119 / 243,911 = 0.8984$
- LVVWD/SNWA – SNWP *Annual Assessment*, $A_{WU} = SA_R \times f_{WU} = 17,268 \times 0.8984 = 15,513$ afy

Water User Group	Shared System Loss (afy)	State Assessments				Water-User Assessment			
		State	3-yr Avg. Annual State CU (af)	3-yr Avg. Annual Reach CU (af)	Annual Assessment (SA_R)	Water User	3-yr Avg. Annual CU (af)	Factor (f_{WU})	Annual Assessment (A_{WU})
WUG1	R1 580,000	NV	243,911	8,191,868	17,269	LVVWD/SNWA - SNWP	219,119	0.8984	15,514
								Total	15,514

Example: Central Arizona Water Conservation District

- Central Arizona Water Conservation District diverts all water from reach R3

Water User Group	Shared System Loss (afy)	State Assessments				Water-User Assessment			
		State	3-yr Avg. Annual State CU (af)	3-yr Avg. Annual Reach CU (af)	Annual Assessment (SA_R)	Water User	3-yr Avg. Annual CU (af)	Factor (f_{WU})	Annual Assessment (A_{WU})
WUG1	R1 580,000	AZ	2,462,740	8,191,868	174,367	Central Arizona Water Conservation District	1,395,999	0.5668	98,839
WUG2	R2 193,000	AZ	2,462,665	7,952,575	59,766		1,395,999	0.5669	33,879
WUG3	R3 329,000	AZ	2,462,439	7,952,174	101,877		1,395,999	0.5669	57,756
Total									190,474

Example: Yuma County Water Users' Association

➤ Yuma County Water Users' Association diverts all water from reach R5

Water User Group	Shared System Loss (afy)	State Assessments				Water-User Assessment				
		State	3-yr Avg. Annual State CU (af)	3-yr Avg. Annual Reach CU (af)	Annual Assessment (SA _R)	Water User	3-yr Avg. Annual CU (af)	Factor (f _{WU})	Annual Assessment (A _{WU})	
WUG1	R1 580,000	AZ	2,462,740	8,191,868	174,367	Yuma County Water Users' Association	237,009	0.0962	16,781	
WUG2	R2 193,000	AZ	2,462,665	7,952,575	59,766		237,009	0.0962	5,752	
WUG3	R3 329,000	AZ	2,462,439	7,952,174	101,877		237,009	0.0962	9,806	
WUG4	R4 365,000	AZ	996,522	5,664,183	64,216		237,009	0.2378	15,273	
WUG5	R5 76,000	AZ	480,704	1,907,161	19,156		237,009	0.4930	9,445	
								Total		57,056

Example: Metropolitan Water District of Southern California

➤ The Metropolitan Water District of Southern California diverts all water from reach R3

Water User Group	Shared System Loss (afy)	State Assessments				Water-User Assessment			
		State	3-yr Avg. Annual State CU (af)	3-yr Avg. Annual Reach CU (af)	Annual Assessment (SA_R)	Water User	3-yr Avg. Annual CU (af)	Factor (f_{WU})	Annual Assessment (A_{WU})
WUG1	R1 580,000	CA	4,101,775	8,191,868	290,414	The Metropolitan Water District of Southern California	809,596	0.1974	57,321
WUG2	R2 193,000	CA	4,101,775	7,952,575	99,545		809,596	0.1974	19,648
WUG3	R3 329,000	CA	4,101,775	7,952,174	169,700		809,596	0.1974	33,495
								Total	110,464

Example: Imperial Irrigation District

- Imperial Irrigation District diverts all water from reach R4

Water User Group	Shared System Loss (afy)	State Assessments				Water-User Assessment			
		State	3-yr Avg. Annual State CU (af)	3-yr Avg. Annual Reach CU (af)	Annual Assessment (SA_R)	Water User	3-yr Avg. Annual CU (af)	Factor (f_{WU})	Annual Assessment (A_{WU})
WUG1	R1 580,000	CA	4,101,775	8,191,868	290,414	Imperial Irrigation District	2,536,339	0.6184	179,578
WUG2	R2 193,000	CA	4,101,775	7,952,575	99,545		2,536,339	0.6184	61,554
WUG3	R3 329,000	CA	4,101,775	7,952,174	169,700		2,536,339	0.6184	104,934
WUG4	R4 365,000	CA	3,284,219	5,664,183	211,635		2,536,339	0.7723	163,442
								Total	509,508

Summary and Notes

➤ System losses: current versus pre-BCPA conditions

- Should assessments be reduced by system losses estimated for pre-BCPA conditions?

➤ MX 3-yr average annual CU values include excess flows

- Assessment is apparently larger than it would be otherwise

SUMMARY OF ASSESSMENTS BY STATE / MX

State	afy
AZ	419,381
CA	773,008
NV	17,570
MX	333,040
TOTAL	1,543,000

SUMMARY OF WATER USER ASSESSMENTS

Reach	State	Major Water Users	afy
1	NV	LVVWD/SNWA - SNWP	15,514
3	AZ	Central Arizona Water Conservation District	190,474
3	CA	The Metropolitan Water District of Southern California	110,464
4	AZ	AZ Colorado River Indian Reservation	45,378
4	AZ	Wellton-Mohawk I.D.D.	51,654
4	CA	Coachella Valley Water District	70,074
4	CA	Imperial Irrigation District	509,508
4	CA	Palo Verde Irrigation District	71,335
5	AZ	Yuma County Water Users' Association	57,056
5	AZ	Yuma Mesa I.D.D.	34,342
5	MX	Mexico	333,040
Subtotal			1,488,839
Reach	State	Remaining Water Users	afy
All	AZ	Other Users in AZ	40,478
All	CA	Other Users in CA	11,627
All	NV	Other Users in NV	2,056
Subtotal			54,161
TOTAL			1,543,000

¹ Major users considered to have losses greater than 10,000 afy