

# Bibliography

- Adriaensen, F., Chardon, J.P., De Blust, G., Swinnen, E., Villalba, S., Gulinck, H., Matthysen, E., 2003. The application of least-cost modelling as a functional landscape model. *Landscape and Urban Planning* 64, 233–247.
- Agresti, A., 2002. *Categorical Data Analysis*, vol. 359. John Wiley and Sons.
- Aitkin, M., 1991. Posterior bayes factors. *Journal of the Royal Statistical Society, Series B (Methodological)* 53, 111–142.
- Alho, J.M., 1990. Logistic regression in capture-recapture models. *Biometrics* 46, 623–635.
- Alpízar-Jara, R., Pollock, K.H., 1996. A combination line transect and capture-recapture sampling model for multiple observers in aerial surveys. *Environmental and Ecological Statistics* 3, 311–327.
- Amstrup, S.C., McDonald, T.L., Manly, B.F.J., 2005. *Handbook of Capture-Recapture Analysis*. Princeton University Press.
- Anderson, D.R., Burnham, K.P., White, G.C., Otis, D.L., 1983. Density estimation of small-mammal populations using a trapping web and distance sampling methods. *Ecology* 64, 674–680.
- Arnason, N.A., 1972. Parameter estimates from mark-recapture experiments on two populations subject to migration and death. *Researches on Population Ecology* 13, 97–113.
- Arnason, N.A., 1973. The estimation of population size, migration rates and survival in a stratified population. *Researches on Population Ecology* 15, 1–8.
- Arnason, A., Schwarz, C., Gerrard, J., 1991. Estimating closed population size and number of marked animals from sighting data. *Journal of Wildlife Management* 55, 716–730.
- Baddeley, A., Turner, R., 2005. Spatstat: an R package for analyzing spatial point patterns. *Journal of Statistical Software* 12, 1–42. ~~ISSN: 1548-7660~~.
- Bales, S., Hellgren, E., Leslie Jr., D., Hemphill Jr., J., 2005. Dynamics of a recolonizing population of black bears in the Ouachita Mountains of Oklahoma. *Wildlife Society Bulletin* 33, 1342–1351.
- Balme, G.A., Slotow, R., Hunter, L.T.B., 2010. Edge effects and the impact of non-protected areas in carnivore conservation: leopards in the Phinda-Mkhuze complex, South Africa. *Animal Conservation* 13, 315–323.

- Bartmann, R.M., White, G.C., Carpenter, L.H., Garrott, R.A., 1987. Aerial mark-recapture estimates of confined mule deer in Pinyon-Juniper woodland. *The Journal of Wildlife Management* 51, 41–46.
- Bayne, E., Hobson, K., 2002. Annual survival of adult American Redstarts and Oven-birds in the southern boreal forest. *The Wilson Bulletin* 114, 358–367.
- Becker, R.A., Wilks, A.R., Brownrigg, R., Minka, T.P., 2012. *Maps: Draw Geographical Maps*. R package version 2.2–5.
- Beier, P., Majka, D.R., Spencer, W.D., 2008. Forks in the road: choices in procedures for designing wildland linkages. *Conservation Biology* 22, 836–851.
- Belant, J., Van Stappen, J., Paetkau, D., 2005. American black bear population size and genetic diversity at Apostle Islands National Lakeshore. *Ursus* 16, 85–92.
- Berger, J., Liseo, B., Wolpert, R., 1999. Integrated likelihood methods for eliminating nuisance parameters. *Statistical Science* 14, 1–28.
- Besag, J., Kooperberg, C., 1995. On conditional and intrinsic autoregressions. *Biometrika* 82, 733–746.
- Best, N.G., Ickstadt, K., Wolpert, R.L., 2000. Spatial poisson regression for health and exposure data measured at disparate resolutions. *Journal of the American Statistical Association* 95, 1076.
- Bibby, C.J., Buckland, S.T., 1987. Bias of bird census results due to detectability varying with habitat. *Acta Ecologica* 8, 103–112.
- Bibby, C.J., Burgess, N.D., Hill, D.A., 1992. *Bird Census Techniques*. Academic Press, London, UK, p. 257.
- Bivand, R., Rundel, C. 2011. Rgeos: interface to geometry engine—open source (GEOS). R package version 0.1-8.
- Blair, W., 1940. A study of prairie deer-mouse populations in southern Michigan. *American Midland Naturalist* 24, 273–305.
- Bolker, B., 2008. *Ecological Models and Data in R*. Princeton University Press.
- Bondrup-Nielsen, S., 1983. Density estimation as a function of live-trapping grid and home range size. *Canadian Journal of Zoology* 61, 2361–2365.
- Borchers, D.L., 2012. A non-technical overview of spatially explicit capture-recapture models. *Journal of Ornithology* 152, 1–10.
- Borchers, D.L., Buckland, S.T., Zucchini, W., 2002. *Estimating Animal Abundance: Closed Populations*, vol. 13. Springer Verlag.
- Borchers, D.L., Efford, M.G., 2008. Spatially explicit maximum likelihood methods for capture-recapture studies. *Biometrics* 64, 377–385.
- Borchers, D.L., Zucchini, W., Fewster, R.M., 1998. Mark-recapture models for line transect surveys. *Biometrics* 54, 1207–1220.
- Boulanger, J., McLellan, B., 2001. Closure violation in DNA-based mark-recapture estimation of grizzly bear populations. *Canadian Journal of Zoology* 79, 642–651.
- Bowden, D.C. 1993. A simple technique for estimating population size. Technical Report 93/12, Department of Statistics, Colorado State University, Fort Collins, Colorado, USA.
- Bowden, D.C., Kufeld, R.C., 1995. Generalized mark-sight population size estimation applied to Colorado moose. *Journal of Wildlife Management* 59, 840–851.

- Box, G.E.P., Draper, N.R., 1959. A basis for the selection of a response surface design. *Journal of the American Statistical Association* 54, 622–654.
- Box, G.E.P., Draper, N.R., 1987. *Empirical Model-Building with Response Surfaces*. Wiley, New York.
- Boyce, M.S., McDonald, L.L., 1999. Relating populations to habitats using resource selection functions. *Trends in Ecology and Evolution* 14, 268–272.
- Brooks, S.P., Catchpole, E.A., Morgan, B.J.T., 2000. Bayesian animal survival estimation. *Statistical Science* 15, 357–376.
- Brownie, C., Hines, J.E., Nichols, J.D., Pollock, K.H., Hestbeck, J.B., 1993. Capture-recapture studies for multiple strata including non-Markovian transitions. *Biometrics* 49, 1173–1187.
- Buckland, S.T., 2004. *Advanced distance sampling*. Oxford University Press, USA.
- Buckland, S., Anderson, D., Burnham, K., Laake, J., Borchers, D., L., T., 2001. *Introduction to distance sampling: estimating abundance of biological populations*. Oxford University Press, Oxford, UK.
- Burnham, K.P., 1997. Distributional results for special cases of the Jolly-Seber model. *Communications in Statistics* 26, 1395–1409.
- Burnham, K.P., Anderson, D.R., 2002. *Model Selection and Multimodel Inference: A Practical Information-Theoretic Approach*. Springer Verlag.
- Burnham, K., Anderson, D., Laake, J. 1980. Estimation of density from line transect sampling of biological populations. *Wildlife Monographs* 72, 3–202.
- Burnham, K., Anderson, D., White, G., Brownie, C., Pollock, K., 1987. *Design and Analysis Methods for Fish Survival Experiments Based on Release-Recapture*. American Fisheries Society Monograph, vol. 5. American Fisheries Society, Bethesda Maryland, p. 737.
- Burnham, K.P., Overton, W.S., 1978. Estimation of the size of a closed population when capture probabilities vary among animals. *Biometrika* 65, 625.
- Burt, W., 1943. Territoriality and home range concepts as applied to mammals. *Journal of Mammalogy* 24, 346–352.
- Carlin, B.P., Chib, S., 1995. Bayesian model choice via Markov chain Monte Carlo methods. *Journal of the Royal Statistical Society, Series B* 57, 473–484.
- Casella, G., Berger, R.L., 2002. *Statistical Inference*. Duxbury Press.
- Casella, G., George, E.I., 1992. Explaining the Gibbs sampler. *American Statistician* 46, 167–174.
- Caswell, H., 1989. *Matrix Population Models*. Sinauer Association, Sunderland.
- Caswell, H., Werner, P.A., 1978. Transient behavior and life history analysis of teasel (*Dipsacus sylvestris* Huds.). *Ecology* 59, 53–66.
- Chandler, R.B., Royle, J.A., ~~in press~~, Spatially-explicit models for inference about density in unmarked or partially marked populations. *Annals of Applied Statistics*.
- Chandler, R.B., Royle, J.A., King, D., 2011. Inference about density and temporary emigration in unmarked populations. *Ecology* 92, 1429–1435.
- Clavel, J., Robert, A., Devictor, V., Julliard, R., 2008. Abundance estimation with a transient model under the robust design. *Journal of Wildlife Management* 72, 1203–1210.

- Clobert, J., Danchin, E., Dhondt, A., Nichols, J., 2001. *Dispersal*. Oxford.
- Cochran, W., 2007. *Sampling Techniques*. John Wiley & Sons, USA.
- Compton, B.W., McGarigal, K., Cushman, S.A., Gamble, L.R., 2007. A resistant-kernel model of connectivity for amphibians that breed in vernal pools. *Conservation Biology* 21, 788–799.
- Conde, D., Colchero, F., Zarza, H., Christensen, N., Sexton, J., Manterola, C., Chávez, C., Rivera, A., Azuara, D., Ceballos, G., 2010. Sex matters: modeling male and female habitat differences for jaguar conservation. *Biological Conservation* 143, 1980–1988.
- Conn, P.B., Cooch, E.G., 2009. Multistate capture-recapture analysis under imperfect state observation: an application to disease models. *Journal of Applied Ecology* 46, 486–492.
- Conroy, M.J., Carroll, J.P., 2009. *Quantitative Conservation of Vertebrates*. Wiley-Blackwell.
- Conroy, M.J., Runge, J.P., Barker, R.J., Schofield, M.R., Fonnesebeck, C.J., 2008. Efficient estimation of abundance for patchily distributed populations via two-phase, adaptive sampling. *Ecology* 89, 3362–3370.
- Converse, S.J., Royle, J.A., 2012. Dealing with incomplete and variable detectability in multi-year, multi-site monitoring of ecological populations. In: Gitzen, R.R., Millspaugh, J.J., Cooper, A.B., Licht, D.S. (Eds.), *Design and Analysis of Long-term Ecological Monitoring Studies*. Cambridge University Press, pp. 426–442.
- Converse, S., White, G., Block, W., 2006a. Small mammal responses to thinning and wildfire in ponderosa pine-dominated forests of the southwestern United States. *Journal of Wildlife Management* 70, 1711–1722.
- Converse, S., White, G., Farris, K., Zack, S., 2006b. Small mammals and forest fuel reduction: national-scale responses to fire and fire surrogates. *Ecological Applications* 16, 1717–1729.
- Cooch, E., White, G., 2006. Program MARK: A Gentle Introduction. Available online with the MARK programme, [p. 7](#).
- Cormack, R.M., 1964. Estimates of survival from the sighting of marked animals. *Biometrika* 51, 429–438.
- Coull, B.A., Agresti, A., 1999. The use of mixed logit models to reflect heterogeneity in capture-recapture studies. *Biometrics* 55, 294–301.
- Cox, D., 1955. Some statistical methods connected with series of events. *Journal of the Royal Statistical Society, Series B (Methodological)* 17, 129–164.
- Cressie, N., 1991. *Statistics for Spatial Data*. Wiley Series in Probability and Mathematical Statistics.
- Csardi, G., Nepusz, T., 2006. The igraph software package for complex network research. *International Journal of Complex Systems* 1695, 38.
- Cushman, S.A., Compton, B.W., McGarigal, K., 2010. Habitat fragmentation effects depend on complex interactions between population size and dispersal ability: modeling influences of roads, agriculture and residential development across a range of life-history characteristics. In: Cushman, S.A., Huettmann, F. (Eds.), *Spatial Complexity, Informatics, and Wildlife Conservation*, Springer, New York, pp. 369–385 (~~Chapter 20~~).

- Cushman, S.A., McKelvey, K.S., Hayden, J., Schwartz, M.K., 2006. Gene flow in complex landscapes: testing multiple hypotheses with causal modeling. *The American Naturalist* 168, 486–499.
- Dawson, D.K., Efford, M.G., 2009. Bird population density estimated from acoustic signals. *Journal of Applied Ecology* 46, 1201–1209.
- DeGraaf, R.M., Yamasaki, M., 2001. *New England Wildlife: Habitat, Natural History, and Distribution*. University Press of New England.
- Dellaportas, P., Forster, J., Ntzoufras, I., 2000. Bayesian variable selection using the Gibbs sampler. In: Dey, D., Ghosh, S., Mallick, B. (Eds.), *Generalized Linear Models: A Bayesian Perspective*. CRC Press, pp. 273–286.
- DeSante, D.F., Burton, K.M., Saracco, J.F., Walker, B.L., 1995. Productivity indices and survival rate estimates from MAPS, a continent-wide programme of constant-effort mist-netting in North America. *Journal of Applied Statistics* 22, 935–948.
- Dice, L.R., 1938. Some census methods for mammals. *Journal of Wildlife Management* 2, 119–130.
- Dice, L.R., 1941. Methods for estimating populations of mammals. *Journal of Wildlife Management* 5, 398–407.
- Diggle, P.J. 2003. *Statistical Analysis of Spatial Point Processes*, second ed. Arnold, London.
- Dijkstra, E.W., 1959. A note on two problems in connexion with graphs. *Numerische Mathematik* 1, 269–271.
- Dillon, A., Kelly, M., 2007. Ocelot *Leopardus pardalis* in Belize: the impact of trap spacing and distance moved on density estimates. *Oryx* 41, 469–477.
- Dixon, P., 2002. Bootstrap resampling. In: *Encyclopedia of Environmetrics*. John Wiley & Sons.
- Dorazio, R.M., 2007. On the choice of statistical models for estimating occurrence and extinction from animal surveys. *Ecology* 88, 2773–2782.
- Dorazio, R.M., Royle, J.A., 2003. Mixture models for estimating the size of a closed population when capture rates vary among individuals. *Biometrics* 59, 351–364.
- Dormann, C.F., McPherson, J.M., Araújo, M., Bivand, R., Bolliger, J., Carl, G., Davies, G., R., Hirzel, A., Jetz, W., Daniel Kissling, W., et al., 2007. Methods to account for spatial autocorrelation in the analysis of species distributional data: a review. *Ecography* 30, 609–628.
- Durban, J., Elston, D., 2005. Mark-recapture with occasion and individual effects: abundance estimation through Bayesian model selection in a fixed dimensional parameter space. *Journal of Agricultural, Biological, and Environmental Statistics* 10, 291–305.
- Eddelbuettel, D., François, R., 2011. Rcpp seamless R and C++ integration. *Journal of Statistical Software* 40, 1–18.
- Efford, M.G., 2011a. SECR: spatially explicit capture-recapture models. R package version 2.3-1.
- Efford, M.G., 2004. Density estimation in live-trapping studies. *Oikos* 106, 598–610.
- Efford, M.G., 2011b. Estimation of population density by spatially explicit capture-recapture analysis of data from area searches. *Ecology* 92, 2202–2207.

- Efford, M.G., 2012. Spatially explicit capture-recapture for bear researchers and managers, Western Black Bear Workshop. Coeur d'Alene, ID.
- Efford, M.G., Dawson, D.K., 2009. Effect of distance-related heterogeneity on population size estimates from point counts. *The Auk* 126, 100–111.
- Efford, M.G., Dawson, D.K. 2010. SECR for acoustic data, <<http://www.otago.ac.nz/density/pdfs/secr-sound.pdf>> (updated May 14 2012).
- Efford, M.G., Borchers, D.L., Byrom, A.E. 2009a. Density estimation by spatially explicit capture-recapture: likelihood-based methods. *Modeling Demographic Processes in Marked Populations*. Springer Verlag, US, pp. 255–269.
- Efford, M.G., Dawson, D.K., Borchers, D.L., 2009b. Population density estimated from locations of individuals on a passive detector array. *Ecology* 90, 2676–2682.
- Efford, M.G., Dawson, D.K., Robbins, C.S., 2004. DENSITY: software for analysing capture-recapture data from passive detector arrays. *Animal Biodiversity and Conservation* 27, 217–228.
- Efford, M.G., Fewster, R.M., 2012. Estimating population size by spatially explicit capture-recapture. *Oikos*.
- Efford, M.G., Warburton, B., Coleman, M.C., Barker, R.J., 2005. A field test of two methods for density estimation. *Wildlife Society Bulletin* 33, 731–738.
- Epps, C.W., Palsbøll, P.J., Wehausen, J.D., Roderick, G.K., Ramey, R.R. I.I., McCullough, D.R., 2005. Highways block gene flow and cause a rapid decline in genetic diversity of desert bighorn sheep. *Ecology Letters* 8, 1029–1038.
- Epps, C.W., Wehausen, J.D., Bleich, V.C., Torres, S.G., Brashares, J.S., 2007. Optimizing dispersal and corridor models using landscape genetics. *Journal of Applied Ecology* 44, 714–724.
- Farnsworth, G.L., Pollock, K.H., Nichols, J.D., Simons, T.R., Hines, J.E., Sauer, J.R., 2002. A removal model for estimating detection probabilities from point-count surveys. *Auk* 119, 414–425.
- Fedorov, V.V., 1972. *Theory of Optimal Experiments*. Academic Press, New York
- Fedorov, V.V., Hackl, P., 1997. *Model-Oriented Design of Experiments*. Springer.
- Fienberg, S.E., Johnson, M.S., Junker, B.W., 1999. Classical multilevel and Bayesian approaches to population size estimation using multiple lists. *Journal of the Royal Statistical Society of London A* 163, 383–405.
- Fiske, I.J., Chandler, R.B., 2011. Unmarked: an R package for fitting hierarchical models of wildlife occurrence and abundance. *Journal of Statistical Software* 43, 1–23.
- Forester, J.D., Im, H.K., Rathouz, P.J., 2009. Accounting for animal movement in estimation of resource selection functions: sampling and data analysis. *Ecology* 90, 3554–3565.
- Forester, J.D., Ives, A.R., Turner, M.G., Anderson, D.P., Fortin, D., Beyer, H.L., Smith, D.W., Boyce, M.S., 2007. State-space models link elk movement patterns to landscape characteristics in Yellowstone National Park. *Ecological Monographs* 77, 285–299.

- Fortin, D., Beyer, H.L., Boyce, M.S., Smith, D.W., Duchesne, T., Mao, J.S., 2005. Wolves influence elk movements: behavior shapes a trophic cascade in Yellowstone National Park. *Ecology* 86, 1320–1330.
- Foster, R.J., Harmsen, B.J., 2012. A critique of density estimation from camera-trap data. *Journal of Wildlife Management* 76, 224–236.
- Fowler, C., 1981. Density dependence as related to life history strategy. *Ecology* 62, 602–610.
- François, R., Eddelbuettel, D., Bates, D., 2011. RcppArmadillo: Rcpp integration for Armadillo templated linear algebra library. R package version 0.2-25.
- Frary, V., Duchamp, J., Maehr, D., Larkin, J., 2011. Density and distribution of a colonizing front of the American black bear *Ursus americanus*. *Wildlife Biology* 17, 404–416.
- Fujiwara, M., Anderson, K., Neubert, M., Caswell, H., 2006. On the estimation of dispersal kernels from individual mark-recapture data. *Environmental and Ecological Statistics* 13, 183–197.
- García-Alaníz, N., Naranjo, E.J., Mallory, F.F., 2010. Hair-snares: a non-invasive method for monitoring felid populations in the Selva Lacandona. Mexico, *Tropical Conservation Science* 3, 403–411.
- Gardner, B., Reppucci, J., Lucherini, M., Royle, J., 2010a. Spatially explicit inference for open populations: estimating demographic parameters from camera-trap studies. *Ecology* 91, 3376–3383.
- Gardner, B., Royle, J.A., Wegan, M.T., 2009. Hierarchical models for estimating density from DNA mark-recapture studies. *Ecology* 90, 1106–1115.
- Gardner, B., Royle, J.A., Wegan, M.T., Rainbolt, R.E., Curtis, P.D., 2010b. Estimating black bear density using DNA data from hair snares. *Journal of Wildlife Management* 74, 318–325.
- Garshelis, D.L., Hristienko, H., 2006. State and provincial estimates of American black bear numbers versus assessments of population trend. *Ursus* 17, 1–7.
- Gelfand, A., Smith, A., 1990. Sampling-based approaches to calculating marginal densities. *Journal of the American Statistical Association* 85, 398–409.
- Gelman, A., 2006. Prior distributions for variance parameters in hierarchical models. *Bayesian Analysis* 1, 515–533.
- Gelman, A., Carlin, J.B., Stern, H.S., Rubin, D.B., 2004. *Bayesian Data Analysis*, second ed. CRC/Chapman & Hall, Boca Raton, Florida, USA.
- Gelman, A., Meng, X.L., Stern, H., 1996. Posterior predictive assessment of model fitness via realized discrepancies. *Statistica Sinica* 6, 733–759.
- Geman, S., Geman, D., 1984. Stochastic relaxation, Gibbs distributions, and the Bayesian restoration of images. *IEEE Transactions on Pattern Analysis and Machine Intelligence* PAMI-6, 721–741.
- Genz, A.S., Meyer, M.R., Lumley, T., Maechler, M., 2007. The adapt package. R package version 1.0-4.
- Gerlach, G., Musolf, K., 2000. Fragmentation of landscape as a cause for genetic subdivision in bank voles. *Conservation Biology* 14, 1066–1074.
- Gilks, W., Wild, P., 1992. Adaptive rejection sampling for Gibbs sampling. *Applied Statistics* 41, 337–348.



- Gilks, W.R., Thomas, A., Spiegelhalter, D.J., 1994. A Language and Program for Complex Bayesian Modelling. *Journal of the Royal Statistical Society. Series D (The Statistician)* 43, 169–177 (~~Article Type: primary article/ Issue Title: Special Issue: Conference on Practical Bayesian Statistics, 1992 (3)/ Full publication date: 1994/ Copyright 1994 Royal Statistical Society~~).
- Gilroy, J., Virzi, T., Boulton, R.L., Lockwood, J., 2012. A new approach to the apparent survival problem: estimating true survival rates from mark-recapture studies. *Ecology* 93, 1509–1516.
- Gimenez, O., Rossi, V., Choquet, R., Dehais, C., Doris, B., Varella, H., Vila, J.P., Pradel, R., 2007. State-space modelling of data on marked individuals. *Ecological Modelling* 206, 431–438.
- Gopalaswamy, A.M., 2012. Capture-recapture models, spatially explicit. In: El-Shaarawi, A.H., Piegorisch, W. (Eds.), *Encyclopedia of Environmentrics*, second ed. John Wiley & Sons Ltd, Chichester, UK.
- Gopalaswamy, A.M., Royle, J.A., Hines, J.E., Singh, P., Jathanna, D., Kumar, N., Karanth, K.U., 2012a. Program SPACECAP: Software for estimating animal density using spatially explicit capture–recapture models. *Methods in Ecology and Evolution* 3 ~~(6)~~, 1067–1072.
- Gopalaswamy, A.M., Royle, J.A., Delampady, M., Nichols, J.D., Karanth, K.U., Macdonald, D.W., 2012b. Density estimation in tiger populations: combining information for strong inference. *Ecology* 93, 1741–1751.
- Grant, E.H.C., Nichols, J.D., Lowe, W.H., Fagan, W.F., 2010. Use of multiple dispersal pathways facilitates amphibian persistence in stream networks. *Proceedings of the National Academy of Sciences* 107, 6936–6940.
- Graves, T.A., Chandler, R.B., Royle, J.A., Beier, P., 2013. Estimating landscape resistance to dispersal (in review).
- Green, P., Richardson, S., 2002. Hidden Markov models and disease mapping. *Journal of the American Statistical Association* 97, 1055–1070.
- Greig-Smith, P., 1964. *Quantitative, Plant Ecology*. Butterworths (Washington).
- Grimm, V., Revilla, E., Berger, U., Jeltsch, F., Mooij, W., Railsback, S., Thulke, H.-H., Weiner, J., Wiegand, T., DeAngelis, D., 2005. Pattern-oriented modeling of agent-based complex systems: lessons from ecology. *Science* 310, 987–991.
- Hahn, T., Bouvier, A., Kiêu, K., 2010. R2Cuba: multidimensional numerical integration. R package version 1.0-6.
- Hall, R.J., Henry, P.F.P., Bunck, C.M., 1999. Fifty-year trends in a box turtle population in Maryland. *Biological Conservation* 88, 165–172.
- Hanks, E.M., Hooten, M.B., 2013. Circuit theory and model-based inference for landscape connectivity. *Journal of the American Statistical Association* 108, 22–33.
- Hanski, I.A., 1999. *Metapopulation Ecology*. Oxford University Press.
- Hardin, R.H., Sloane, N.J.A., 1993. A new approach to the construction of optimal designs. *Journal of Statistical Planning and Inference* 37, 339–369.
- Hastings, W., 1970. Monte Carlo sampling methods using Markov chains and their applications. *Biometrika* 57, 97–109.



- Hawkins, C.E., Racey, P.A., 2005. Low population density of a tropical forest carnivore, *Cryptoprocta ferox*: implications for protected area management, *Oryx* 39, 35–43.
- Hayes, R.J., Buckland, S.T., 1983. Radial distance models for the line transect method. *Biometrics* 39, 29–42.
- Hayne, D., 1950. Apparent home range of *Microtus* in relation to distance between traps. *Journal of Mammalogy* 31, 26–39.
- Hayne, D.W., 1949. An examination of the strip census method for estimating animal populations. *Journal of Wildlife Management* 13, 145–157.
- Hedley, S.L., Buckland, S.T., Borchers, D.L., 1999. Spatial modelling from line transect data. *Journal of Cetacean Research and Management* 1, 255–264.
- Hendriks, I., Tenan, S., Tavecchia, G., Marbá, N., Jordá, G., Deudero, S., Álvarez, E., Duarte, C.M., 2013. Boat anchoring impacts coastal populations of the pen shell, the largest bivalve in the Mediterranean. *Biological Conservation* 160, 105–113.
- Hestbeck, J.B., Malecki, R.A., 1989. Mark-resight estimate of Canada Goose mid-winter numbers. *Journal of Wildlife Management* 53, 749–752.
- Hijmans, R.J., van Etten, J., 2012. Raster: geographic analysis and modeling with raster data. R package version 1.9-67.
- Hines, J.E., Kendall, W.L., Nichols, J.D., 2003. On the use of the robust design with transient capture-recapture models. *Auk* 120, 1151–1158.
- Holdenried, R., 1940. A population study of the long-eared chipmunk (*Eutamias quadrimaculatus*) in the central Sierra Nevada. *Journal of Mammalogy* 21, 405–411.
- Hooten, M., Johnson, D., Hanks, E., Lowry, J., 2010. Agent-based inference for animal movement and selection. *Journal of Agricultural, Biological, and Environmental Statistics* 15, 523–538.
- Hooten, M., Wikle, C., 2010. Statistical agent-based models for discrete spatio-temporal systems. *Journal of the American Statistical Association* 105, 236–248.
- Hornik, K., 2011. The R FAQ. ISBN 3-900051-08-9.
- Huggins, R.M., 1989. On the statistical analysis of capture experiments. *Biometrika* 76, 133.
- Hurlbert, S.H., 1984. Pseudoreplication and the design of ecological field experiments. *Ecological monographs* 54, 187–211.
- Illian, J., Penttinen, A., Stoyan, H., Stoyan, D., 2008. *Statistical Analysis and Modelling of Spatial Point Patterns*. Wiley.
- Ivan, J., 2012. Density, demography, and seasonal movements of snowshoe hares in central Colorado, PhD Thesis. Colorado State University.
- Ivan, J., White, G., Shenk, T., 2013a. Using auxiliary telemetry information to estimate animal density from capture-recapture data. *Ecology* 94, 809–816.
- Ivan, J., White, G., Shenk, T., 2013b. Using simulation to compare methods for estimating density from capture-recapture data. *Ecology* 94, 817–826.
- Jackson, R., Roe, J., Wangchuk, R., Hunter, D., 2006. Estimating snow leopard population abundance using photography and capture-recapture techniques. *Wildlife Society Bulletin* 34, 772–781.

- Jennelle, C.S., Runge, M.C., MacKenzie, D.I., 2002. The use of photographic rates to estimate densities of tigers and other cryptic mammals: a comment on misleading conclusions. *Animal Conservation* 5, 119–120.
- Jett, D.A., Nichols, J.D., 1987. A field comparison of nested grid and trapping web density estimators. *Journal of Mammalogy* 68, 888–892.
- Jhala, Y.V., Qureshi, Q., Gopal, R., Sinha, P.R., 2011. Status of tigers, co-predators and prey in India. Technical Report. National Tiger Conservation Authority, Government of India, New Delhi and Wildlife Institute of India, Dehradun.
- Johnson, 2010. A model-based approach for making ecological inference from distance sampling data. *Biometrics* 66, 310–318.
- Johnson, D., 1980. The comparison of usage and availability measurements for evaluating resource preference. *Ecology* 61, 65–71.
- Johnson, D.H., 1999. The insignificance of statistical significance testing. *Journal of Wildlife Management* 63, 763–772.
- Johnson, D.S., London, J.M., Lea, M.A., Durban, J., 2008a. Continuous-time correlated random walk model for animal telemetry data. *Ecology* 89, 1208–1215.
- Johnson, D.S., Thomas, D.L., Ver Hoef, J.M., Christ, A., 2008b. A general framework for the analysis of animal resource selection from telemetry data. *Biometrics* 64, 968–976.
- Jolly, G.M., 1965. Explicit estimates from capture-recapture data with both death and dilution-stochastic model. *Biometrika* 52, 225–247.
- Jonsen, I.D., Flemming, J.M., Myers, R.A., 2005. Robust state-space modeling of animal movement data. *Ecology* 86, 2874–2880.
- Kadane, J.B., Lazar, N.A., 2004. Methods and criteria for model selection. *Journal of the American Statistical Association* 99, 279–290.
- Karanth, K.U., 1995. Estimating tiger *Panthera tigris* populations from camera-trap data using capture-recapture models. *Biological Conservation* 71, 333–338.
- Karanth, K.U., Nichols, J.D., 1998. Estimation of tiger densities in India using photographic captures and recaptures. *Ecology* 79, 2852–2862.
- Karanth, K.U., Nichols, J.D., 2000. Ecological status and conservation of tigers in India, WCS, US Fish and Wildlife Service. Centre for Wildlife Studies, Bangalore, India, p. 123.
- Karanth, K.U., Nichols, J.D., 2002. Monitoring tigers and their prey: a manual for researchers, managers and conservationists in ~~(T)ropical (A)sia~~ <sup>(T)ropical (A)sia</sup>. Centre for Wildlife Studies, Bangalore, India.
- Kass, R., Wasserman, L., 1996. The selection of prior distributions by formal rules. *Journal of the American Statistical Association* 91, 1343–1370.
- Kays, R.W., Slauson, K.M., 2008. Remote cameras. In: Long, R.A., MacKay, P., Zielinski, W.J., Ray, J.C. (Eds.), *Noninvasive Survey Methods for Carnivores*. Island Press, Washington, DC, pp. 110–140.
- Kelly, M., Noss, A., Di Bitetti, M., Maffei, L., Arispe, R., Paviolo, A., De Angelo, C., Di Blanco, Y., 2008. Estimating puma densities from camera trapping across three study sites: Bolivia, Argentina, and Belize. *Journal of Mammalogy* 89, 408–418.
- Kendall, K.C., Stetz, J.B., Boulanger, J., Macleod, A.C., Paetkau, D., White, G.C., 2009. Demography and genetic structure of a recovering grizzly bear population. *Journal of Wildlife Management* 73, 3–16.

- Kendall, W.L., 1999. Robustness of closed capture-recapture methods to violations of the closure assumption. *Ecology* 80, 2517–2525.
- Kendall, W.L., Nichols, J.D., Hines, J.E., 1997. Estimating temporary emigration using capture-recapture data with Pollock's Robust design. *Ecology* 78, 563–578.
- Kéry, M., 2008. Estimating abundance from bird counts: binomial mixture models uncover complex covariate relationships. *Auk* 125, 336–345.
- Kéry, M., 2010. Introduction to WinBUGS for Ecologists: A Bayesian Approach to Regression, ANOVA and Related Analyses. Academic Press.
- Kéry, M., 2011. Towards the modelling of true species distributions. *Journal of Biogeography* 38, 617–618.
- Kéry, M., Gardner, B., Monnerat, C., 2010. Predicting species distributions from checklist data using site-occupancy models. *Journal of Biogeography* 37, 1851–1862.
- Kéry, M., Gardner, B., Stoeckle, T., Weber, D., Royle, J.A., 2011. Use of spatial capture-recapture modeling and DNA data to estimate densities of elusive animals. *Conservation Biology* 25, 356–364.
- Kéry, M., Royle, J.A., Schmid, H., 2005. Modeling avian abundance from replicated counts using binomial mixture models. *Ecological Applications* 15, 1450–1461.
- Kéry, M., Schaub, M., 2012. Bayesian Population Analysis Using WinBugs. Academic Press.
- Kiefer, J., 1959. Optimal experimental designs (with discussion). *Journal of the Royal Statistical Society, Series B* 21, 272–319.
- King, R., Brooks, S., 2001. On the Bayesian analysis of population size. *Biometrika* 88, 317–336.
- King, R., Brooks, S., Coulson, T., 2008. Analyzing complex capture-recapture data in the presence of individual and temporal covariates and model uncertainty. *Biometrics* 64, 1187–1195.
- Knape, Jonas, de Valpine, P., 2012. Are patterns of density dependence in the Global Population Dynamics Database driven by uncertainty about population abundance? *Ecology Letters* 15, 17–23.
- Knaus, J., 2010. Snowfall: easier cluster computing (based on snow). R package version 1.8-4.
- Koehler, G.M., Pierce, D.J., 2003. Black bear home-range sizes in Washington: climatic, vegetative, and social influences. *Journal of Mammalogy* 84, 81–91 (~~ArticleType: research article/ Full publication date: Feb., 2003/ Copyright 2003 American Society of Mammalogists~~).
- Kohn, M., York, E., Kamradt, D., Haught, G., Sauvajot, R., Wayne, R., 1999. Estimating population size by genotyping faeces. *Proceedings of the Royal Society of London. Series B: Biological Sciences* 266, 657–663.
- Krebs, C.J., 1999. *Ecological Methodology*. Benjamin/Cummings, Menlo Park, CA.
- Kucera, T.E., Barrett, R.H., 2011. A history of camera trapping. In: O'Connell, A.F., Nichols, J.D., Karanth, K.U. (Eds.), *Camera Traps in Animal Ecology Methods and Analyses*. Springer, Toyoko, Japan, pp. 9–26.
- Kuo, L., Mallick, B., 1998. Variable selection for regression models, *Sankhyā: The Indian Journal of Statistics, Series B* 60, 65–81.

- Laird, N.M., Ware, J.H., 1982. Random-effects models for longitudinal data. *Biometrics* 38, 963–974.
- Langtimm, C.A., Dorazio, R.M., Stith, B.M., Doyle, T.J., 2011. New aerial survey and hierarchical model to estimate manatee abundance. *Journal of Wildlife Management* 75, 399–412.
- Le Cam, L., 1990. Maximum likelihood: an introduction. *International Statistical Review/Revue Internationale de Statistique* 58, 153–171.
- Lebreton, J.D., Burnham, K.P., Clobert, J., Anderson, D.R., 1992. Modeling survival and testing biological hypotheses using marked animals: a unified approach with case studies. *Ecological Monographs* 62, 67–118.
- Leggett, W.C., Carscadden, J.E., 1978. Latitudinal variation in reproductive characteristics of American shad (*Alosa sapidissima*): evidence for population specific life history strategies in fish. *Journal of the Fisheries Research Board of Canada* 35, 1469–1477.
- Lele, S.R., Keim, J.L., 2006. Weighted distributions and estimation of resource selection probability functions. *Ecology* 87, 3021–3028.
- Lele, S.R., Moreno, M., Bayne, E., 2012. Dealing with detection error in site occupancy surveys: what can we do with a single survey? *Journal of Plant Ecology* 5, 22–31.
- Lele, S.R., Nadeem, K., Schmuland, B., 2010. Estimability and likelihood inference for generalized linear mixed models using data cloning. *Journal of the American Statistical Association* 105, 1617–1625.
- Leonard, J.B.K., McCormick, S.D., 1999. Effects of migration distance on whole-body and tissue-specific energy use in American shad (*Alosa sapidissima*). *Canadian Journal of Fisheries and Aquatic Sciences* 56, 1159–1171.
- Lewin-Koh, N.J., Bivand, R., contributions by Edzer J. Pebesma, Archer, E., Baddeley, A., Bibiko, H.-J., Dray, S., Forrest, D., Friendly, M., Giraudoux, P., Golicher, D., Rubio, V.G., Hausmann, P., Hufthammer, K.O., Jagger, T., Luque, S.P., MacQueen, D., Niccolai, A., Short, T., Stabler, B., Turner, R., 2011. Maptools: Tools for reading and handling spatial objects. R package version 0.8-10.
- Lichstein, J.W., Simons, T.R., Shriener, S.A., Franzreb, K.E., 2002. Spatial autocorrelation and autoregressive models in ecology. *Ecological Monographs* 72, 445–463.
- Link, W., 2003. Nonidentifiability of population size from capture-recapture data with heterogeneous detection probabilities. *Biometrics* 59, 1123–1130.
- Link, W.A., in [review](#), A cautionary note on the discrete uniform prior for the binomial  $N$ .
- Link, W.A., Barker, R.J., 1994. Density estimation using the trapping web design: a geometric analysis. *Biometrics* 50, 733–745.
- Link, W.A., Barker, R.J., 2005. Modeling association among demographic parameters in analysis of open population capture-recapture data. *Biometrics* 61, 46–54.
- Link, W.A., Barker, R.J., 2006. Model weights and the foundations of multimodel inference. *Ecology* 87, 2626–2635.
- Link, W.A., Barker, R.J., 2010. *Bayesian Inference: With Ecological Applications*. Academic Press, London, UK.

- Link, W.A., Eaton, M.J., 2011. On thinning of chains in MCMC. *Methods in Ecology and Evolution* 3, 112–115.
- Link, W.A., Yoshizaki, J., Bailey, L.L., Pollock, K.H., 2010. Uncovering a latent multinomial: analysis of ~~mark-recapture~~ data with misidentification. *Biometrics* 66, 178–185.
- Liu, Wu, 1999. Parameter expansion for data augmentation. *Journal of American Statistical Association* 94, 1264–1274.
- Lukacs, P.M., Burnham, K.P., 2005. Estimating population size from DNA-based closed capture-recapture data incorporating genotyping error. *Journal of Wildlife Management* 69, 396–403.
- Lunn, D., Spiegelhalter, D., Thomas, A., Best, N., 2009. The BUGS project: evolution, critique, and future directions. *Statistics in Medicine* 28, 3049–3067.
- Lunn, D.J., Thomas, A., Best, N., Spiegelhalter, D., 2000. WinBUGS-a Bayesian modelling framework: concepts, structure, and extensibility. *Statistics and Computing* 10, 325–337.
- Mace, R., Minta, S., Manley, T., Aune, K., 1994. Estimating grizzly bear population size using camera sightings. *Wildlife Society Bulletin* 22, 74–83.
- MacEachern, S.N., Berliner, L.M., 1994. Subsampling the Gibbs sampler. *American Statistician* 48, 188–190.
- MacKay, P., Smith, D.A., Long, R.A., Parker, M., ~~Long, R.A., MacKay, P., Zielinski, W.J., Ray, J.C.~~, 2008. Scat detection dogs. *Noninvasive survey methods for carnivores*, 183–222.
- MacKenzie, D.I., Nichols, J.D., Lachman, G.B., Droege, S., Royle, J.A., Langtimm, C.A., 2002. Estimating site occupancy rates when detection probabilities are less than one. *Ecology* 83, 2248–2255.
- MacKenzie, D.I., Nichols, J.D., Royle, J.A., Pollock, K.H., Bailey, L.L., Hines, J.E., 2006. *Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence*. Academic Press.
- Maffei, L., Noss, A.J., 2008. How small is too small? Camera trap survey areas and density estimates for ocelots in the Bolivian Chaco. *Biotropica* 40, 71–75.
- Magoun, A.J., Long, C.D., Schwartz, M.K., Pilgrim, K.L., Lowell, R.E., Valkenburg, P., 2011. Integrating motion-detection cameras and hair snags for wolverine identification. *Journal of Wildlife Management* 75, 731–739.
- Manel, S., Schwartz, M.K., Luikart, G., Taberlet, P., 2003. Landscape genetics: combining landscape ecology and population genetics. *Trends in Ecology and Evolution* 18, 189–197.
- Manly, B., McDonald, L., Thomas, D., McDonald, T., Erickson, W., 2002. *Resource Selection by Animals: Statistical Design and Analysis for Field Studies*, second ed. Springer.
- Marques, T., Buckland, S., Borchers, D., Tosh, D., McDonald, R., 2010. Point transect sampling along linear features. *Biometrics* 66, 1247–1255.
- Marques, T., Thomas, L., Ward, J., DiMarzio, N., Tyack, P., 2009. Estimating cetacean population density using fixed passive acoustic sensors: an example with Blainville's beaked whales. *Journal of the Acoustical Society of America* 125, 1982.

- Marques, T.A., Thomas, L., Royle, J.A., 2011. A hierarchical model for spatial capture-recapture data: comment. *Ecology* 92, 526–528.
- Matechou, E., Morgan, B.J.T., Pledger, S., Collazo, J.A., Lyons, J.E., 2013. Integrated analysis of capture-recapture-resighting data and counts of unmarked birds at stop-over sites. *Journal of Agricultural, Biological, and Environmental Statistics* 18, 120–135.
- Matthysen, E., 2005. Density-dependent dispersal in birds and mammals. *Ecography* 28, 403–416.
- McCarthy, M.A., 2007. *Bayesian Methods for Ecology*. Cambridge University Press, Cambridge.
- McClintock, B., Hoeting, J., 2010. Bayesian analysis of abundance for binomial sighting data with unknown number of marked individuals. *Environmental and Ecological Statistics* 17, 317–332.
- McClintock, B., King, Thomas, Matthiopoulos, McConnell, Morales, 2012. A general discrete-time modeling framework for animal movement using multi-state random walks. *Ecological Monographs* 82, 335–349.
- McClintock, B., White, G., 2012. From NOREMARK to MARK: software for estimating demographic parameters using mark-resight methodology. *Journal of Ornithology* 152, 641–650.
- McClintock, B., White, G., Antolin, M., Tripp, D., 2009a. Estimating abundance using mark-resight when sampling is with replacement or the number of marked individuals is unknown. *Biometrics* 65, 237–246.
- McClintock, B., White, G., Burnham, K., 2006. A robust design mark-resight abundance estimator allowing heterogeneity in resighting probabilities. *Journal of Agricultural, Biological, and Environmental Statistics* 11, 231–248.
- McClintock, B.T., Conn, P., Alonso, R., Crooks, K.R., 2013. Integrated modeling of bilateral photo-identification data in mark-recapture analyses. *Ecology*. <http://dx.doi.org/10.1890/12-1613.1>.
- McClintock, B.T., White, G.C., 2009. A less field-intensive robust design for estimating demographic parameters with markresight data. *Ecology* 90, 313–320.
- McClintock, B.T., White, G.C., Burnham, K.P., Pryde, M.A., 2009b. A generalized mixed effects model of abundance for mark-resight data when sampling is without replacement. In: Thomson, D. (Ed.), *Modeling Demographic Processes in Marked Populations*. Springer, New York, pp. 271–289.
- McCullagh, P., Nelder, J.A., 1989. *Generalized Linear Models*. Chapman & Hall/CRC.
- McRae, B.H., Beier, P., 2007. Circuit theory predicts gene flow in plant and animal populations. *Proceedings of the National Academy of Sciences* 104, 19885–19890.
- McRae, B.H., Dickson, B.G., Keitt, T.H., Shah, V.B., 2008. Using circuit theory to model connectivity in ecology, evolution, and conservation. *Ecology* 89, 2712–2724.
- Metropolis, N., Rosenbluth, A., Rosenbluth, M., Teller, A., Teller, E., et al., 1953. Equation of state calculations by fast computing machines. *Journal of Chemical Physics* 21, 1087–1092.

- Metropolis, N., Ulam, S., 1949. The Monte Carlo method. *Journal of the American Statistical Association* 44, 335–341.
- Meyer, R.K., Nachtsheim, C.J., 1995. The coordinate-exchange algorithm for construction exact optimal experimental designs. *Technometrics* 37 (4), 60–69.
- Millar, R.B., 2009. Comparison of hierarchical Bayesian models for overdispersed count data using DIC and Bayes' factors. *Biometrics* 65, 962–969.
- Mills, L.S., Citta, J.J., Lair, K.P., Schwartz, M.K., Tallmon, D.A., 2000. Estimating animal abundance using noninvasive DNA sampling: promise and pitfalls. *Ecological Applications* 10, 283–294.
- Minta, S., Mangel, M., 1989. A simple population estimate based on simulation for capture-recapture and capture-resight data. *Ecology* 70, 1738–1751.
- Mitchell, T.J., 1974. An algorithm for the construction of D-optimal experimental designs. *Technometrics* 16, 203–210.
- Mohr, C., 1947. Table of equivalent populations of North American small mammals. *American Midland Naturalist* 37, 223–249.
- Molinari-Jobin, A., Kéry, M., Marboutin, E., Marucco, F., Zimmermann, F., Molinari, P., Frick, H., Wölfl, S., Bled, F., Breitenmoser-Würsten, C., Fuxjäger, C., Huber, T., I., K., Kos, I., Manfred Wölfl, M., Breitenmoser, U., 2013. Mapping range dynamics from opportunistic data: spatio-temporal distribution modeling of lynx *Lynx lynx* L. in the Alps. (unpublished manuscript).
- Mollet, P., Kéry, M., Gardner, B., Pasinelli, G., A, R.J., in review. Population size estimation for capercaillie (*Tetrao urogallus* L.) using DNA-based individual recognition and spatial capture-recapture models.
- Morrison, M.L., Strickland, M.D., Block, W.M., Collier, B.A., Peterson, M.J., 2008. *Wildlife Study Design*. Springer.
- Müller, W.G., 2007. *Collecting Spatial Data: Optimum Design of Experiments for Random Fields*. Springer.
- Murdoch, W.W., 1994. Population redulation in theory and practice. *Ecology* 75, 271–287.
- Neal, A., White, G., Gill, R., Reed, D., Olterman, J., 1993. Evaluation of mark-resight model assumptions for estimating mountain sheep numbers. *Journal of Wildlife Management* 57, 436–450.
- Neal, A.K. 1990. Evaluation of Mark-Resight Population Estimates using Simulations and Field Data from Mountain Sheep. MS Thesis, Colorado State University, Fort Collins, Colorado, USA.
- Neal, R., 2003. Slice sampling. *Annals of Statistics* 31, 705–741.
- Nelder, J.A., Wedderburn, R.W.M., 1972. Generalized linear models, *Journal of the Royal Statistical Society. Series A (General)* 135, 370–384.
- Nichols, J., Pollock, K., 1990. Estimation of recruitment from immigration versus in situ reproduction using Pollock's robust design. *Ecology* 71, 21–26.
- Nichols, J., Thomas, L., Conn, P., 2009. Inferences about landbird abundance from count data: recent advances and future directions. *Modeling Demographic Processes in Marked Populations*, 201–235.



- Nichols, J.D., Hines, J.E., Lebreton, J.-D., Pradel, R., 2000a. Estimation of contributions to population growth: a reverse-time capture-recapture approach. *Ecology* 81 ~~(2)~~, 3362–3376.
- Nichols, J.D., Hines, J.E., Pollock, K.H., Hinz, R.L., Link, W.A., 1994. Estimating breeding proportions and testing hypotheses about costs of reproduction with capture-recapture data. *Ecology* 75, 2052–2065.
- Nichols, J.D., Hines, J.E., Sauer, J.R., Fallon, F.W., Fallon, J.E., Heglund, P.J., 2000b. A double-observer approach for estimating detection probability and abundance from point counts. *Auk* 117, 393–408.
- Nichols, J.D., Karanth, K.U., 2002. Statistical concepts: assessing spatial distributions. In: Karanth, K.U., Nichols, J.D., (Eds.), *Monitoring tigers and their prey: a manual for researchers, managers and conservationists in Tropical Asia*. Centre for Wildlife Studies, Bangalore, India, pp. 29–38.
- Niemi, A., Fernández, C., 2010. Bayesian spatial point process modeling of line transect data. *Journal of Agricultural, Biological, and Environmental Statistics* 15, 327–345.
- Norris, J.L., Pollock, K.H., 1996. Nonparametric MLE under two closed capture-recapture models with heterogeneity. *Biometrics* 52, 639–649.
- Nowak, R.M., 1999. *Walker's Mammals of the World*, vol 1, sixth ed. John's Hopkins University Press, ~~first printing ed.~~ Baltimore.
- Nychka, D., Yang, Q., Royle, J.A., 1997. Constructing spatial designs for monitoring air pollution using regression subset selection. *Statistics for the Environment: Pollution Assessment and Control*, vol. 3. Springer Verlag, New York, NY, pp. 131–154.
- O'Brien, T.G., 2011. Abundance, density and relative abundance: a conceptual framework. In: O'Connell, A.F., Nichols, J.D., Karanth, K.U. (Eds.), *Camera Traps in Animal Ecology: Methods and Analyses*. Springer, Tokyo, Japan, pp. 71–96.
- O'Connell, A.F., Nichols, J.D., Karanth, K.U. (Eds.), 2011. *Camera Traps in Animal Ecology: Methods and Analyses*. Springer, Tokyo, Japan. ~~pp. 280.~~
- O'Hara, R., Sillanpää, M., 2009. A review of Bayesian variable selection methods: what, how and which. *Bayesian Analysis* 4, 85–118.
- Otis, D.L., Burnham, K.P., White, G.C., Anderson, D.R., 1978. Statistical inference from capture data on closed animal populations. *Wildlife Monographs*, 3–135.
- Ovaskainen, O., 2004. Habitat-specific movement parameters estimated using mark-recapture data and a diffusion model. *Ecology* 85, 242–257.
- Ovaskainen, O., Rekola, H., Meyke, E., Arjas, E., 2008. Bayesian methods for analyzing movements in heterogeneous landscapes from mark-recapture data. *Ecology* 89, 542–554.
- Parmenter, R.R., MacMahon, J.A., 1989. Animal density estimation using a trapping web design: field validation experiments. *Ecology* 70, 169–179.
- Parmenter, R.R., Yates, T.L., Anderson, D.R., Burnham, K.P., Dunnum, J.L., Franklin, A.B., Friggens, M.T., Lubow, B.C., Miller, M., Olson, G.S., et al., 2003. Small-mammal density estimation: a field comparison of grid-based vs. web-based density estimators. *Ecological Monographs* 73, 1–26.

- Patterson, T., Thomas, L., Wilcox, C., Ovaskainen, O., Matthiopoulos, J., 2008. State-space models of individual animal movement. *Trends in Ecology and Evolution* 23, 87–94.
- Paviolo, A., De Angelo, C., Di Blanco, Y., Di Bitetti, M., 2008. Jaguar *Panthera onca* population decline in the Upper Paraná Atlantic Forest of Argentina and Brazil. *Oryx* 42, 554.
- Paviolo, A., Di Blanco, Y., De Angelo, C., Di Bitetti, M., 2009. Protection affects the abundance and activity patterns of pumas in the Atlantic Forest. *Journal of Mammalogy* 90, 926–934.
- Pebesma, E., Bivand, R., 2011. Package sp. R package version 0.9-91.
- Pledger, S., 2004. Unified maximum likelihood estimates for closed capture-recapture models using mixtures. *Biometrics* 56, 434–442.
- Pledger, S., Efford, M., Pollock, K., Collazo, J., Lyons, J., 2009. Stopover duration analysis with departure probability dependent on unknown time since arrival. *Modeling Demographic Processes in Marked populations* 3, 349–363.
- Plummer, M., 2003. JAGS: A program for analysis of Bayesian graphical models using Gibbs sampling. In: *Proceedings of the 3rd International Workshop on Distributed Statistical Computing (DSC 2003)*. March, pp. 20–22.
- Plummer, M., 2011. rjags: Bayesian graphical models using mcmc. R package version 3-5.
- Plummer, M., Best, N., Cowles, K., Vines, K., 2006. CODA: convergence diagnosis and output analysis for MCMC. *R News* 6, 7–11.
- Pollock, K.H., 1982. A capture-recapture design robust to unequal probability of capture. *Journal of Wildlife Management* 46, 752–757.
- Pollock, K.H., Nichols, J.D., Brownie, C., Hines, J.E. 1990. Statistical inference for capture-recapture experiments. *Wildlife Monographs* 3, 3–97.
- Porneluzi, P.A., Faaborg, J., 1999. Season long fecundity, survival, and viability of Ovenbirds in fragmented and unfragmented landscapes. *Conservation Biology* 13, 1151–1161.
- Pradel, R., 1996. Utilization of capture-mark-recapture for the study of recruitment and population growth rate. *Biometrics* 52, 703–709.
- Pradel, R., Hines, J.E., Lebreton, J.D., Nichols, J.D., 1997. Capture-Recapture Survival Models Taking Account of Transients. *Biometrics* 53, 60–72.
- Raabe, J. 2012. Factors Influencing Distribution and Survival of Migratory Fishes following Multiple Low-Head Dam Removals on a North Carolina River. Ph.D dissertation. Ph.D Thesis, North Carolina State University, Raleigh, NC.
- Rathbun, S., 1996. Estimation of Poisson intensity using partially observed concomitant variables. *Biometrics* 52, 226–242.
- Rathbun, S., Cressie, N., 1994. A space-time survival point process for a longleaf pine forest in southern Georgia. *Journal of the American Statistical Association* 89, 1164–1174.
- Rathbun, S., Shiffman, S., Gwaltney, C., 2007. Modelling the effects of partially observed covariates on Poisson process intensity. *Biometrika* 94, 153–165.
- Reich, B.J., Gardner, B., Wilting, A., in review. A spatial capture-recapture model for territorial species.

- Robert, C.P., Casella, G., 2004. Monte Carlo Statistical Methods, Springer, New York, USA.
- Robert, C.P., Casella, G., 2010. Introducing Monte Carlo Methods with R, Springer, New York, USA.
- Roberts, G.O., Rosenthal, J.S., 1998. Optimal scaling of discrete approximations to Langevin diffusions. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)* 60, 255–268.
- Rowcliffe, J., Carbone, C., Jansen, P.A., Kays, R., Kranstauber, B., 2011. Quantifying the sensitivity of camera traps: an adapted distance sampling approach. *Methods in Ecology and Evolution* 2, 464–476.
- Rowcliffe, J.M., Field, J., Turvey, S.T., Carbone, C., 2008. Estimating animal density using camera traps without the need for individual recognition. *Journal of Applied Ecology* 45, 1228–1236.
- Royle, J.A., Kéry, M., Guélat, J., 2011a. Spatial capture-recapture models for search-encounter data. *Methods in Ecology and Evolution* 2, 602–611.
- Royle, J.A., 2004a. Generalized estimators of avian abundance from count survey data. *Animal Biodiversity and Conservation* 27, 375–386.
- Royle, J.A., 2004b. N-mixture models for estimating population size from spatially replicated counts. *Biometrics* 60, 108–115.
- Royle, J.A., 2006. Site occupancy models with heterogeneous detection probabilities. *Biometrics* 62, 97–102.
- Royle, J.A., 2008. Modeling individual effects in the Cormack-Jolly-Seber model: a state-space formulation. *Biometrics* 64, 364–370.
- Royle, J.A., 2009a. Analysis of capture-recapture models with individual covariates using data augmentation. *Biometrics* 65, 267–274.
- ~~Royle, J.A., 2009b. Analysis of capture-recapture models with individual covariates using data augmentation. *Biometrics* 65, 267–274.~~
- Royle, J.A., Chandler, R.B., 2012. Integrating Resource Selection Information with Spatial Capture-Recapture. arXiv, preprint arXiv:1207.3288.
- Royle, J.A., Chandler, R.B., Gazenski, K.D., Graves, T.A. 2013a. Spatial capture-recapture for jointly estimating population density and landscape connectivity. *Ecology* 94, 287–294.
- Royle, J.A., Chandler, R.B., Sun, C.C., Fuller, A.K., 2013b. Integrating resource selection information with spatial capture-recapture. *Methods in Ecology and Evolution* 4, 520–530.
- Royle, J.A., Chandler, R.B., Yackulic, C., Nichols, J.D., 2012a. Likelihood analysis of species occurrence probability from presence-only data for modelling species distributions. *Methods in Ecology and Evolution* 3, 545–554.
- Royle, J.A., Converse, S.J., in review. Hierarchical spatial capture-recapture models: Modeling population density in stratified populations.
- Royle, J.A., Converse, S.J., Link, W.A., 2012b. Data Augmentation for Hierarchical Capture-recapture Models. arXiv, preprint arXiv:1211.5706.
- Royle, J.A., Dawson, D.K., Bates, S., 2004. Modeling abundance effects in distance sampling. *Ecology* 85, 1591–1597.

- Royle, J.A., Dorazio, R.M., 2006. Hierarchical models of animal abundance and occurrence. *Journal of Agricultural, Biological, and Environmental Statistics* 11, 249–263.
- Royle, J.A., Dorazio, R.M., 2008. *Hierarchical Modeling and Inference in Ecology: the Analysis of Data from Populations, Metapopulations and Communities*. Academic Press.
- Royle, J.A., Dorazio, R.M., 2012. Parameter-expanded data augmentation for Bayesian analysis of capture-recapture models. *Journal of Ornithology* 152, S521–S537.
- Royle, J.A., Dorazio, R.M., Link, W.A., 2007. Analysis of multinomial models with unknown index using data augmentation. *Journal of Computational and Graphical Statistics* 16, 67–85.
- Royle, J.A., Dubovsky, J.A., 2001. Modeling spatial variation in waterfowl band-recovery data. *Journal of Wildlife Management* 65, 726–737.
- Royle, J.A., Gardner, B. 2011. Hierarchical models for estimating density from trapping arrays. In: O’Connell, A.F.J., Nichols, J.D., Karanth, U., (Eds.), *Camera Traps in Animal Ecology: Methods and Analyses*. Springer Verlag, Tokyo, Japan, pp. 163–190.
- Royle, J.A., Karanth, K.U., Gopalaswamy, A.M., Kumar, N.S., 2009a. Bayesian inference in camera trapping studies for a class of spatial capture-recapture models. *Ecology* 90, 3233–3244.
- Royle, J.A., Kéry, M., 2007. A Bayesian state-space formulation of dynamic occupancy models. *Ecology* 88, 1813–1823.
- Royle, J.A., Link, W.A., 2006. Generalized site occupancy models allowing for false positive and false negative errors. *Ecology* 87, 835–841.
- Royle, J.A., Magoun, A.J., Gardner, B., Valkenburg, P., Lowell, R.E., 2011b. Density estimation in a wolverine population using spatial capture-recapture models. *Journal of Wildlife Management* 75, 604–611.
- Royle, J.A., Nichols, J.D., 2003. Estimating abundance from repeated presence-absence data or point counts. *Ecology* 84, 777–790.
- Royle, J.A., Nichols, J.D., Karanth, K.U., Gopalaswamy, A.M., 2009b. A hierarchical model for estimating density in camera-trap studies. *Journal of Applied Ecology* 46, 118–127.
- Royle, J.A., Nychka, D., 1998. An algorithm for the construction of spatial coverage designs with implementation in SPLUS. *Computers and Geosciences* 24, 479–488.
- Royle, J.A., Young, K.V., 2008. A hierarchical model for spatial capture-recapture data. *Ecology* 89, 2281–2289.
- Russell, R.E., Royle, J.A., Desimone, R., Schwartz, M.K., Edwards, V.L., Pilgrim, K.P., McKelvey, K.S., 2012. Estimating abundance of mountain lions from unstructured spatial samples. *Journal of Wildlife Management* 76, 1551–1561.
- Rutledge, M., 2013. Impacts of resident Canada geese in a suburban environment, PhD Thesis. North Carolina State University.
- Sacks, J., Welch, W.J., Mitchell, T.P., Wynn, H., 1989. Design and analysis of computer experiments. *Statistical Science* 4, 409–435.

- Sæther, B.-E., Bakke, 2000. Avian life history variation and contribution of demographic traits to the population growth rate. *Ecology* 81, 642–653.
- Sæther, B.E., Engen, S., Matthysen, E., 2002. Demographic characteristics and population dynamical patterns of solitary birds. *Science* 295, 2070–2073.
- Saïd, S., Servanty, S., 2005. The influence of landscape structure on female roe deer home-range size. *Landscape Ecology* 20, 1003–1012.
- Salom-Pérez, R., Carrillo, E., Sáenz, J., Mora, J., 2007. Critical condition of the jaguar *Panthera onca* population in Corcovado National Park, Costa Rica. *Oryx* 41, 51.
- Sanathanan, L., 1972. Estimating the size of a multinomial population. *Annals of Mathematical Statistics* 43, 142–152.
- Sauer, J.R., Link, W.A., 2002. Hierarchical modeling of population stability and species group attributes from survey data. *Ecology* 83, 1743–1751.
- Schaub, M., Royle, J.A., 2013. Estimating true instead of apparent survival using spatial Cormack-Jolly-Seber models (in review).
- Schofield, M., Barker, R., 2008. A unified capture-recapture framework. *Journal of Agricultural, Biological, and Environmental Statistics* 13, 458–477.
- Schwartz, M.K., Copeland, J.P., Anderson, N.J., Squires, J.R., Inman, R.M., McKelvey, K.S., Pilgrim, K.L., Waits, L.P., Cushman, S.A., 2009. Wolverine gene flow across a narrow climatic niche. *Ecology* 90, 3222–3232.
- Schwartz, M.K., Monfort, S.L., 2008. *Genetic and Endocrine Tools for Carnivore Surveys*. Island Press Washington, DC, USA.
- Schwarz, C.J., Arnason, A.N., 1996. A general methodology for the analysis of Capture-recapture experiments in open populations. *Biometrics* 52, 860–873.
- Schwarz, C.J., Arnason, A.N., 2005. Jolly-Seber models in MARK. In: Cooch, E.G., White, G. (Eds.), *Program MARK: A Gentle Introduction*, fifth ed. (book accessed online <<http://www.phidot.org/software/mark/docs/book/>>).
- Schwarz, C.J., Bailey, R.E., Irvine, J.R., Dalziel, F.C., 1993. Estimating salmon spawning escapement using capture-recapture methods. *Canadian Journal of Fisheries and Aquatic Sciences* 50, 1181–1191.
- Seber, G.A.F., 1965. A note on the multiple-recapture census. *Biometrika* 52, 249–259.
- Seber, G.A.F., 1982. *The Estimation of Animal Abundance and Related Parameters*. Macmillan Publishing Company.
- Sepúlveda, M.A., Bartheld, J.L., Monsalve, R., Gómez, V., Medina-Vogel, G., 2007. Habitat use and spatial behaviour of the endangered Southern river otter (*Lontra provocax*) in riparian habitats of Chile: conservation implications. *Biological Conservation* 140, 329–338.
- Shirk, A.J., Wallin, D.O., Cushman, S.A., Rice, C.G., Warheit, K.I., 2010. Inferring landscape effects on gene flow: a new model selection framework. *Molecular Ecology* 19, 3603–3619.
- Sillett, T.S., Chandler, R.B., Royle, J.A., Kéry, M., Morrison, S.A., 2012. Hierarchical distance-sampling models to estimate population size and habitat-specific abundance of an island endemic. *Ecological Applications* 22(7), 1997–2006.

- Sillett, T., Rodenhouse, N., Holmes, R., 2004. Experimentally reducing neighbor density affects reproduction and behavior of a migratory songbird. *Ecology* 85, 2467–2477.
- Skalski, J.R., Millspaugh, J.J., Spencer, R.D., 2005. Population estimation and biases in paintball, mark-resight surveys of elk. *Journal of Wildlife Management* 69, 1043–1052.
- Skaug, H.J., Schweder, T., 1999. Hazard models for line transect surveys with independent observers. *Biometrics* 55, 29–36.
- Sklyar, O., Murdoch, D., Smith, M., Eddelbuettel, D., François, R., 2010. Inline C, C++. Fortran function calls from R. R package version 0.3.8.
- Smith, D., Smith, M.S., 2006. Estimation of binary Markov random Fields using Markov chain Monte Carlo. *Journal of Computational and Graphical Statistics* 15, 1–21.
- Smith, M.H., Blessing, R., Chelton, J.G., Gentry, J.B., Golley, F.B., McGinnis, J.T., 1971. Determining density for small mammal populations using a grid and assessment lines. *Acta Theriologica* 16, 105–125.
- Soisalo, M.K., Cavalcanti, S.M.C., 2006. Close-up space in radio-telemetry. *Biological Conservation* 129, 487–496.
- Sollmann, R., Furtado, M.M., Gardner, B., Hofer, H., Jacomo, A.T.A., Trres, N.M., Silveira, L., 2011. Improving density estimates for elusive carnivores: accounting for sex-specific detection and movements using spatial capture-recapture models for jaguars in central Brazil. *Biological Conservation* 144, 1017–1024.
- Sollmann, R., Gardner, B., Belant, J.L., 2012. How does spatial study design influence density estimates from spatial capture-recapture models? *PLoS One* 7, e34575.
- Sollmann, R., Gardner, B., Chandler, R.B., Shindle, D., Onorato, D.P., Royle, J.A., O'Connell, A.F., ~~in revision~~. Using multiple data sources provides density estimates for endangered Florida panther. *Journal of Applied Ecology*.
- Sollmann, R., Gardner, B., Parsons, A., Stocking, J., McClintock, B., Simons, T., Pollock, K., O'Connell, A., 2013a. A spatial mark-resight model augmented with telemetry data. *Ecology* 94, 553–559.
- Sollmann, R., Mohamed, A., Samejima, H., Wilting, A., 2013b. Risky business or simple solution-Relative abundance indices from camera-trapping. *Biological Conservation* 159, 405–412.
- Sólymos, P., Lele, S., Bayne, E., 2012. Conditional likelihood approach for analyzing single visit abundance survey data in the presence of zero inflation and detection error. *Environmetrics* 23, 197–205.
- Spiegelhalter, D., Best, N., Carlin, B., Van Der Linde, A., 2002. Bayesian measures of model complexity and fit. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)* 64, 583–639.
- Stabler, B., 2006. Shapefiles: read and write ESRI shapefiles. R package version 0.6.
- Stanley, T., Burnham, K., 1999. A closure test for time-specific capture-recapture data. *Environmental and Ecological Statistics* 6, 197–209.
- Stanley, T., Richards, J., 2013. Software review: a program for testing capture-recapture data for closure. *Wildlife Society Bulletin* 33, 782–785.

- Stevens, Jr. D., Olsen, A., 2004. Spatially balanced sampling of natural resources. *Journal of the American Statistical Association* 99, 262–278.
- Stevick, P.T., Palsbøll, P.J., Smith, T.D., Bravington, M.V., Hammond, P.S., 2001. Errors in identification using natural markings: rates, sources, and effects on capture-recapture estimates of abundance. *Canadian Journal of Fisheries and Aquatic Sciences* 58, 1861–1870.
- Stoyan, D., Penttinen, A., 2000. Recent applications of point process methods in forestry statistics. *Statistical Science* 15, 61–78.
- Strauss, D., 1975. A model for clustering. *Biometrika* 63, 467–475.
- Sturtz, S., Ligges, U., Gelman, A., 2005. R2WinBUGS: A package for running WinBUGS from R. *Journal of Statistical Software* 12, 1–16.
- Su, Y.-S., Yajima, M., 2011. R2jags: A Package for running jags from R. R package version 0.02-17.
- Sun, C.C., 2013. Population Estimation, Genetic Diversity, and Structure of Black bears in Southwestern New York, Master's Thesis. Cornell University.
- Taberlet, P., Bouvet, J., 1992. Bear conservation genetics. *Nature* 358, 197–197.
- Takemura, A., 1999. Some superpopulation models for estimating the number of population uniques. In: *Proceedings of the International Conference on Statistical Data Protection SDP*. Citeseer 98, 45–58.
- Tanner, M.A., Wong, W.H., 1987. The calculation of posterior distributions by data augmentation. *Journal of the American Statistical Association* 82, 528–540.
- Tenan, S., O'Hara, R.B., Hendriks, I., Tavecchia, G., 2013. Bayesian model and variable selection in ecological studies. ~~*Methods in Ecology and Evolution*~~ (in review).
- Thomas, A., O'Hara, B., Ligges, U., Sturtz, S., 2006. Making BUGS Open. *R News* 6, 12–17.
- Thompson, C., Royle, J.A., Garner, J., 2012. A framework for inference about carnivore density from unstructured spatial sampling of scat using detector dogs. *Journal of Wildlife Management* 76, 863–871.
- Thompson, S.K., 2002. *Sampling*. Wiley, New York.
- Tierney, L., Rossini, A.J., Li, N., Sevcikova, H., 2011. Snow: Simple Network of Workstations. R package version 0.3.7.
- Tilman, D., Kareiva, P., 1997. *Spatial Ecology: the Role of Space in Population Dynamics and Interspecific Interactions*, vol. 30. Princeton University Press.
- Tischendorf, L., Fahrig, L., 2000. On the usage and measurement of landscape connectivity. *Oikos* 90, 7–19.
- Tischendorf, L., Grez, A., Zaviero, T., Fahrig, L., 2005. Mechanisms affecting population density in fragmented habitat. *Ecology and Society* 10, 7.
- Tobler, M., Carrillo-Percastegui, S., Leite Pitman, R., Mares, R., Powell, G., 2008. An evaluation of camera traps for inventorying large-and medium-sized terrestrial rainforest mammals. *Animal Conservation* 11, 169–178.
- Tobler, M.W., Hibert, F., Debeir, L., Hansen, C., 2013. Density and sustainable harvest estimates for the lowland tapir in the Amazon of French Guiana using a spatial capture-recapture model. *Oryx* (in press).



- Tracy, J.A. 2006., Individual-based movement modeling as a tool for conserving connectivity. In: Crooks, K., Sanjayan, M., (Eds.), *Connectivity Conservation*. Cambridge University Press, pp. 343–368.
- Trolle, M., Kéry, M., 2003. Estimation of ocelot density in the Pantanal using capture-recapture analysis of camera-trapping data. *Journal of Mammalogy* 84, 607–614.
- Trolle, M., Kéry, M., 2005. Camera-trap study of ocelot and other secretive mammals in the northern Pantanal. *Mammalia* 69, 409–416.
- Tufto, J., Andersen, R., Linnell, J., 1996. Habitat use and ecological correlates of home range size in a small cervid: the roe deer. *Journal of Animal Ecology* 65, 715–724.
- Tyre, A.J., Tenhumberg, B., Field, S.A., Niejalke, D., Parris, K., Possingham, H.P., 2003. Improving precision and reducing bias in biological surveys: estimating false-negative error rates. *Ecological Applications* 13, 1790–1801.
- Valiere, N., Taberlet, P., 2000. Urine collected in the field as a source of DNA for species and individual identification. *Molecular Ecology* 9, 2150–2152.
- van Etten, J. 2011. Package gdistance. R package version 1.1-2.
- Venables, W., Ripley, B. 2002. *Modern Applied Statistics with S*, Springer Verlag, New York, NY.
- Venables, W., Smith, D., Team, R.D.C., 2012. *An Introduction to R*.
- Ver Hoef, J., Boveng, P., 2007. Quasi-poisson vs. negative binomial regression: How should we model overdispersed count data? *Ecology* 88, 2766–2772.
- Ver Hoef, J.M., 2012. Who Invented the Delta Method? *American Statistician* 66, 124–127.
- Wallace, R.B., Gomez, H., Ayala, G., Espinoza, F., 2003. Camera trapping for jaguar (*Panthera onca*) in the Tuichi Valley, Bolivia. *Journal of Neotropical Mammalogy* 10, 133–139.
- Wegan, M.T., Curtis, P., Rainbolt, R., Gardner, B., 2012. Temporal sampling frame selection in DNA-based capture mark-recapture investigations. *Ursus* 23, 42–51.
- Wegan, M.T., 2008. Aversive conditioning, population estimation, and habitat preference of black bears (*Ursus Americanus*) on fort drum military installation in Northern New York. Master's Thesis. Cornell University, January.
- Wegge, P., Pokheral, C.P., Jnawali, S.R., 2004. Effects of trapping effort and trap shyness on estimates of tiger abundance from camera trap studies. *Animal Conservation* 7, 251–256.
- White, G., 1996. NOREMARK: population estimation from mark-resighting surveys. *Wildlife Society Bulletin* 24, 50–52.
- White, G., Bennetts, R., 1996. Analysis of frequency count data using the negative binomial distribution. *Ecology* 77, 2549–2557.
- White, G., Shenk, M. 2001. Population estimation with radio-marked individuals. In: Millspaugh, J., Marzluff, J., (Eds.), *Radio Tracking and animal populations*. Academic Press, San Diego, USA, pp. 329–350.
- White, G.C., Anderson, D.R., Burnham, K.P., Otis, D., 1982. *Capture-Recapture and Removal Methods for Sampling Closed Populations*. Los Alamos National Laboratory, Los Alamos.

- White, G.C., Garrot, R., 1990. Analysis of Wildlife Radiolocation Data, Academic Press, New York, USA.
- White, G.C., Shenk, T.M., 2000. Population Estimation with Radio-Marked Animals. Academic Press, San Diego, California.
- Whitman, J., Ballard, W., Gardner, C. 1986. Home range and habitat use by wolverines in southcentral Alaska. *Journal of Wildlife Management*, 460–463.
- Wickham, H., 2007. Reshaping data with the reshape package. *Journal of Statistical Software*, 21.
- Wikle, C.K., 2010. Hierarchical Modeling with spatial data. In: Gelfand, A., Diggle, P., Fuentes, M., Guttorp, P., (Eds.), *Handbook of Spatial Statistics*. Chapman and Hall, pp. 89–106.
- Williams, B.K., Nichols, J.D., Conroy, M.J., 2002. Analysis and Management of Animal Populations: Modeling, Estimation, and Decision Making. Academic Press.
- Wilson, K.R., Anderson, D.R., 1985a. Evaluation of a density estimator based on a trapping web and distance sampling theory. *Ecology* 66, 1185–1194.
- Wilson, K.R., Anderson, D.R., 1985b. Evaluation of two density estimators of small mammal population size. *Journal of Mammalogy* 66, 13–21.
- With, K., Crist, T., 1995. Critical thresholds in species' responses to landscape structure. *Ecology* 76, 2446–2459.
- Wolpert, R.L., Ickstadt, K., 1998. Poisson/gamma random field models for spatial statistics. *Biometrika* 85, 251–267.
- Woods, J.G., Paetkau, D., Lewis, D., McLellan, B.N., Proctor, M., Strobeck, C., 1999. Genetic tagging of free-ranging black and brown bears. *Wildlife Society Bulletin* 27, 616–627.
- Wright, J., Barker, R., Schofield, M., Frantz, A., Byrom, A., Gleeson, D., 2009. Incorporating genotype uncertainty into mark-recapture-type models for estimating abundance using DNA samples. *Biometrics* 65, 833–840.
- Wynn, H.P., 1970. The sequential generation of D-optimum experimental designs. *Annals of Mathematical Statistics* 41, 1655–1664.
- Yang, H.C., Chao, A., 2005. Modeling animals' behavioral response by Markov Chain models for capture-recapture experiments. *Biometrics* 61, 1010–1017.
- Yoshizaki, J., Pollock, K.H., Brownie, C., Webster, R.A., 2009. Modeling misidentification errors in capture-recapture studies using photographic identification of evolving marks. *Ecology* 90, 3–9.
- Zeller, K., McGarigal, K., Whiteley, A., 2012. Estimating landscape resistance to movement: a review. *Landscape Ecology* 27, 777–797.
- Zuur, A.F., Ieno, E.N., Walker, N.J., Saveliev, A.A., Smith, G.M., 2009. *Mixed Effects Models and Extensions in Ecology with R*. Springer Verlag.
- Zylstra, E., Steidl, R., Swann, D., 2010. Evaluating survey methods for monitoring a rare vertebrate, the Sonoran desert tortoise. *Journal of Wildlife Management* 74, 1311–1318.