Appendix B. Demographic and disease parameters used in the agent-based model

DeerLandscapeDisease.

Table B1. Demographic parameters used in DeerLandscapeDisease. CFL = contiguous forest landscape, FFL = fragmented forest landscape.

Parameter	**Value**	**Source**
Chance of dispersal	Males: 0.7 Females: 0.2	(Hawkins et al., 1971; Nixon et al., 2007, 1994; Rosenberry et al., 1999)
Chance of exploratory movement	CFL: Gestation: 0.32 Fawning: 0.08 Prerut: 0.20 Rut: 0.96 FLL: Gestation: 2.33 Fawning: 0.33 Prerut: 0.11 Rut: 0.61	Estimated from field data
Duration of exploratory movement	12-24 hours	Estimated from field data
Duration of mating-related grouping	1-7 days	(Marchington and Hirth, 1984)
Gestation time	187-222 days	(Marchington and Hirth, 1984)
Group adhesion (probability of staying in group)	Females: 0.95 Males: 0.40 Females (fawning): 0 Males (rut): 0	Added in model to account for male groups being more fluid than female
Maximum group size (adults)	Males: 10 Females: 4	(Marchington and Hirth, 1984)
Maximum home range size (ha)	CFL: 6.46 FFL: 5.34	Calculated from field data
Minimum forest proportion in home range	CFL: 0.185 FFL: 0.22	Calculated from field data
Number of fawns born to each female (proportions)	1 fawn: 0.25 2 fawns: 0.50 3 fawns: 0.25	(Verme and Ullrey, 1984)
Yearly mortality	Males: 0.40 Females: 0.20 Fawns, 0-2 months: 0.44 Fawns, 2-12 months: 0.2	(Hawkins et al., 1970; Nixon et al., 1994, 1991; Rohm et al., 2007)

Table B2. Disease parameters used in DeerLandscapeDisease. CFL = contiguous forest landscape, FFL = fragmented forest landscape. CDF= Gaussian cumulative distribution function.

Parameter	Value	Source
Chance of infection	Direct contact: 0.0218 Indirect contact: 8.235E-6	Calibrated values to match a 10 year rise in prevalence with a factor of 1.715, (Wisconsin Department of Natural Resources, 2012)
Deer infectivity/change of shedding prions	CDF X~N (20,4)	Based on the assumption that infectivity increases with disease progression after an initial incubation time of 18 months
Disease mortality	CDF X~N (28,2)	Based on the assumption that mortality increases with disease progression after an initial incubation time of 18 months.
Prion half life	6 months	Based on known persistence of prion proteins (Williams et al., 2002)
Start prevalence	Direct scenarios: 0.04 Indirect scenarios: 0.047	Calibrated values to match a 10 year rise in prevalence with a factor of 1.715 (Wisconsin Department of Natural Resources, 2012)

Table B3. Movement parameters used in DeerLandscapeDisease. CFL = contiguous forest landscape, FFL = fragmented forest landscape. N=Normal distribution, LN= log-normal distribution, WCauchy=Wrapped Cauchy distribution, Wei=Weibull distribution, Exp=Exponential distribution.

Parameter	**Value**	**Details**
Dispersal	Step lengths as in general movement. Turn angles from wrapped cauchy: WCauchy(μ_t, ρ_t), μ_t=0.02 ρ_t=0.99	Step length from field data, turn angle averaged around zero
Exploratory movement	Step lengths as in general movement Turn angles from wrapped cauchy: WCauchy(μ_t, ρ_t), μ_t=0.02 ρ_t=0.99	Step length from field data, turn angle averaged around zero
Fawn movement (< 6 months)	Turn angles facing mother deer Step lengths from exponential distribution, X ~ Exp(λ), λ = 0.1	Turn angle and step length modeled to stay closed to mother
Group movement	Turn angles facing leader deer Step lengths from exponential distribution X ~ Exp(λ): CFL and FFL: Gestation: λ = 0.00442 Fawning: λ = 0.00331 Prerut: λ = 0.00317 Rut: λ = 0.00406	Step length fitted to field data, see Appendix C
Mating movement, male following female	Turn angles facing female Step lengths from exponential distribution, X ~ Exp(λ), λ = 0.1	Turn angle and step length modeled to stay closed to female
Turn angle, Wrapped Cauchy distribution	X ~ WCauchy(μ_t, ρ_t) $\mu_t = \theta c_t$ $\rho_t = \rho_\infty + (\rho_0 - \rho_\infty)$*exp(-$\gamma_\rho$*$d_t$), parameter θc_t is the turn angle pointing towards home range center, d_t is distance from home range center ρ_t: CFL: Gestation: ρ_0: ((X + 1)/2), X ~Beta(72.76,79.22)	Estimated from field data, see Appendix C for details $\rho_0 \in [-1, 1]$ $\rho_\infty \in [-1, 1]$ $\gamma_\rho \in [0, \infty)$

	ρ_∞: 1 (48%) or X ~Beta(4.40,1,70) γ_ρ:X ~N(y, MSE), $y=-2.79\rho_\infty - 4.32,\ MSE= 1.21$	
	Fawning: ρ_0: $((X+1)/2)$, X ~Beta(41.51,54.02) ρ_∞: 1 (33%) or X ~Beta(2.41,0.74) γ_ρ:X ~N(y, MSE), $y=-2.79\rho_\infty - 4.32,\ MSE= 1.21$	X $\in$ [0.4,1]
	Prerut: ρ_0: $((X+1)/2)$, X ~Beta(0.41,1.07) ρ_∞: 1 (71%) or X ~Beta(3.26,0.86) γ_ρ:X ~N(y, MSE), $y=-2.79\rho_\infty - 4.32,\ MSE= 1.21$	X $\in$ [0.4,1]
	Rut: ρ_0: $((X+1)/2)$, X ~Beta(4.24,5.96) ρ_∞: 1 (30%) or X ~Beta(28.48,32.63) γ_ρ:X ~N(y, MSE), $y=-2.79\rho_\infty - 4.32,\ MSE= 1.21$	
	FFL: Gestation: ρ_0: $((X+1)/2)$, X ~Beta(36.72,40.78) ρ_∞: 1 (25%) or X ~Beta(4.54,2.35) γ_ρ:X ~N(y, MSE), $y=-2.79\rho_\infty - 4.32,\ MSE= 1.21$	X $\in$ [0.4,1]
	Fawning: ρ_0: $((X+1)/2)$, X ~Beta(15.01,18.04) ρ_∞: 1 (33%) or X ~Beta(4.25,2.72) γ_ρ:X ~N(y, MSE), $y=-2.79\rho_\infty - 4.32,\ MSE= 1.21$	X $\in$ [0.4,1]
	Prerut: ρ_0: $((X+1)/2)$, X ~Beta(7.60,10.17) ρ_∞: 1 (29%) or X ~Beta(2.87,1.22) γ_ρ:X ~N(y, MSE), $y=-2.79\rho_\infty - 4.32,\ MSE= 1.21$	
	Rut: ρ_0: $((X+1)/2)$, X ~Beta(10.79,15.13) ρ_∞: 1 (21%) or X ~Beta(4.64,2.76) γ_ρ:X ~N(y, MSE), $y=-2.79\rho_\infty - 4.32,\ MSE= 1.21$	X $\in$ [0.4,1]

		X ∈ [0.4,1] X ∈ [0.4,1] X ∈ [0.4,1]
Step length, Weibull distribution:	X ~ Wei(α_t, β_t) $\alpha_t = \alpha$ $\beta_t = \beta_0 + \gamma_\beta * d_{t,}$, d_t is distance from home range center CFL: Gestation: α_t: X ~LN(-0.048, 0.085) β_0: X~LN (4.74,0.25) γ_β: X~N (0.15,0.082) Fawning: α_t: X ~LN(-0.026, 0.099) β_0: X~LN (4.74,0.25) γ_β: X~N (0.12,0.077) Prerut: α_t: X ~LN(-0.044, 0.12) β_0: X~LN (4.82,0.36) γ_β: X~N (0.18,0.15) Rut: α_t: X ~LN(-0.077,0.058)	Estimated from field data, see Appendix C for details $\alpha \in [0, \infty)$ $\beta_0 \in [0, \infty)$ $\gamma_\beta \in (-\infty, \infty)$ $\beta_t \in [10,5241]$

	β_0: X~LN (4.70,0.23) γ_{β}: X~N (0.17,0.085) FFL: Gestation: α_t: X ~LN(-0.15,0.074) β_0: X~LN (6.595, 1.551) γ_{β}: X~N (0.16,0,084) Fawning: α_t: X ~LN(-0.026,0.11) β_0: X~LN (6.595, 1.551) γ_{β}: X~N (0,19,0.11), Prerut: α_t: X ~LN(-0.14,0.092) β_0: X~LN (6.595, 1.551) γ_{β}: X~N (0.25,0.11) Rut: α_t: X ~LN(-0.05, 0.09) β_0: X~LN (6.595, 1.551) γ_{β}: X~N (0.17,0.089)	

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