



Department of Defense Legacy Resource Management Program

PROJECT 06-290

**QUANTIFYING IMPACTS OF GROUNDWATER
WITHDRAWAL ON AVIAN COMMUNITIES IN DESERT
RIPARIAN WOODLANDS OF THE SOUTHWESTERN U.S.**

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**Quantifying impacts of groundwater withdrawal on avian communities
in desert riparian woodlands of the southwestern U.S.**

Final Models

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Table 1. Final models for 7 species of riparian birds generated from stepwise multiple linear regression using data collected from 15 study sites (Aravaipa and Rincon Creek study sites were excluded; see final report for details) located in riparian woodlands of southeastern Arizona (April-October 2006).

Variables selected in final models	<i>b</i>	SE	Beta	<i>t</i>	<i>P</i>
<u>Black Phoebe</u>					
Constant	-0.002	0.023	-	-0.1	0.947
Surface water ¹	0.001	0.000	0.609	2.8	0.016
<u>Bell's Vireo</u>					
Constant	5.940	0.722	-	8.2	<0.001
Width riparian area 2 (m) ^{2,3}	-0.427	0.148	-0.325	-2.9	0.016
Volume of forbs in understory (0-2.5 m)	-0.505	0.133	-0.337	-3.8	0.003
Volume of grass in understory (0-2.5 m)	-0.401	0.084	-0.504	-4.8	0.001
Volume of live POPFRE ⁴ in mid-story (0-2.5 m)	-0.550	0.136	-0.389	-4.0	0.002
<u>Yellow Warbler</u>					
Constant	-6.463	1.588	-	-4.1	0.002
Canopy height (m)	0.211	0.061	0.577	3.4	0.005
Width riparian area 2 (m) ^{2,3}	0.884	0.365	0.408	2.4	0.032
<u>Lucy's Warbler</u>					
Constant	0.890	0.115	-	7.7	<0.001
Volume of dead veg. in understory (0-2.5)	0.008	0.003	0.522	2.2	0.046
<u>Wilson's Warbler</u>					
Constant	0.113	0.119	-	1.0	0.360
Surface water ¹	0.003	0.001	0.893	6.5	<0.001
Volume of live PROVEL ⁴ veg. in understory (0-2.5 m)	0.252	0.056	0.620	4.5	0.001
<u>Common Yellowthroat</u>					
Constant	-0.420	0.133	-	-3.2	0.008
Volume of Grass in understory (0-2.5 m)	0.169	0.053	0.463	3.2	0.008
Surface water ¹	0.003	0.001	0.601	4.1	0.001
<u>Song Sparrow</u>					
Constant	-0.267	0.289	-	-0.9	0.374
Surface water ¹	0.005	0.002	0.588	3.2	0.008
Volume of dead veg. in understory (0-2.5)	0.029	0.008	0.724	3.4	0.006
Volume of live PROVEL ^{1,4} veg. in canopy (5-20 m)	-0.682	0.292	-0.577	-2.3	0.039
<u>Summer Tanager</u>					
Constant	-0.114	0.093	-	-1.2	0.244
Volume of live veg. in canopy (5-20 m)	0.051	0.009	0.720	5.6	<0.001
Volume of dead veg. in understory (0-2.5)	0.007	0.002	0.424	3.3	0.007

Table 2. Final models for community-level bird parameters (species richness and total relative abundance) generated from stepwise multiple linear regression using data collected from 15 study sites (Aravaipa and Rincon Creek study sites were excluded; see final report for details) located in riparian woodlands of southeastern Arizona in 2006.

Variables selected in final models	<i>b</i>	SE	Beta	<i>t</i>	<i>P</i>
<u>Species richness (total)</u>					
Constant	13.542	1.344	-	10.1	<0.001
Volume of live PROVEL ¹ in understory (0-2.5 m)	2.190	0.844	0.545	2.6	0.023
<u>Species richness (riparian obligate species)</u>					
Constant	13.542	1.344	-	10.1	<0.001
Volume of live PROVEL ^{1,2} in canopy (5-20 m)	2.190	0.844	0.545	2.6	0.023
Volume of grass in understory (0-2.5 m)	0.839	0.411	0.429	2.0	0.064
<u>Total relative abundance</u>					
Constant	-11.245	5.113	-	-2.2	0.050
Width riparian area 2 (m) ^{3,4}	5.557	0.819	0.877	6.8	<0.001
Volume of live PROVEL ^{1,2} in mid-story (2.5-5 m)	2.144	0.598	0.470	3.6	0.004
Volume of live veg. in understory (0-2.5 m)	-0.139	0.053	-0.330	-2.6	0.023

Predictive equations for Black Phoebe, Wilson's Warbler, Common Yellowthroat, and Song Sparrow (the 4 species positively associated with surface water; adapted from Table 1):

- Black Phoebe relative abundance (within 50 m of survey point) = 0.001(extent of surface water [m²] within 50 m of survey point) – 0.002.
- Common Yellowthroat relative abundance (within 50 m from survey point) = 0.003(extent of surface water [m²] within 50 m from survey point) + 0.169 (volume of grass in understory within 50 m of survey point) – 0.42.
- Wilson's Warbler relative abundance (within 50 m of survey point) = 0.003(extent of surface water [m²] within 50 m of survey point) + 0.252(volume of live velvet mesquite in understory within 50 m of survey point) + 0.113.
- Song Sparrow relative abundance (within 50 m of survey point) = 0.005(extent of surface water [m²] within 50 m of survey point) + 0.029(volume of dead vegetation in understory within 50 m of survey point) – 0.682(volume of live velvet mesquite in canopy within 50 m of survey point) – 0.267.