

Contents

Preface	ix
1. Introduction	1
1.1. Statistical Home Range Analysis	2
1.2. Mechanistic Home Range Analysis	4
2. From Individual Behavior to Patterns of Space Use	7
2.1. Movement in One Dimension	8
2.2. Movement in Two Dimensions	12
2.3. Directed and Random Motion	13
2.4. Predicting Home Range Patterns	21
2.5. Summary	22
3. A Simple Mechanistic Home Range Model	23
3.1. Model of Individual Movement Behavior	24
3.2. Characterizing the Movement Behavior of a Red Fox	27
3.3. Equations for Patterns of Space Use	30
3.4. Solving for Patterns of Space Use	31
3.5. Predicted Red Fox Home Range	33
3.6. Coyote Home Range Patterns	35
3.7. Summary	37
4. A Model Based on Conspecific Avoidance	38
4.1. Model Formulation	39
4.2. Equations for Space Use	42
4.3. Empirical Evaluation of the Model	43
4.4. Summary	53
5. Comparative Analysis of Home Range Patterns Predicted by the Conspecific Avoidance Model	55
5.1. Predicted Patterns of Space Use	55
5.2. Border versus Hinterland Scent Marking	60
5.3. The Distribution of Scent Marks along Boundaries	64
5.4. Summary	66

6. Mathematical Analysis of the Conspecific Avoidance Model	67
6.1. Model Equations	67
6.2. Impact of the Scent-Marking Response	68
6.3. Existence of a Buffer Zone	72
6.4. Generalized Response Functions	74
6.5. Summary	77
7. The Influence of Landscape and Resource Heterogeneity on Patterns of Space Use	79
7.1. Landscape Heterogeneity	79
7.2. Resource Heterogeneity and Foraging Behavior	82
7.3. Model Predictions	89
7.4. Summary	91
8. Home Range Formation in the Absence of a Den Site	92
8.1. Model Formulation	92
8.2. Analysis	94
8.3. Summary	96
9. Secondary Ecological Interactions	97
9.1. Wolf–Deer Interactions	97
9.2. Wolf–Coyote Interactions	100
9.3. Summary	103
10. Displacement Distances: Theory and Applications	104
10.1. The Minimum Convex Polygon Method	104
10.2. Mean-Absolute and Mean-Squared Displacement	110
10.3. Summary	114
11. ESS Analysis of Movement Strategies: Analyzing the Functional Significance of Home Range Patterns	115
11.1. Evolutionarily Stable Movement Strategy for Interacting Wolf Packs	116
11.2. Analysis	119
11.3. Roles of Aggression and Signaling	126
11.4. Summary	128
12. Future Directions and Synthesis	130

Appendixes

A	Derivation of the Fokker-Planck Equation for Space Use	137
B	Alternative Derivation of the Space Use Equation	139
C	Autocorrelation in Movement Direction	140
D	Estimating the Parameters of the Localizing Tendency Model	142
E	Movement with Attraction toward a Den	144
F	Model Fitting	149
G	Numerical Methods for Solving Space Use Equations	151
H	Displacement Distances	152
I	ESS Analysis Model Parameters	157
	References	158
	Index	169