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Nathan D. Chelgren and Jason B. Dunham. 0000. Connectivity and conditional models of access and abundance of species in stream networks. *Ecological Applications* 000:00-00.

APPENDIX A. Sensitivity of posterior summaries of model coefficients to the choice of prior distribution for the intercept μ_1 associated with probability of access, and to the random coefficients (of species) arrangement for conditional access and abundance.

TABLE A1. Sensitivity of posterior summaries to the choice of prior distribution and to the random effects model structure. Summaries are of the posterior distributions of intercepts and coefficients for probability of access ψ, abundance λ, and capture probability p. Coefficients are representative of the median response (in the case of prior sets 1 and 2), or are the finite sample mean response among species (Prior Set 3). Continuous variables gradient (Grad), and active width (ACWid) represent values standardized to 0.5 standard deviation about the mean. Stream-road crossing types are indicator variables shifted to have mean 0 and difference 1. LCI, and UCI are 95% Bayesian credible intervals. Prior Sets represent: 1, the original set on which manuscript results are based (prior variance for μ_1 = 2.98); 2, diffuse prior for the intercept μ_1 (variance = 3.35e+7); and 3, a non-random effects model where coefficients of ψ, and λ were modeled separately by species s (prior variance for $a_{s,1}$ = 2.98).

Parameter	Variable	Level	Prior Set	Mean	Stdev	LCI	UCI

μ_1	Intercept	ψ	1	2.09	0.63	0.97	3.45
			2	2.34	0.80	0.98	4.14
			3	2.22	1.48	0.03	3.99
μ_2	Grad	ψ	1	-8.19	1.18	-10.28	-5.66
			2	-7.72	1.37	-10.06	-4.54
			3	-7.21	2.80	-11.23	-2.58
μ_3	Non-Replaced	ψ	1	-3.36	0.53	-4.31	-2.21
			2	-3.27	0.53	-4.22	-2.11
			3	-1.01	0.88	-2.86	0.09
μ_4	(Non-Replaced)*Grad	ψ	1	0.25	0.78	-1.32	1.98
			2	0.25	0.78	-1.13	2.02
			3	0.00	0.21	-0.38	0.32
μ_5	Replaced	ψ	1	0.41	0.87	-1.08	2.55
			2	0.93	1.29	-1.21	3.97
			3	0.62	0.90	-0.77	1.80
μ_6	(Replaced)*Grad	ψ	1	0.16	0.78	-1.37	1.93

			2	0.15	0.82	-1.44	2.24
			3	0.12	0.50	-0.54	1.23
μ_7	Intercept	λ	1	1.80	0.62	0.50	2.97
			2	1.76	0.63	0.45	2.97
			3	1.24	0.27	0.84	1.66
μ_8	ACWid	λ	1	1.64	0.30	1.03	2.24
			2	1.66	0.36	0.93	2.30
			3	1.81	0.27	1.37	2.22
μ_9	Intercept	*p*	1	-0.68	0.22	-1.12	-0.24
			2	-0.61	0.24	-1.10	-0.18
			3	-0.49	0.17	-0.76	-0.27
μ_{10}	Pass 2	*p*	1	-0.14	0.06	-0.25	-0.02
			2	-0.14	0.06	-0.25	-0.03
			3	-0.14	0.06	-0.24	-0.03
μ_{11}	ACWid	*p*	1	-1.47	0.17	-1.77	-1.12

	2	-1.50	0.21	-1.88	-1.08
	3	-1.36	0.18	-1.65	-1.01

TABLE A2. Species-specific sensitivities to the choice of prior distribution and to the random effects model structure. Summaries are of the posterior distributions of species-specific intercepts and coefficients for probability of access ψ, abundance λ, and capture probability p. Continuous variables gradient (Grad), and active width (ACWid) represent values standardized to 0.5 standard deviation about the mean. Stream-road crossing types are indicator variables shifted to have mean 0 and difference 1. LCI, and UCI are 95% Bayesian credible intervals. Prior Sets represent: 1, the original set on which manuscript results are based (prior variance for μ_1 = 2.98); 2, diffuse prior distribution for the intercept μ_1 (variance = 3.35e+7); and 3, a non-random effects model where coefficients of ψ, and λ were modeled separately by species s (prior variance for $a_{s,1}$ = 2.98).

Parameter	Variable	Level	Prior Set	Mean	Stdev	LCI	UCI
$a_{Cutthroat,1}$	Intercept	ψ	1	3.98	0.18	3.65	4.35
			2	4.02	0.18	3.69	4.38
			3	3.99	0.20	3.63	4.39
$a_{Cutthroat,2}$	Grad	ψ	1	-5.53	0.42	-6.38	-4.72
			2	-5.61	0.46	-6.53	-4.72
			3	-5.54	0.46	-6.43	-4.63
$a_{Cutthroat,3}$	Non-Replaced	ψ	1	-3.40	0.55	-4.42	-2.25

			2	-3.37	0.61	-4.45	-2.01
			3	-2.86	1.42	-4.64	1.08
$a_{Cutthroat,4}$	(Non-Replaced)*Grad	ψ	1	0.38	1.01	-1.43	2.71
			2	0.22	0.83	-1.31	2.00
			3	0.32	2.21	-4.06	4.42
$a_{Cutthroat,5}$	Replaced	ψ	1	0.30	1.16	-1.84	3.26
			2	0.52	1.42	-1.89	3.82
			3	1.39	1.82	-1.66	5.36
$a_{Cutthroat,6}$	(Replaced)*Grad	ψ	1	0.16	1.03	-1.93	2.49
			2	0.11	0.97	-1.96	2.40
			3	0.11	2.36	-4.30	4.70
$a_{Cutthroat,7}$	Intercept	λ	1	2.65	0.11	2.43	2.88
			2	2.64	0.11	2.44	2.86
			3	2.64	0.11	2.40	2.85
$a_{Cutthroat,8}$	ACWid	λ	1	1.26	0.21	0.83	1.67
			2	1.31	0.24	0.81	1.75

			3	1.14	0.21	0.68	1.53
$a_{Cutthroat,9}$	Intercept	p	1	-0.75	0.13	-1.03	-0.48
			2	-0.75	0.12	-0.98	-0.52
			3	-0.74	0.12	-0.96	-0.49
$a_{Rainbow,1}$	Intercept	ψ	1	2.34	0.23	1.89	2.81
			2	2.40	0.23	1.96	2.85
			3	2.75	0.27	2.22	3.30
$a_{Rainbow,2}$	Grad	ψ	1	-7.17	0.63	-8.41	-5.93
			2	-6.98	0.66	-8.26	-5.69
			3	-6.07	0.70	-7.45	-4.70
$a_{Rainbow,3}$	Non-Replaced	ψ	1	-3.40	0.52	-4.35	-2.31
			2	-3.37	0.53	-4.32	-2.24
			3	-1.83	2.54	-5.53	4.07
$a_{Rainbow,4}$	(Non-Replaced)*Grad	ψ	1	0.30	0.84	-1.25	2.15
			2	0.25	0.79	-1.22	2.05
			3	0.08	2.36	-4.67	4.64

$a_{Rainbow,5}$	Replaced	ψ	1	0.38	0.97	-1.35	2.72
			2	0.74	1.36	-1.54	3.91
			3	-0.10	2.14	-3.37	4.87
$a_{Rainbow,6}$	(Replaced)*Grad	ψ	1	0.15	0.83	-1.48	2.09
			2	0.14	0.86	-1.56	2.29
			3	0.45	2.52	-4.63	5.30
$a_{Rainbow,7}$	Intercept	λ	1	1.28	0.22	0.88	1.75
			2	1.22	0.21	0.79	1.60
			3	1.00	0.21	0.60	1.44
$a_{Rainbow,8}$	ACWid	λ	1	1.86	0.26	1.34	2.34
			2	1.83	0.24	1.35	2.30
			3	1.97	0.25	1.50	2.44
$a_{Rainbow,9}$	Intercept	*p*	1	0.19	0.28	-0.36	0.73
			2	0.33	0.30	-0.29	0.87
			3	0.33	0.32	-0.09	0.92
$a_{SmallTrout,1}$	Intercept	ψ	1	3.35	0.21	2.97	3.77

			2	3.38	0.21	2.98	3.80
			3	3.64	0.22	3.25	4.09
$a_{SmallTrout,2}$	Grad	ψ	1	-5.59	0.50	-6.56	-4.64
			2	-5.52	0.51	-6.50	-4.54
			3	-5.25	0.54	-6.27	-4.23
$a_{SmallTrout,3}$	Non-Replaced	ψ	1	-3.39	0.56	-4.41	-2.24
			2	-3.39	0.61	-4.44	-2.05
			3	-0.40	2.35	-4.02	4.68
$a_{SmallTrout,4}$	(Non-Replaced)*Grad	ψ	1	0.38	1.00	-1.41	2.69
			2	0.22	0.84	-1.33	2.03
			3	-0.38	2.53	-5.09	4.67
$a_{SmallTrout,5}$	Replaced	ψ	1	0.28	1.15	-1.96	3.20
			2	0.44	1.53	-2.52	3.83
			3	-0.77	2.18	-4.05	4.16

$a_{SmallTrout,6}$	(Replaced)*Grad	ψ	1	0.16	1.02	-1.91	2.45
			2	0.11	0.97	-1.90	2.45
			3	-0.54	2.38	-5.37	4.12
$a_{SmallTrout,7}$	Intercept	λ	1	1.62	0.34	1.09	2.38
			2	1.66	0.29	1.10	2.28
			3	1.06	0.17	0.76	1.39
$a_{SmallTrout,8}$	ACWid	λ	1	1.50	0.26	0.99	2.00
			2	1.57	0.30	1.02	2.18
			3	1.40	0.24	0.90	1.85
$a_{SmallTrout,9}$	Intercept	*p*	1	-1.04	0.45	-2.00	-0.37
			2	-1.10	0.35	-1.82	-0.30
			3	-0.38	0.19	-0.72	0.01
$a_{Sculpin,1}$	Intercept	ψ	1	1.80	0.20	1.44	2.19
			2	1.77	0.20	1.37	2.14

			3	1.62	0.19	1.23	2.00
$a_{Sculpin,2}$	Grad	ψ	1	-9.73	0.66	-11.12	-8.51
			2	-9.95	0.77	-11.59	-8.56
			3	-9.43	0.70	-10.86	-8.16
$a_{Sculpin,3}$	Non-Replaced	ψ	1	-3.34	0.59	-4.39	-2.08
			2	-3.21	0.61	-4.28	-1.85
			3	-1.23	1.72	-4.08	2.44
$a_{Sculpin,4}$	(Non-Replaced)*Grad	ψ	1	0.19	0.84	-1.60	1.97
			2	0.26	0.92	-1.47	2.47
			3	0.10	2.39	-4.52	4.57
$a_{Sculpin,5}$	Replaced	ψ	1	0.56	0.85	-0.73	2.64
			2	1.49	1.28	-0.56	4.25
			3	1.80	1.91	-1.47	5.63
$a_{Sculpin,6}$	(Replaced)*Grad	ψ	1	0.15	0.72	-1.26	1.77
			2	0.19	0.85	-1.37	2.40
			3	1.23	2.41	-3.56	5.81

$a_{Sculpin,7}$	Intercept	λ	1	3.63	0.11	3.41	3.83
			2	3.64	0.13	3.39	3.87
			3	3.77	0.09	3.56	3.94
$a_{Sculpin,8}$	ACWid	λ	1	2.50	0.15	2.18	2.75
			2	2.40	0.19	2.00	2.78
			3	2.19	0.13	1.98	2.40
$a_{Sculpin,9}$	Intercept	p	1	-0.95	0.11	-1.16	-0.72
			2	-0.93	0.11	-1.16	-0.70
			3	-0.99	0.11	-1.19	-0.79
$a_{Lamprey,1}$	Intercept	ψ	1	-1.25	0.79	-2.88	0.21
			2	-1.24	0.74	-2.79	0.05
			3	0.03	0.65	-1.23	1.20
$a_{Lamprey,2}$	Grad	ψ	1	-14.13	1.90	-18.13	-10.76
			2	-14.12	1.82	-17.98	-10.91
			3	-10.70	1.37	-13.35	-8.06
$a_{Lamprey,3}$	Non-Replaced	ψ	1	-3.30	1.05	-5.25	-0.91

			2	-3.12	1.19	-5.50	-0.56
			3	-0.49	2.55	-4.92	4.68
$a_{Lamprey,4}$	(Non-Replaced)*Grad	ψ	1	-0.04	1.58	-3.45	3.28
			2	0.32	1.51	-2.68	3.75
			3	0.16	2.42	-4.37	4.77
$a_{Lamprey,5}$	Replaced	ψ	1	0.84	1.34	-1.22	4.21
			2	2.33	1.94	-0.82	6.77
			3	-0.41	2.29	-4.19	4.57
$a_{Lamprey,6}$	(Replaced)*Grad	ψ	1	0.12	1.20	-2.38	2.70
			2	0.25	1.27	-2.21	3.47
			3	-0.13	2.41	-4.77	4.58
$a_{Lamprey,7}$	Intercept	λ	1	0.99	0.39	0.33	2.03
			2	1.13	0.44	0.31	2.15
			3	0.89	0.73	-0.19	2.04
$a_{Lamprey,8}$	ACWid	λ	1	1.66	0.38	0.93	2.42
			2	1.63	0.39	0.83	2.33

			3	1.79	0.94	0.33	3.53
$a_{Lamprey,9}$	Intercept	p	1	-0.86	0.42	-2.16	-0.25
			2	-0.94	0.44	-1.94	-0.12
			3	-0.75	0.33	-1.54	-0.35
$a_{Coho,1}$	Intercept	ψ	1	0.31	0.29	-0.26	0.87
			2	0.32	0.30	-0.32	0.88
			3	0.41	0.27	-0.13	0.95
$a_{Coho,2}$	Grad	ψ	1	-12.24	0.95	-14.23	-10.44
			2	-12.29	1.03	-14.44	-10.47
			3	-11.23	0.86	-13.02	-9.64
$a_{Coho,3}$	Non-Replaced	ψ	1	-3.31	0.82	-4.81	-1.50
			2	-3.13	0.89	-4.72	-1.04
			3	-0.59	2.23	-4.20	4.29
$a_{Coho,4}$	(Non-Replaced)*Grad	ψ	1	0.05	1.17	-2.45	2.55
			2	0.29	1.19	-2.01	3.04
			3	-0.24	2.41	-5.04	4.15

$a_{Coho,5}$	Replaced	ψ	1	0.73	1.04	-0.82	3.33
			2	1.99	1.59	-0.64	5.26
			3	1.54	1.81	-1.50	5.33
$a_{Coho,6}$	(Replaced)*Grad	ψ	1	0.13	0.89	-1.67	2.12
			2	0.22	1.05	-1.72	2.80
			3	0.11	2.56	-4.98	5.15
$a_{Coho,7}$	Intercept	λ	1	3.12	0.24	2.65	3.63
			2	3.05	0.29	2.54	3.54
			3	3.11	0.17	2.80	3.41
$a_{Coho,8}$	ACWid	λ	1	1.55	0.28	0.99	2.13
			2	1.73	0.35	1.13	2.38
			3	1.15	0.26	0.72	1.64
$a_{Coho,9}$	Intercept	*p*	1	-0.91	0.35	-1.72	-0.14
			2	-0.91	0.40	-1.65	-0.22
			3	-0.72	0.14	-0.99	-0.48
$a_{Chinook,1}$	Intercept	ψ	1	1.10	0.66	-0.18	2.43

			2	1.04	0.65	-0.29	2.37
			3	1.38	0.55	0.31	2.46
$a_{Chinook,2}$	Grad	ψ	1	-9.39	1.54	-12.37	-6.22
			2	-9.34	1.54	-12.48	-6.26
			3	-6.89	1.37	-9.44	-4.14
$a_{Chinook,3}$	Non-Replaced	ψ	1	-3.35	0.62	-4.47	-1.99
			2	-3.28	0.63	-4.44	-1.87
			3	-0.80	2.62	-5.18	4.36
$a_{Chinook,4}$	(Non-Replaced)*Grad	ψ	1	0.24	0.91	-1.66	2.12
			2	0.27	0.90	-1.46	2.42
			3	0.04	2.53	-4.82	5.12
$a_{Chinook,5}$	Replaced	ψ	1	0.48	0.88	-0.96	2.65
			2	1.24	1.33	-0.82	4.23
			3	1.05	2.00	-2.53	5.02
$a_{Chinook,6}$	(Replaced)*Grad	ψ	1	0.14	0.74	-1.33	1.83
			2	0.17	0.83	-1.43	2.26

			3	-0.17	2.47	-4.79	4.49
$a_{Chinook,7}$	Intercept	λ	1	1.31	0.46	0.37	2.11
			2	1.03	0.67	-0.10	2.72
			3	2.03	0.59	1.11	2.82
$a_{Chinook,8}$	ACWid	λ	1	1.04	0.56	-0.18	2.01
			2	1.00	0.74	-0.97	2.22
			3	-0.61	0.39	-1.27	0.19
$a_{Chinook,9}$	Intercept	*p*	1	-0.69	0.41	-1.44	0.07
			2	-0.28	0.47	-1.34	0.52
			3	-0.23	0.59	-1.11	0.50
$a_{Dace,1}$	Intercept	ψ	1	0.71	1.60	-2.68	3.67
			2	0.91	1.89	-2.44	5.58
			3	3.93	1.18	1.78	6.51
$a_{Dace,2}$	Grad	ψ	1	-10.40	2.96	-17.05	-5.11
			2	-9.59	3.13	-15.45	-1.94
			3	-2.58	2.23	-6.78	1.54

$a_{Dace,3}$	Non-Replaced	ψ	1	-3.35	0.72	-4.68	-1.81
			2	-3.20	0.72	-4.52	-1.63
			3	0.09	2.54	-5.01	5.06
$a_{Dace,4}$	(Non-Replaced)*Grad	ψ	1	0.07	1.03	-2.19	2.14
			2	0.22	0.95	-1.62	2.42
			3	-0.09	2.47	-4.63	5.10
$a_{Dace,5}$	Replaced	ψ	1	0.60	1.00	-1.09	2.97
			2	1.47	1.54	-0.92	4.84
			3	0.44	2.22	-3.75	5.10
$a_{Dace,6}$	(Replaced)*Grad	ψ	1	0.14	0.89	-1.66	2.14
			2	0.19	0.92	-1.59	2.43
			3	-0.09	2.47	-4.94	4.54
$a_{Dace,7}$	Intercept	λ	1	-0.15	0.98	-2.08	1.76
			2	-0.25	0.95	-2.18	1.36
			3	-4.60	0.86	-6.04	-3.19
$a_{Dace,8}$	ACWid	λ	1	1.83	0.65	0.58	3.25

			2	1.74	0.62	0.60	3.07
			3	5.46	0.73	4.20	6.60
$a_{Dace,9}$	Intercept	p	1	-0.30	0.45	-1.24	0.51
			2	-0.07	0.44	-1.00	0.77
			3	-0.48	0.33	-1.03	-0.04

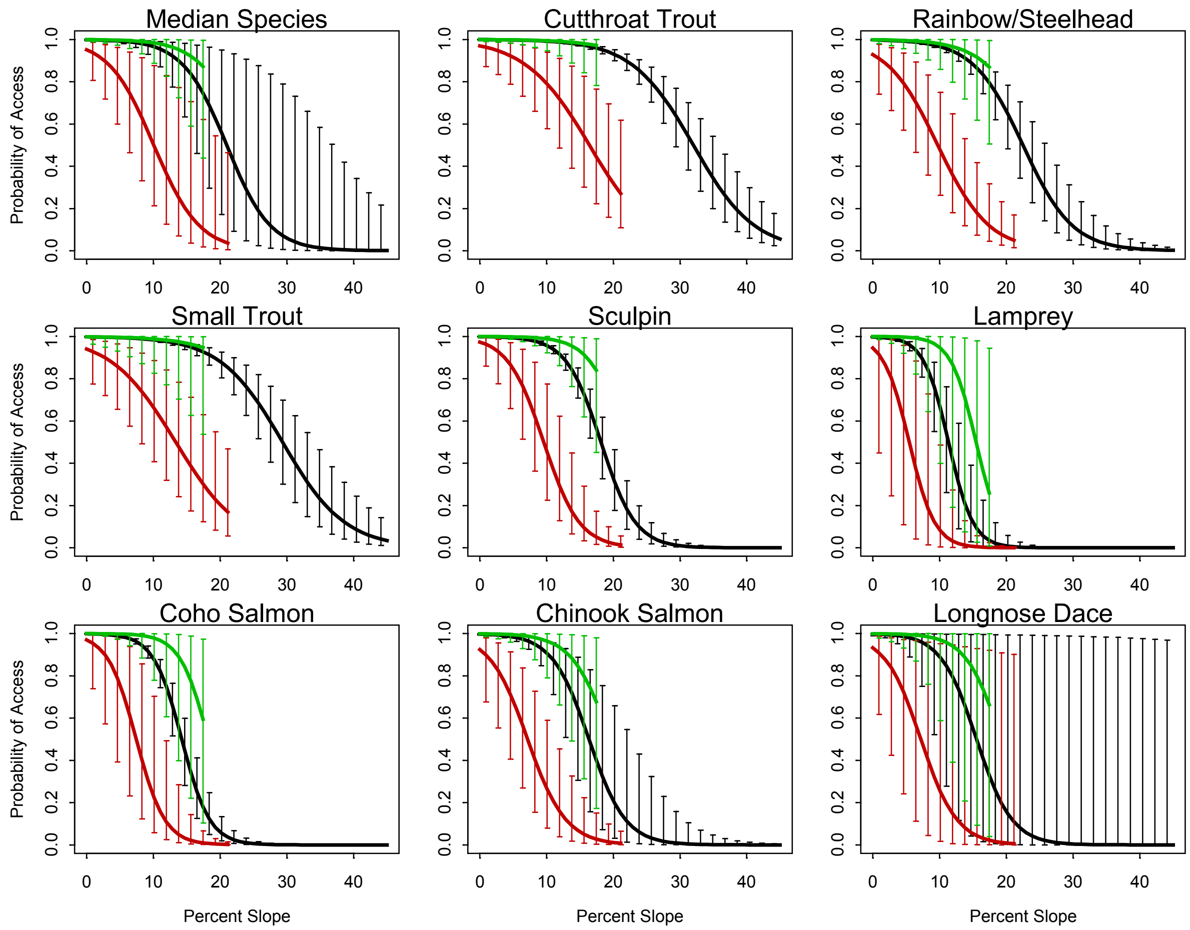

FIG. A1. Probability of access, conditional on access to the downstream neighboring 30-m plot, representative of no intervening stream-road crossing (black), stream-road crossings replaced to stream simulation standards (green), and non-replaced crossings (red). A more diffuse prior distribution (variance = 3.35e+7) was used for the intercept μ_1 than was used in the model reported in the manuscript (variance = 2.98; manuscript Fig. 2). Fitted relationships represent posterior medians (intervals are 95% Bayesian credible intervals). Plotted ranges represent 95% of the distribution of slopes in the data.

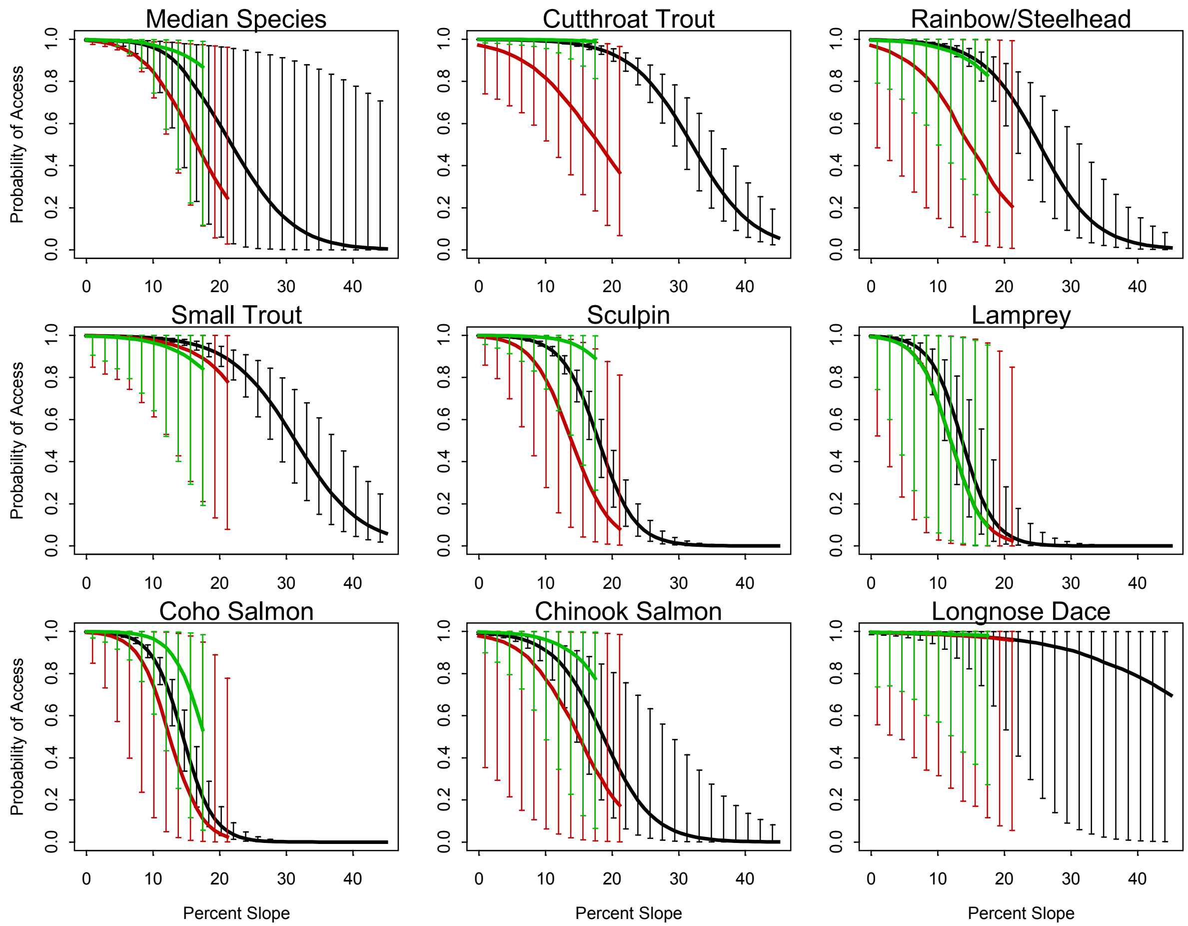

FIG. A2. Probability of access, conditional on access to the downstream neighboring 30-m plot, representative of no intervening stream-road crossing (black), stream-road crossings replaced to stream simulation standards (green), and non-replaced crossings (red). A non-random effects model was fit where coefficients relating to ψ and λ were modeled separately by species with no hierarchical structure. Fitted relationships represent posterior medians (intervals are 95% Bayesian credible intervals). Plotted ranges represent 95% of the distribution of slopes in the data.