

BASINS IN NEW MEXICO

PERSPECTIVE VIEW THE MIDDLE RIO GRANDE





MIDDLE RIO GRANDE SURFACE WATER FEATURES



MIDDLE RIO GRANDE GROUNDWATER FEATURES



ACCOUNTING CATEGORIES FOR EACH WATER BALANCE AREA





	at Otowi(+)	
River depletion		
by wells ()	tion	
Managed	e (+)	
	Inflow Inflow at Otowi Tributary yield Well production from storage ¹ Releases from reservoir storage	AFY 1,088,000 290,000 27,000 130,000
evapotranspiration ()	$\Sigma = $ Inflow to basin yield	1,535,000
Fill reservoir storage (?)	<i>Outflow</i> River depletion by wells Managed consumptive use and lake evaporation Unmanaged evapotranspiration Filling reservoir storage	AFY -35,000 -379,000 -254,000 -149,000
	Outflow below Elephant Butte $\Sigma = $ Outflow from basin yield	-718,000
	Aquifer storage to a depth of 100 feet below the wa 47.7 million AF.	ater table equals
Reservoir releases (+)	¹ Well production from storage is averaged over 80 years in period of major use	nstead of 50 year
Outflow below Elephant Butte	≥()	

MRG yield is variable around a median of 1,500,000 AFY. The driest one in five years produces about 1,260,000 AF and the wettest one in five years produces about 1,800,000 AF.

The MRG is sustained, on average, by about 817,000 AFY, largely from the 447,000 AFY of water it generates as in-basin tributary inflow and by imported San Juan Chama Project water supplementing Otowi inflow of 336,000 AFY. Well-field production in the MRG, about 5.1 million AF as a historical volume through year 2000, is derived partially from aquifer storage which increases the basin yield. Well yield from storage is calculated in the New Mexico Office of the State Engineer (OSE) Administrative Model as about 2.3 million AF (45 percent of production) cumulatively and 57,000 AFY (37 percent of production) in year 1999. Well-field depletion of surface water from the OSE model is 2.8 million AF (55 percent of production) cumulatively and is 97,000 AF (63 percent of production) in year 1999. LANDSAT imagery of healthy vegetation below the mountain front in the MRG is 193,000 acres. About 480,000 AFY is lost at a CU rate of 2.5 feet/year.

The aquifer area, the 100-feet drawdown allowance and a storage coefficient of ten percent for basin fill and two percent for consolidated sedimentary rock, excluding crystalline bedrock, implies 47.7 million AF stored in the aquifer space of the MRG.

Table 5.3

Mean Annual Water Budget Summary by Reach

			REACH		
Mean Annual Values in	1	2	3	4	Total
acre-feet/year	Otowi to San Felipe	San Felipe to Bernardo	Bernardo to San Acacia	San Acacia to Elephant Butte	Otowi to Elephant Butte
Mainstem Inflow	964	1033	869	892	964
San Juan-Chama Water	76	0	0	0	76
Tributary Inflow	14	61	38	20	133
Adj. Base Groundwater Inflow ¹	18	64	10	17	109
TOTAL INFLOW	1073	1158	918	928	1282
Cron Depletions	10	180	1	57	248
Riparian Depletions	21	107	27	88	243
(Effective Precipitation) ²	-3	-24	-3	-9	-39
Reservoir Evaporation	8	0	0	123	131
Groundwater Depletion	3	94	0	3	100
(Wastewater Returns)	0	-68	0	-1	-69
TOTAL DEPLETIONS	39	289	26	259	613
REACH OUTFLOW	1033	869	891	669	669
SCHEDULED DELIVERY ³	650	650	650	650	650
MEAN AVAILABLE SUPPLY ⁴	383	219	241	19	19

¹ Adjusted Base groundwater inflow represents groundwater inflow under base conditions of no pumping, no irrigation recharge and no evapotranspiration. Reductions to this base inflow are independently derived and subtracted from water budget as depletions.

² Effective precipitation is estimated as a reduction to crop and riparian consumptive use for reaches from Cochiti to San Marcial. (Effective precipitation is included directly in consumptive use term below San Marcial.)

³ Scheduled delivery is the mean value of risk model output from 10,000 simulations of Otowi Index Flow according to climate-based probability distribution function.

⁴ Mean Available Supply is the supply at reach endpoints after subtracting the scheduled delivery.

Adapted From The Middle Rio Grande Water Supply Study



Adapted From The Middle Rio Grande Water Supply Study



Values are annual average (rounded). Natural variability is large for most. Some but not all variabilities are shown.

Line widths are drawn in relative scale of magnitude Action Committee of the Middle Rio Grande Water Assembly 10/7/99 Version

MIDDLE RIO GRANDE WATER BUDGET

Annual Surface-Water & Groundwater Averages (rounded) for 1972-1997

Annual Surface-Water InflowAnnual (Native Water)Annual Variability (1000 ac-ft)Rio Grande native water at Otowi Gage ("Otowi Index")1,100297-2,170San Juan-Chama Project imported water reaching Otowi Gage552-150Tributary inflow (the rios Santa Fe, Galisteo, Jemez, Tijeras, Puerco, Salado)955Ungaged tributariesunknown5Storm-drain inflow from Albuquerque55Municipal Wastewater inflow (pumped from groundwater)70Discharge from shallow aquifer to surface systemOtowi to San Acacia220Trigated agriculture and valley-floor turfOtowi to San Acacia295Open-water evaporation (incl.from farm fields)Otowi to San Acacia100±30Riparian ET, irrig, agric. & open-water evap.Combined below San Acacia100±30Elephant Butte evaporation14041-228300-1,435Groundwater Recharge(+) & Discharge(-)1545300-1,435
Annual Surface-Water Inflow(Native Water)Variability(1000 ac-ft)(1000 ac-ft)(1000 ac-ft)(1000 ac-ft)Rio Grande native water at Otowi Gage ("Otowi Index")1,100297-2,170San Juan-Chama Project imported water reaching Otowi Gage552-150Tributary inflow (the rios Santa Fe, Galisteo, Jemez, Tijeras, Puerco, Salado)9595Ungaged tributariesunknown5Storm-drain inflow from Albuquerque50Storm-drain inflow from Albuquerque50Discharge from shallow aquifer to surface systemOtowi to San Acacia220Irigated agriculture and valley-floor turfOtowi to San Acacia1545Open-water evaporation (incl.from farm fields)Otowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia100±30Elephant Butte evaporation14041-228300-1,435Groundwater Recharge(+) & Discharge(-)1545300-1,435
(1000 ac-ft)(1000 ac-ft)Rio Grande native water at Otowi Gage ("Otowi Index")1,100San Juan-Chama Project imported water reaching Otowi Gage55Tributary inflow (the rios Santa Fe, Galisteo, Jemez, Tijeras, Puerco, Salado)95Ungaged tributariesunknownStorm-drain inflow from Albuquerque5Municipal Wastewater inflow (pumped from groundwater)70Discharge from shallow aquifer to surface systemOtowi to San Acacia15451545Annual Surface-Water Outflow295Recharge to shallow aquiferOtowi to San Acacia1545100Annigate agriculture and valley-floor turfOtowi to San AcaciaRiparian ET, irrig. agric. & open-water evap.Combined below San AcaciaElephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**8501545
Rio Grande native water at Otowi Gage ("Otowi Index")1,100297-2,170San Juan-Chama Project imported water reaching Otowi Gage552-150Tributary inflow (the rios Santa Fe, Galisteo, Jemez, Tijeras, Puerco, Salado)9595Ungaged tributariesunknownStorm-drain inflow from Albuquerque5Municipal Wastewater inflow (pumped from groundwater)70Discharge from shallow aquifer to surface systemOtowi to San Acacia220Intrigated agriculture and valley-floor turfOtowi to San Acacia295Open-water evaporation (incl.from farm fields)Otowi to San Acacia100Hiparian ET, irrig. agric. & open-water evap.Combined below San Acacia100Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)Image: Combined below San Acacia300-1,435
San Juan-Chama Project imported water reaching Otowi Gage552-150Tributary inflow (the rios Santa Fe, Galisteo, Jemez, Tijeras, Puerco, Salado)9595Ungaged tributariesunknownStorm-drain inflow from Albuquerque5Municipal Wastewater inflow (pumped from groundwater)70Discharge from shallow aquifer to surface systemOtowi to San Acacia2201545Annual Surface-Water OutflowRecharge to shallow aquiferOtowi to San Acacia295Open-water evaporation (incl.from farm fields)Otowi to San Acacia100±30Hrrigated agriculture and valley-floor turfRiparian ET, irrig. agric. & open-water evap.Combined below San AcaciaElephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users **850 1545Groundwater Recharge(+) & Discharge(-)
Tributary inflow (the rios Santa Fe, Galisteo, Jemez, Tijeras, Puerco, Salado) 95 Ungaged tributaries unknown Storm-drain inflow from Albuquerque 5 Municipal Wastewater inflow (pumped from groundwater) 70 Discharge from shallow aquifer to surface system Otowi to San Acacia 220 Isscharge to shallow aquifer Otowi to San Acacia 295 Open-water evaporation (incl.from farm fields) Otowi to San Acacia 60 ±30 Irrigated agriculture and valley-floor turf Otowi to San Acacia 100 ±30 Riparian ET, irrig. agric. & open-water evap. Combined below San Acacia 100 ±30 Elephant Butte evaporation 140 41-228 300-1,435 Surface-water outflow from Elephant Butte Dam to downstream users **850 300-1,435 Groundwater Recharge(+) & Discharge(-) 5 5
Ungaged tributariesunknownStorm-drain inflow from Albuquerque5Municipal Wastewater inflow (pumped from groundwater)70Discharge from shallow aquifer to surface systemOtowi to San Acacia220IS451545Annual Surface-Water Outflow8Recharge to shallow aquiferOtowi to San Acacia295Open-water evaporation (incl.from farm fields)Otowi to San Acacia60±30Irrigated agriculture and valley-floor turfOtowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia100±30Elephant Butte evaporation14041-228300-1,435Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)555
Storm-drain inflow from Albuquerque 5 Municipal Wastewater inflow (pumped from groundwater) 70 Discharge from shallow aquifer to surface system Otowi to San Acacia 220 Ists 1545 Annual Surface-Water Outflow 1545 Recharge to shallow aquifer Otowi to San Acacia 295 Open-water evaporation (incl.from farm fields) Otowi to San Acacia 60 ±30 Irrigated agriculture and valley-floor turf Otowi to San Acacia 100 ±30 Riparian ET, irrig. agric. & open-water evap. Combined below San Acacia 100 \$41-228 Surface-water outflow from Elephant Butte Dam to downstream users **850 300-1,435 300-1,435 Groundwater Recharge(+) & Discharge(-) 5 5 5
Municipal Wastewater inflow (pumped from groundwater)70Discharge from shallow aquifer to surface systemOtowi to San Acacia22015451545Annual Surface-Water Outflow Recharge to shallow aquiferOtowi to San Acacia295Open-water evaporation (incl.from farm fields)Otowi to San Acacia60±30Irrigated agriculture and valley-floor turfOtowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia100\$80-180Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)555
Discharge from shallow aquifer to surface systemOtowi to San Acacia220 1545Annual Surface-Water Outflow Recharge to shallow aquiferOtowi to San Acacia295Open-water evaporation (incl.from farm fields)Otowi to San Acacia60±30Irrigated agriculture and valley-floor turfOtowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia100\$80-180Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)5000000000000000000000000000000000000
Annual Surface-Water Outflow1545Recharge to shallow aquiferOtowi to San Acacia295Open-water evaporation (incl.from farm fields)Otowi to San Acacia60±30Irrigated agriculture and valley-floor turfOtowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia10080-180Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)5050
Annual Surface-Water OutflowOtowi to San Acacia295Recharge to shallow aquiferOtowi to San Acacia60±30Open-water evaporation (incl.from farm fields)Otowi to San Acacia60±30Irrigated agriculture and valley-floor turfOtowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia10080-180Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)Image: Construction of the state outflow from term sterm state
Recharge to shallow aquiferOtowi to San Acacia295Open-water evaporation (incl.from farm fields)Otowi to San Acacia60±30Irrigated agriculture and valley-floor turfOtowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia10080-180Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)140140
Open-water evaporation (incl.from farm fields)Otowi to San Acacia60±30Irrigated agriculture and valley-floor turfOtowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia10080-180Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)500500
Irrigated agriculture and valley-floor turfOtowi to San Acacia100±30Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia10080-180Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)15451545
Riparian ET, irrig. agric. & open-water evap.Combined below San Acacia10080-180Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435Groundwater Recharge(+) & Discharge(-)15451545
Elephant Butte evaporation14041-228Surface-water outflow from Elephant Butte Dam to downstream users**850300-1,435I54515451545
Surface-water outflow from Elephant Butte Dam to downstream users
Groundwater Recharge(+) & Discharge(-)
Groundwater Recharge(+) & Discharge(-)
SHALLOW AOUIFER (underlying Rio Grande flood plain)
Recharge (from surface wtr & percolation from irrig) Otowi to San Acacia +295
Septic-tank return flow (from pumping) Otowi to San Acacia + 10
Inflow from deep aquifer Otowi to San Acacia + 50
Riparian evapotranspiration (all non-crop ET) Otowi to San Acacia -135
Discharge to surface-system drainage ditches Otowi to San Acacia -220
DEEP AOUIFER
Deep groundwater inflow (from north & west) + 40
Mountain-front & tributary recharge Otowi to San Acacia +110
Groundwater pumped (all wells) Otowi to San Acacia - 170
Consumed (that is evaporated) 90
Municipal wastewater to river 70
Septic-tank return flow to shallow aquifer 10
Outflow to shallow aquifer - 50
Groundwater mined from aquifer Otowi to San Acacia -70

Table footnote:

** Calculated outflow (rounded) based on the data in this table. The average of wet-water actual flow past the dam is 729,000 ac-ft. The average of "scheduled deliveries" mandated by the Rio Grande Compact for the 1972-97 Otowi Index supply is 786,000 ac-ft. The average of the Elephant Butte Effective Supply (actual deliveries plus changes in Elephant Butte lake storage) is 799,000 ac-ft. (See Summary, Note 8.)

Action Committee of the Middle Rio Grande Water Assembly