

Supplementary Materials for:

Scale and landscape features matter for understanding waterbird habitat selection

Table S1.

AUC for optimized scale selection of the variables for foraging state.

Variable	Scale	CLASS LEVEL METRICS								
		Artificial	Forest	Grassland	Lake	Marsh	Mudflat	Paddy field	Pond	River
AI	1.5	0.6823	0.5944	0.7484	0.6699	0.7526	0.7602	0.7014	0.6894	0.6919
	3.0	0.7503	0.6767	0.7502	0.7255	0.7479	0.7663	0.7298	0.7100	0.7256
	5.0	0.7737	0.7421	0.7582	0.7536	0.7526	0.7732	0.7317	0.7343	0.7384
	8.0	0.7554	0.7602	0.7521	0.7518	0.7461	0.7549	0.7364	0.7369	0.7341
	10.0	0.7297	0.7377	0.7288	0.7317	0.7255	0.7305	0.7215	0.7219	0.7315
AM	1.5	0.7070	0.6271	0.7468	0.6750	0.7549	0.7608	0.7115	0.6926	0.7048
	3.0	0.7604	0.7141	0.7579	0.7292	0.7492	0.7611	0.7428	0.7055	0.7247
	5.0	0.7755	0.7670	0.7636	0.7585	0.7511	0.7648	0.7413	0.7277	0.7447
	8.0	0.7559	0.7601	0.7495	0.7564	0.7405	0.7501	0.7316	0.7291	0.7322
	10.0	0.7328	0.7336	0.7282	0.7367	0.7191	0.7275	0.7202	0.7147	0.7272
COHESION	1.5	0.6920	0.6000	0.7381	0.6801	0.7527	0.7679	0.7071	0.6963	0.6987
	3.0	0.7548	0.6759	0.7535	0.7316	0.7522	0.7680	0.7424	0.7235	0.7255
	5.0	0.7692	0.7428	0.7592	0.7618	0.7609	0.7728	0.7342	0.7397	0.7491
	8.0	0.7479	0.7591	0.7465	0.7537	0.7491	0.7555	0.7311	0.7312	0.7392
	10.0	0.7255	0.7337	0.7238	0.7339	0.7289	0.7334	0.7201	0.7181	0.7210
ED	1.5	0.8105	0.6928	0.8189	0.7565	0.8999	0.9080	0.8026	0.8323	0.8069
	3.0	0.8828	0.8232	0.8580	0.8139	0.9105	0.9200	0.8340	0.8586	0.8494
	5.0	0.9069	0.9069	0.8813	0.8632	0.9130	0.9274	0.8559	0.8651	0.8833
	8.0	0.8883	0.8989	0.8706	0.8705	0.8908	0.9070	0.8541	0.8545	0.8799
	10.0	0.8480	0.8550	0.8378	0.8396	0.8444	0.8565	0.8206	0.8290	0.8453
IJI	1.5	0.7097	0.5940	0.8223	0.8008	0.8379	0.7977	0.7623	0.8075	0.8073
	3.0	0.8013	0.7766	0.8419	0.8788	0.8715	0.8229	0.8253	0.8067	0.8478
	5.0	0.8627	0.8688	0.8648	0.9117	0.8859	0.8482	0.8603	0.8473	0.8762
	8.0	0.8565	0.8768	0.8614	0.9020	0.8749	0.8602	0.8689	0.8446	0.8755
	10.0	0.8178	0.8499	0.8283	0.8564	0.8296	0.8326	0.8417	0.8365	0.8341
LPI	1.5	0.8155	0.6935	0.8412	0.7477	0.8919	0.9093	0.8198	0.8040	0.7957
	3.0	0.8830	0.8153	0.8647	0.8387	0.8901	0.9113	0.8375	0.8338	0.8432
	5.0	0.9091	0.9014	0.8767	0.8926	0.8971	0.9137	0.8476	0.8503	0.8781
	8.0	0.8846	0.8959	0.8627	0.8910	0.8883	0.8886	0.8579	0.8480	0.8753
	10.0	0.8428	0.8497	0.8205	0.8523	0.8389	0.8424	0.8252	0.8151	0.8397
PLAND	1.5	0.7138	0.6305	0.7298	0.6829	0.7602	0.7735	0.7084	0.7125	0.7014
	3.0	0.7566	0.7269	0.7552	0.7384	0.7643	0.7780	0.7345	0.7299	0.7256
	5.0	0.7710	0.7727	0.7580	0.7654	0.7653	0.7805	0.7429	0.7353	0.7488
	8.0	0.7562	0.7616	0.7431	0.7582	0.7501	0.7613	0.7373	0.7399	0.7415
	10.0	0.7298	0.7378	0.7205	0.7393	0.7264	0.7358	0.7217	0.7248	0.7290

SHAPE_ MN	1.5	0.7768	0.6278	0.8512	0.7420	0.8812	0.8700	0.7919	0.7860	0.7953
	3.0	0.8684	0.7971	0.8719	0.8043	0.8938	0.8677	0.8440	0.8129	0.8241
	5.0	0.9052	0.8812	0.8715	0.8433	0.8977	0.8750	0.8648	0.8455	0.8486
	8.0	0.8889	0.8857	0.8623	0.8549	0.8758	0.8655	0.8668	0.8594	0.8645
	10.0	0.8493	0.8487	0.8425	0.8212	0.8307	0.8322	0.8366	0.8314	0.8308

Variable	Scale	NATURAL AND HUMAN DISTURBANCE METRICS				Variable	Scale	LANDSCAPE LEVEL METRICS			
Road density	1.5	0.6620				PD	1.5	0.8265			
	3.0	0.6949					3.0	0.8376			
	5.0	0.7113					5.0	0.8589			
	8.0	0.7178					8.0	0.8632			
	10.0	0.7178					10.0	0.8306			
Waterway density	1.5	0.5590				SHDI	1.5	0.8088			
	3.0	0.5787					3.0	0.8219			
	5.0	0.5825					5.0	0.8517			
	8.0	0.6035					8.0	0.8568			
	10.0	0.6160					10.0	0.8364			
Roughnes s	1.5	0.6019									
	3.0	0.5901									
	5.0	0.6200									
	8.0	0.6351									
	10.0	0.6775									

Table S2.

AUC for optimized scale selection of the variables for roosting.

Variable	Scale	CLASS LEVEL METRICS								
		Artificial	Forest	Grassland	Lake	Marsh	Mudflat	Paddy field	Pond	River
AI	0.1	0.5380	0.5380	0.5209	0.5668	0.5865	0.7049	0.5277	0.5262	0.5048
	0.5	0.5708	0.5622	0.6608	0.6299	0.7076	0.7877	0.6118	0.5564	0.5760
	1.0	0.6431	0.5772	0.7383	0.6848	0.7635	0.7977	0.6774	0.6648	0.6727
	1.5	0.6994	0.6173	0.7783	0.6961	0.7909	0.7976	0.7205	0.7154	0.7332
AM	0.1	0.5441	0.5418	0.5322	0.5707	0.5985	0.7208	0.5332	0.5317	0.5066
	0.5	0.6020	0.5673	0.6615	0.6347	0.7094	0.7955	0.6242	0.5754	0.5749
	1.0	0.6748	0.5989	0.7377	0.6828	0.7670	0.7998	0.7010	0.6747	0.6740
	1.5	0.7229	0.6368	0.7779	0.7032	0.7922	0.7970	0.7393	0.7165	0.7333
COHESI	0.1	0.5413	0.5402	0.5290	0.5654	0.5850	0.7089	0.5293	0.5267	0.5054
	0.5	0.5869	0.5652	0.6486	0.6307	0.7087	0.7956	0.6160	0.5645	0.5753
	1.0	0.6514	0.5776	0.7251	0.6791	0.7679	0.8064	0.6780	0.6810	0.6735
ED	1.5	0.7064	0.6209	0.7663	0.6969	0.7925	0.8057	0.7220	0.7306	0.7236
	0.1	0.5636	0.5511	0.5446	0.5766	0.6255	0.7260	0.5161	0.5365	0.5013

III	0.5	0.6359	0.5758	0.7180	0.6750	0.8007	0.8902	0.5935	0.5835	0.6119
	1.0	0.7266	0.6211	0.7930	0.7323	0.8775	0.9199	0.7207	0.7503	0.7466
	1.5	0.8267	0.7045	0.8343	0.7830	0.9161	0.9290	0.7969	0.8359	0.8043
	0.1	0.5457	0.5355	0.5279	0.5186	0.5826	0.6046	0.5006	0.5323	0.5030
	0.5	0.5554	0.5699	0.7082	0.6790	0.7547	0.8321	0.5767	0.5994	0.6040
	1.0	0.5906	0.5851	0.7731	0.7707	0.8073	0.8211	0.6939	0.7511	0.7523
	1.5	0.7296	0.5924	0.8287	0.8214	0.8547	0.8043	0.7548	0.8263	0.8130
	0.1	0.5632	0.5632	0.5417	0.6051	0.6594	0.7875	0.5411	0.5341	0.5038
	0.5	0.6296	0.5875	0.7083	0.6672	0.8044	0.9043	0.6388	0.5775	0.6234
	1.0	0.7326	0.6264	0.7978	0.7420	0.8851	0.9263	0.7556	0.7341	0.7414
	1.5	0.8302	0.6996	0.8500	0.7758	0.9089	0.9296	0.8215	0.8223	0.7973
	0.1	0.5452	0.5437	0.5332	0.5707	0.6017	0.7212	0.5359	0.5339	0.5088
PLAND	0.5	0.6078	0.5689	0.6490	0.6340	0.7135	0.7967	0.6230	0.5744	0.5870
	1.0	0.6944	0.6009	0.7156	0.6759	0.7702	0.8069	0.6995	0.6944	0.6767
	1.5	0.7403	0.6465	0.7559	0.7063	0.7949	0.8087	0.7395	0.7426	0.7305
SHAPE_	0.1	0.5684	0.5564	0.5165	0.6051	0.6435	0.7857	0.5172	0.5395	0.5040
	0.5	0.6265	0.5709	0.7119	0.6851	0.7887	0.8866	0.5960	0.5852	0.6077
MN	1.0	0.6728	0.6041	0.8083	0.7407	0.8553	0.8941	0.7275	0.6965	0.7520
	1.5	0.7805	0.6329	0.8650	0.7738	0.8950	0.8941	0.7836	0.8001	0.7940

Variable	Scale	NATURAL AND		Variable	Scale	LANDSCAPE	
		HUMAN	DISTURBANCE			LEVEL	METRICS
Road density	0.1	0.5746		PD	0.1	0.7892	
	0.5	0.6347			0.5	0.8249	
	1.0	0.6857			1.0	0.8391	
	1.5	0.7179			1.5	0.8462	
Waterway density	0.1	0.4937		SHDI	0.1	0.6542	
	0.5	0.5492			0.5	0.7919	
	1.0	0.5729			1.0	0.8056	
	1.5	0.5768			1.5	0.8212	
Roughness	0.1	0.5302					
	0.5	0.5976					
	1.0	0.6243					
	1.5	0.6298					

Table S3.

Component models with $\Delta AICc < 2$ of the top ranked models for foraging.

Component models	AICc	$\Delta AICc$	weight
1/2/3/4/5/6/7/9/10/11/12/13/14/15/16	1860.78	0.00	0.32
1/2/3/4/5/6/7/9/10/11/12/13/14/15/16/17	1861.32	0.54	0.25
1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16	1861.50	0.72	0.23

1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17

1861.74

0.96

0.20

Term codes of variables in the component models.

AM_forest_5km	AM_grassland_5km	EucD_artificial	EucD_lake
1	2	3	4
EucD_marsh	EucD_mudflat	EucD_river	EucD_waterway
5	6	7	8
iji_mudflat_8km	lpi_lake_5km	lpi_paddyfield_8km	lpi_river_5km
9	10	11	12
PLAND_mudflat_5km	PLAND_paddyfield_5km	Roughness_8km	Slope
13	14	15	16
Waterseasonality			
17			

Table S4.Component models with $\Delta AICc < 2$ of the top ranked models for roosting.

Component models	AICc	$\Delta AICc$	weight
4/5/6/7/8/9/10/11/12/13/17/18	820.19	0.00	0.16
1/4/5/6/7/8/9/10/11/12/13/17/18	820.63	0.44	0.13
4/5/6/7/9/10/11/12/13/17/18	821.06	0.87	0.11
4/5/6/7/8/9/10/11/12/13/17/18/19	821.34	1.15	0.09
1/4/5/6/7/9/10/11/12/13/17/18	821.44	1.25	0.09
4/5/6/7/8/9/10/11/12/13/16/17/18	821.57	1.38	0.08
4/5/6/7/8/9/10/11/12/13/14/17/18	821.75	1.56	0.08
1/4/5/6/7/8/9/10/11/12/13/17/18/19	821.87	1.68	0.07
2/4/5/6/7/8/9/10/11/12/13/17/18	822.06	1.87	0.06
3/4/5/6/7/8/9/10/11/12/13/17/18	822.15	1.96	0.06
4/5/6/7/8/9/10/11/12/13/15/17/18	822.19	2.00	0.06

Term codes of variables in the component models.

AM_forest_1.5km	AM_grassland_1.5km	Aspect	COH_mudflat
1	2	3	4
EucD_lake	EucD_marsh	EucD_river	EucD_waterway
5	6	7	8
iji_lake_1.5km	PLAND_artificial_1.5km	PLAND_lake_1.5km	PLAND_marsh_1.5km
9	10	11	12
PLAND_mudflat_1.5km	PLAND_paddyfield_1.5km	PLAND_pond_1.5km	PLAND_river_1.5km
13	14	15	16
Recurrence	Roughness_0.5km	Slope	
17	18	19	

Figure S1. Correlation matrix of retained variables for final multi-scale habitat modeling of roosting state.

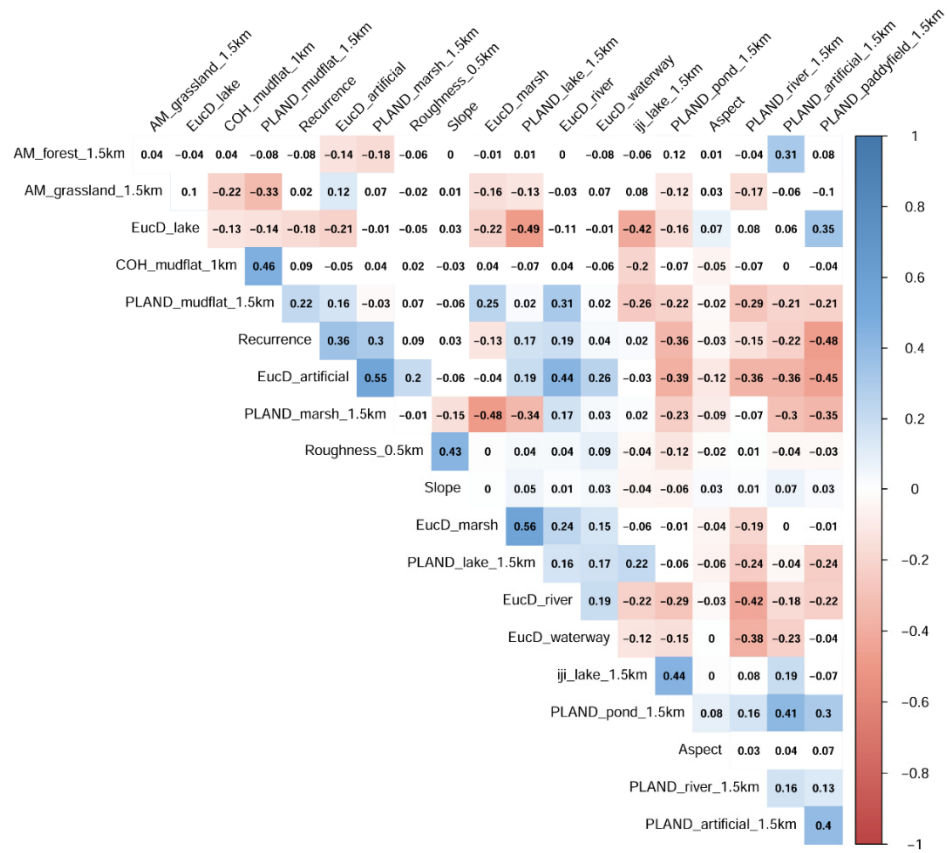


Figure S2. Correlation matrix of retained variables for final multi-scale habitat modeling of foraging state.

