

# APPENDIX D. CHANGES IN WATER USE BY WOODY RIPARIAN VEGETATION

**Table D-1. Estimated water use by riparian vegetation type and density,  
Upper Verde Valley Riparian Area Historical Analysis, 1940-1995.**

MESQUITE								COTTONWOOD/WILLOW								TOTAL
Low Density		Medium Density		High Density		Total	Low Density	Medium Density		High Density		Total				
area	water use	area	water use	area	water use	water use	area	water use	area	water use	area	water use	water use	water use		
(acres)	(acre-feet)	(acres)	(acre-feet)	(acres)	(acre-feet)	(acre-feet)	(acres)	(acre-feet)	(acres)	(acre-feet)	(acres)	(acre-feet)	(acre-feet)	(acre-feet)		
NORTH FRINGE																
1940	nd		nd		nd		nd		nd		nd			nd		
1954	nd		nd		nd		nd		nd		nd			nd		
1968	28.68	25.81	27.12	56.95	21.56	64.68	147.44	0.89	1.60	1.33	5.59	0.44	2.64	9.83	157.27	
1977	16.67	15.00	28.90	60.69	22.90	68.70	144.39	1.11	2.00	0.22	0.92	0.00	0.00	2.92	147.32	
1989	3.78	3.40	18.67	39.21	15.78	47.34	89.95	1.11	2.00	0.00	0.00	0.00	0.00	2.00	91.95	
1995	8.00	7.20	27.57	57.90	27.12	81.36	146.46	0.67	1.21	0.67	2.81	0.89	5.34	9.36	155.82	
CORE AREA																
1940	340.36	306.32	564.01	1184.42	181.63	544.89	2035.64	57.80	104.04	84.26	353.89	127.83	766.98	1224.91	3260.55	
1954	361.48	325.33	487.31	1023.35	163.62	490.86	1839.54	22.45	40.41	111.38	467.80	211.87	1271.22	1779.43	3618.97	
1968	525.77	473.19	378.38	794.60	208.98	626.94	1894.73	24.90	44.82	130.50	548.10	286.34	1718.04	2310.96	4205.69	
1977	264.55	238.10	390.38	819.80	208.98	626.94	1684.83	32.68	58.82	129.61	544.36	387.94	2327.64	2930.83	4615.66	
1989	317.91	286.12	391.27	821.67	288.79	866.37	1974.16	33.57	60.43	131.61	552.76	271.22	1627.32	2240.51	4214.66	
1995	274.34	246.91	397.72	835.21	391.05	1173.15	2255.27	28.46	51.23	145.39	610.64	238.54	1431.24	2093.11	4348.37	
SOUTH FRINGE																
1940	nd		nd		nd		nd		nd		nd					
1954	63.80	57.42	125.39	263.32	48.91	146.73	467.47	17.79	32.02	22.01	92.44	13.12	78.72	203.18	670.65	
1968	50.69	45.62	74.70	156.87	34.46	103.38	305.87	6.45	11.61	16.23	68.17	10.45	62.70	142.48	448.35	
1977	42.68	38.41	93.37	196.08	58.69	176.07	410.56	12.89	23.20	26.90	112.98	18.90	113.40	249.58	660.14	
1989	47.58	42.82	92.26	193.75	71.81	215.43	452.00	16.23	29.21	16.45	69.09	20.68	124.08	222.38	674.38	
1995	75.81	68.23	85.81	180.20	70.25	210.75	459.18	13.56	24.41	13.12	55.10	26.90	161.40	240.91	700.09	

(more)

## APPENDIX D (continued)

The water use values in table D-1 are **estimates**. Because we were interested in showing relative change only, we did not calculate exact water use values. Actual water use values are probably  $\pm 5\text{-}10\%$  of the values shown in Table D-1. These estimates were derived by using phreatophyte water use values from a study that was conducted near Safford, Arizona (Gatewood 1950). In that study, Fremont cottonwood had a water use value of approximately 6 acre-feet per year and velvet mesquite had a water use value of approximately 3 acre-feet per year. Because water use values were not available for Goodding willow, and because Goodding willow and Fremont cottonwood have similar structure and function, we made that assumption that water use for Goodding willow was also approximately 6 acre-feet per year. To calculate water use in Table D-1, we simply multiplied the stated water use values by the area of that vegetation type and the percent canopy closure. We do not recommend using the water use value from Table D-1 for modeling, water budget, or other purposes unless they are first adjusted for climate differences between Safford and the Verde Valley. This can be done using the Blaney-Criddle Method or a comparable method for calculating consumptive use.

### Sample calculation:

Year	Mesquite							Cottonwood/Willow							Total
	Low Density		Medium Density		High Density		Total	Low Density		Medium Density		High Density		Total	
	Area	water use	area	water use	area	water use	water use	area	water use	area	water use	area	water use	water use	
	(acres)	(acre-feet)	(acres)	(acre-feet)	(acres)	(acre-feet)	(acre-feet)	(acres)	(acre-feet)	(acres)	(acre-feet)	(acres)	(acre-feet)	(acre-feet)	(acre-feet)
	a		b		c		d	e		f		g		h	z
1995	274.34	246.91	397.72	835.21	391.05	1173.15	2255.27	28.46	51.23	145.39	610.64	238.54	1431.24	2093.11	4348.37

a = (274.34 acres\*.30 canopy cover)\*3.0 acre-feet per acre water use = 246.91 acre feet water use

b = (397.72 acres\*.70 canopy cover)\*3.0 acre-feet per acre water use = 835.21 acre feet water use

c = (391.05 acres\*1.00 canopy cover)\*3.0 acre-feet per acre water use = 1173.15 acre feet water use

d = a+b+c = 2255.27 acre-feet water use

e = (28.46 acres\*.30 canopy cover)\*6.0 acre-feet per acre water use = 51.23 acre feet water use

f = (145.39 acres\*.70 canopy cover)\*6.0 acre-feet per acre water use = 610.64 acre feet water use

g = (238.54 acres\*1.00 canopy cover)\*6.0 acre-feet per acre water use =1431.24 acre feet water use

h = e+f+g = 2093.11 acre-feet water use

z = d+h = 4348.37 acre-feet water use