

CURRICULUM VITAE [RAPTORS & MOVEMENT ECOLOGY]

David Brandes Ph.D.

Professor of Civil & Environmental Engineering and of Environmental Studies

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Education

Ph.D. Civil Engineering (Water Resources), The Pennsylvania State University, 1998

M.S. Environmental Systems Engineering, Clemson University, 1992

B.S. Civil Engineering (Environmental/Water Resources) with Honors, University of Maryland, 1988

Professional Experience

Professor, Civil & Environmental Engineering and Environmental Studies, Lafayette College, 2014-

Associate Professor, Civil & Environmental Engineering, Lafayette College, 2006-14

Visiting Professor, Division of Natural Sci and Engineering, St. Louis University-Madrid, spring 2011

Visiting Scientist, Acopian Center for Conservation Learning, Hawk Mountain Sanctuary, 2007-08

Acting Head, Civil & Environmental Engineering, Lafayette College, 2006-07, 2011

Assistant Professor, Civil & Environmental Engineering, Lafayette College, 1999-05

Postdoctoral Scholar and Instructor, Penn State University, 1998-99

Graduate Research Assistant, Env Science Group, Los Alamos National Laboratory, 1994-97

Consulting Engineer, ENVIRON Corp., 1989-90, 1992-94

Research Expertise

I. Hydrology & Hydraulics: impacts of urbanization on streamflow regimes, particularly baseflow; watershed assessment; outflow structure hydraulics

II. Movement Ecology of Raptors: mathematical modeling of raptor migration and movement patterns based on interaction of topography, landcover, and weather

Research Collaboration Awards

- USDA U.S. Forest Service, Research Management and Partnership Award 2013, Eastern Golden Eagle Working Group
- Pennsylvania Society for Ornithology, Conservation Award 2011, Golden Eagle Project (David Brandes, Todd Katzner, Michael Lanzone, Tricia Miller)

Professional Memberships/Activities

Member, American Geophysical Union (Hydrology Section)

Member, American Water Resources Association

Member, American Society of Civil Engineers (ASCE) Environmental & Water Resource Institute (EWRI)

Member, Raptor Research Foundation

Chair, Raptor Population Index Steering Committee (a partnership of Hawk Mountain Sanctuary, Hawkwatch International, Hawk Migration Association of North America, Bird Studies Canada)

Reviewer for ASCE J. of Hydrologic Eng, ASCE J. of Water Resources Planning and Management, Water Resources Research, Hydrological Processes, Environmental Science & Techn., Journal of the Am. Water Res. Assoc., Journal of Environmental Management, Journal of Raptor Research

Refereed Journal Publications - Hydrology & Hydraulics [OMITTED]

Sample Conference Proceedings and Presentations - Hydrology & Hydraulics [OMITTED]

Refereed Journal Publications – Movement Ecology of Raptors

- Dennhardt, A., A. Duerr, D Brandes, and T. Katzner, 2015. Modeling autumn migration of a rare soaring raptor identifies new movement corridors in central Appalachia. *Ecol. Modelling*. 303:19-29
- Dennhardt, A., A. Duerr, D Brandes, and T. Katzner, 2015. Integrating citizen-science data with movement models to estimate the size of a migratory golden eagle population. *Biol. Conservation*, 184:68-78.
- Duerr, A., T Miller, M Lanzone, D Brandes, J Cooper, K O'Malley, C. Maisonneuve, J Tremblay, and T. Katzner, 2014. Flight response of slope-soaring birds to seasonal variation in thermal generation. *Functional Ecol*. DOI: 10.1111/1365-2435.12381.
- Miller, T., R. Brooks, M. Lanzone, D Brandes, J Cooper, K O'Malley, C. Maisonneuve, J. Tremblay, A. Duerr, and T. Katzner, 2014. Assessing risk to birds from industrial wind energy development via paired resource selection models. *Conservation Biology* 28(3):745-755.
- Dodge, S., G. Bohrer, K. Bildstein, S.C. Davidson, R. Weinzierl, M.J. Bechard, D. Barber, R. Kays, D. Brandes, J. Han, M. Wikelski, 2014. Environmental drivers of variability in the movement ecology of turkey vultures (*Cathartes aura*) in North and South America. *Phil. Trans. R. Soc. B* 369, 20130195
- Dodge, S., G. Bohrer, R. Weinzierl, S.C. Davidson, R. Kays, D. Douglas, S. Cruz, J. Han, D. Brandes, M. Wikelski, 2013. The Environmental-Data Automated Track Annotation (Env-DATA) System: Linking Animal Tracks with Environmental Data. *Movement Ecology* 1:3
- Katzner, T.E., D. Brandes, T. Miller, M. Lanzone, C. Maisonneuve, J.A. Tremblay, R. Mulvihill, and G.T. Merovich. 2012. Topography drives migratory flight altitude of golden eagles: implications for on-shore wind energy development. *Journal of Applied Ecology* 49: 1178-118.
- Bohrer, G., D. Brandes, et al. 2012. Estimating updraft velocity components over large spatial scales: contrasting migration strategies of golden eagles and turkey vultures. *Ecology Letters*, 15(2):96-103.
- Katzner, T., B. Smith, T. Miller, D. Brandes, J. Cooper, M. Lanzone, D. Brauning, C. Farmer, S. Harding, D. Kramar, C. Koppie, C. Maisonneuve, M. Martell, E. Mojica, C. Todd, J. Tremblay, M. Wheeler, D.F. Brinker, T. Chubbs, R. Gubler, K O'Malley, S. Mehus, B. Porter, R.P. Brooks, B.D. Watts, and K.L. Bildstein. 2012. Status, Biology, and Conservation Priorities for North America's eastern Golden Eagle (*Aquila chrysaetos*) Population. *The Auk* 129(1):168-176.
- Lanzone, M., T. Miller, P. Turk, D. Brandes, C. Halverson, C. Maisonneuve, J. Tremblay, J. Cooper, K O'Malley, R. P. Brooks, and T.E. Katzner. 2012. Flight responses by a migratory soaring raptor to changing meteorological conditions. *Biology Letters* 8: 710-713.

- Duerr, A., T. Miller, M. Lanzone, D. Brandes, J. Cooper, K O'Malley, C. Maisonneuve, J. Tremblay, and T. Katzner. 2012. Testing an emerging paradigm in migration ecology shows surprising differences in efficiency between flight modes. *PLoS ONE* 7(4): e35548. doi:10.1371/journal.pone.0035548
- Brandes, D. and D.W. Ombalski, 2004. Modeling raptor migration pathways using a fluid flow analogy. *J. Raptor Research* 38(3): 195-207.

Book Chapters – Movement Ecology of Raptors

- Ombalski, D. and D. Brandes, 2010. "Golden Eagle (*Aquila chrysaetos*)" in *Terrestrial Vertebrates of Concern in Pennsylvania: A Guide to Conservation, Management, and Research*, Edited by M. A. Steele, M.C. Brittingham, T.J. Maret, J.F. Merritt. Johns Hopkins University Press. 528 pp.
- Brandes, D., 2010. "Golden Eagle Migration through Central Pennsylvania" in *Birds of Central Pennsylvania* by N. Bolgiano & G. Grove, Stone Mountain Press.
- Brandes, D., Miller, T.A., and T.E. Katzner, 2009. "Wind Power Mortality" in *Avian Ecology and Conservation: A Pennsylvania Focus with National Implications*, Pennsylvania Academy of Science.
- Miller, T.A., Brandes, D., Lanzone, M.J., Ombalski, D., Maisonneuve, C., and T.E. Katzner, 2009. "Golden Eagle Migration and Winter Behavior in Pennsylvania" in *Avian Ecology and Conservation: A Pennsylvania Focus with National Implications*, Pennsylvania Academy of Science.

Other publications – Movement Ecology of Raptors

- Katzner, T., P. Turk, A. Duerr, D. Brandes, T. Miller, M. Lanzone, 2012. *Golden Eagle home range, habitat use, demography and renewable energy development in the California desert*. Report submitted to Bureau of Land Management, California State Office
- Brandes, D. 2009. Modeling flight paths for raptor conservation in a changing world. Pennsylvania DCNR Keystone Wild Notes, Summer 2009.
- Brandes, D. 2008. FlightPath Terrain-based Raptor Migration Model. Final report for Pennsylvania DCNR Wild Resource Conservation Program Grant. Available for download at: <http://sites.lafayette.edu/brandesd/research/raptor-research/>
- Ombalski, D., and D. Brandes. 2006. Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) Species Assessment – Golden Eagle, *Aquila chrysaetos*.
- Brandes, D., 1998. Spring golden eagle passage through the northeast U.S. - evidence for a geographically concentrated flight? *HMANA Hawk Migration Studies* 23(2): 38-42.

Recent Conference Proceedings and Presentations – Movement Ecology of Raptors

- Farmer, C., D. Brandes, L. Gnagy, and K. Kosciuch, 2014. Predicting raptor collision risk from first principles: Application of updraft modeling to wind farms. National Wind Coordinating Collaborative Research Meeting. Denver, CO, USA
- Brandes, D., L. Goodrich, S. Hoffman, and D. Oleyar, 2014. The Raptor Population Index-2013 Summary of Results. Raptor Research Foundation Annual Meeting, Corpus Christi, TX.
- Brandes, D. et al. 2014. Annotation of raptor telemetry tracks with orographic and thermal lift velocities using Movebank Env-DATA. Raptor Research Foundation Annual Meeting, Corpus Christi, TX.
- Brandes, D. 2014. Simulating orographic lift, with examples related to land-based wind energy, golden eagles, and griffon vultures. Symposium on Animal Movement and the Environment, Raleigh, NC.
- Brandes, D., L. Barrios, and A. Rodriguez. 2012. High resolution modeling of updrafts to investigate griffon vulture (*Gyps fulvus*) collision risk with wind turbines. National Wind Coordinating Collaborative Research Meeting. Denver, CO, USA

- Brandes, D., L Barrios, and A Rodriguez. 2011. Modeling the Interaction of Terrain and Wind to Quantify High-Risk Conditions for Eurasian Griffon Vultures (*Gyps fulvus*) at Wind Farms. Raptor Research Foundation Annual Meeting, Duluth, MN.
- Brandes, D., C Maisonneuve, J Tremblay, T Miller, T Katzner, and M Lanzone. 2011. Influence of High-Latitude Warming on Fall Migration Timing of Eastern Golden Eagles (*Aquila chrysaetos*). Raptor Research Foundation Annual Meeting, Duluth, MN.
- Miller, T.A. M Lanzone, D Brandes, C Maisonneuve, J Cooper, K O'Malley, R Brooks, and T Katzner. 2011. Characteristics of Spring Migration of Golden Eagles (*Aquila chrysaetos*) through Eastern North America as Determined by GPS-GSM and Conventional Satellite Telemetry. Raptor Research Foundation Annual Meeting, Duluth, MN.
- Katzner, T., T. Miller, M. Lanzone, D. Brandes, R. Brooks, J. Cooper, C. Maisonneuve, J. Trembley, K. O'Malley. 2011. Golden eagles and Wind Energy in Eastern North America. U.S. Fish & Wildlife Service, Northeast Region Biologists Conference, Baltimore, MD.
- Brandes, D., G. Bohrer, J. Mandel, T. Katzner, T. Miller, M. Lanzone, C. Maisonneuve, and J. Tremblay, 2010. Raptor migration by computer – using modeling and satellite tracking data to fill in the gaps. 2010 Conference of the Hawk Migration Association of North America, Duluth, MN.
- Brandes, D., Katzner, T.E., Miller, T.A., Lanzone, M.J., and G. Bohrer, 2009. Simulation of Golden Eagle (*Aquila chrysaetos*) Migration Pathways through the Central Appalachians. Raptor Research Foundation Annual Meeting, Pitlochry, Scotland.
- Miller, T.A., Brandes, D., Lanzone, M.J., Ombalski, D., Maisonneuve, C., Brooks, R., and T.E. Katzner, 2009. Modeling Migratory Flight Characteristics of Eastern North American Golden Eagles (*Aquila chrysaetos*) Using High Frequency Telemetry Data. Raptor Research Foundation Annual Meeting, Pitlochry, Scotland.
- Brandes, D. 2009. Appalachian Wind Energy and Raptors: Moving Forward in a Data Vacuum. Invited presentation, University of Maryland Appalachian Laboratory.
- Brandes, D. 2008. Appalachian wind energy development and migrating raptors: a collision course? Invited presentation, Conservation through Education Lecture Series, East Stroudsburg University.
- Brandes, D., Katzner, T., Miller, T., Lanzone, M., Bildstein, K., and D. Ombalski. 2007. A Terrain-based Dynamic Model for Simulating Raptor Migration through the Appalachians. Raptor Research Foundation & Hawk Migration Association of North America 2007 Joint Meeting.
- Miller, T., Brandes, D., Lanzone, M., Ombalski, D., Mulvihill, R., Brooks, R., and T. Katzner. 2007. Flight Characteristics of Golden Eagles (*Aquila chrysaetos*) Migrating Through Eastern North America as Determined by GPS Telemetry. Raptor Research Foundation & Hawk Migration Association of North America 2007 Joint Meeting.
- Brandes, D. 2007. Raptor migration and the siting of utility-scale wind energy plants in Pennsylvania. Invited presentation, Pennsylvania Wind-Wildlife Collaborative Technical Workshop, Ft. Indiantown Gap.

Externally-Funded Projects – Movement Ecology of Raptors

- "Discovering relationships between climate and animal migration with new tools for linking animal movement tracks with weather and land surface data", NASA Research Opportunities in Space and Earth Sciences Grant. (2011-2014). Co-PI, with Gil Bohrer, Ohio State University (PI).
- "Golden Eagle home range, habitat use, demography and renewable energy development in the California desert", U.S. Bureau of Land Management, California State Office. (2011-2013). Co-PI, with Todd Katzner, West Virginia University (PI).
- "Developing high-resolution spatial data of migration corridors for avian species of concern in regions of high potential wind development", US Department of Energy, 20% Wind by 2030: Overcoming the Challenges. (2010-12). Co-PI, with Todd Katzner, West Virginia University (PI).

- "Assessing risks of wind energy development for a priority "umbrella" species: Pennsylvania's special responsibility for conservation of eastern golden eagles", PA Game Commission State Wildlife Grant (2007-2009), Co-PI, with Todd Katzner, West Virginia University (PI).
- "FlightPath: A Computer Program for Simulating Potential Risk of Wind Power Sites to Migrating Raptors in Pennsylvania", PA DCNR WRCP-06210 (2007-2008), PI.