

CURRICULUM VITAE

Susan P. Elias

**PhD Candidate, School of Earth and Climate Sciences & Climate Change Institute
University of Maine
Orono, ME 04469-5790
207-756-276, susan.elias@maine.edu**

EDUCATION

University of Maine PhD Earth and Climate Sciences Anticipated 2019, Advisor - Kirk A. Maasch
Dissertation: Lyme Disease and Deer tick abundance in Maine, USA, as related to climate, hosts, habitat, and human behavior
Chase Distinguished Research Assistantship 2017-18, NSF Integrated Graduate and Research Training Fellow, Climate Change Institute, 2015-17, GPA 4.0

Virginia Polytechnic Institute and State University MS Wildlife Science 1994, GPA 3.9
Thesis: Piping plover habitat suitability on the central barrier islands of Long Island, NY
Burd S. McGuinness Fellowship for academic excellence

University of Maine BS Wildlife Management 1984, GPA 3.6
Special Interest in Conservation Award, Phi Kappa Phi
Cross-Country and Track Scholarship; UMaine Sports Hall of Fame Inductee 1997

SCIENTIFIC EMPLOYMENT

2000- Present **Maine Medical Center Research Institute Vector-borne Disease Laboratory**
Research Associate/Scientific Manager

1998-2007 **University of Maine Dept. of Wildlife Ecology, Holt Research Forest**
Research Associate

1991-1994 **Virginia Tech Dept. of Fisheries and Wildlife Sciences**
Graduate Research Assistant, Research Associate

1981-1985 **University of Maine Dept. of Wildlife, Dept. of Geological Sciences (Acid Rain Lab)**
Research Assistant

OTHER EMPLOYMENT

1995-1998 **L.L. Bean:**
Contract computer programmer/analyst

1986-1992 **U.S. National Cycling Team, North Jersey Women's Bicycle Club**
National Champion; Tour de France Points Champion; World Championships Team

MAJOR RESEARCH INTERESTS

1. *Ecology of tick and mosquito vectors and emergent vector-borne diseases (Lyme, Babesia, Anaplasma, Powassan Virus, Eastern Equine Encephalitis Virus) as related to climate, hosts, habitat, and human behavior.*
2. *Modeling environmental spatio-temporal change and risk using multivariate approaches e.g., logistic regression, GLMMs, sensitivity analysis, spatial analysis.*
3. *Informing adaptation to risk through community outreach and integrated pest management..*

PERSONAL STATEMENT

Climate change has already brought higher risk of contracting vector-borne illness, but quantifying spatio-temporal risk remains a challenge. By virtue of education and research experience, and training as a National Science Foundation Integrated Graduate and Research Training Fellow at the University of Maine Climate Change Institute, I am prepared to bring Maine's unique datasets together and model tick abundance as a function of climate, hosts, habitat, and human behavior. This will allow us to weight drivers of tick abundance, forecast risk, and facilitate adaptation.

My quantitative training at Virginia Tech laid a foundation for research in shorebird ecology, forest ecosystem science, and vector-borne disease ecology. I have made a career of designing field studies and working with challenging ecological data, using designs such as before-after/control-impact, and approaches such as generalized linear mixed modeling, time series analysis, and uncertainty analysis. I have experience in experimental design, statistical analysis, collaboration, travel, grant writing, publication, outreach, field sampling, and project management.

In my years of project management, I have been responsible for overseeing personnel, mentoring undergraduates and resident doctors, running meetings, tracking budgets, ordering, compliance, database management, and coordinating clinical studies. For grant proposals I've written narratives, done power analyses and logic models, compiled budgets, CVs, compliance documents, reference articles and letters of support.

Vector-borne disease ecology—within the broader field of eco-epidemiology—is an interdisciplinary field, with contributions coming from specialists in entomology, parasitology, molecular biology and microbiology, genetics, immunology, integrated pest management, wildlife, forest, and soil science, ornithology, infectious diseases, epidemiology, public health, public health policy, economics, and more. I have collaborated extensively with experts in these fields.

New knowledge must be translated into public policy, through an understanding of risk communication principles and practices. I am experimenting with the One Health framework to communicate the ecology of Lyme to stakeholders at risk for tick bite. The One Health concept is that human and veterinary health depend on the health of the environment. Also, in step with a contemporary understanding that “the arts are becoming a favored medium for conveying science to the public” (Lesen et al. *Science Communication Through Art: Trends in Ecology & Evolution* 2016;31), I have begun to explore art for communicating the ecology of Lyme. Please see the Ecology of Lyme painting by Olaf Hajek at <http://olafhajek.com/news>.

RESEARCH GRANTS AND ROLES

Grant Title: Stakeholder Views on Deer Herd Reduction as a Method to Prevent Lyme Disease among Residents of Unbridged Maine Islands

Funding Agency: University of Maine Climate Change Institute

Amount: \$8,200

Period: 1/1/2016-12/31/2017

Role: PI, research design, research coordinator, statistician/analyst

Grant Title: Manipulation of winter soil conditions as an IPM tool for blacklegged tick control.

Funding Agency: Connecticut Agricultural Experiment Station/USDA Northeastern Integrated Pest Management Center Partnership

Amount: \$45,900

Period: 10/1/2015-8/31/2017

Role: statistician

Grant Title: Arbovirus surveillance in Maine

Funding Agency: Maine Center for Disease Control (#16-1064)

Amount: \$25,000

Period: 7/1/15-6/30/16

Role: research design, research coordinator, statistician/analyst, manuscript co-author

Grant Title: Serosurvey for eastern equine encephalitis virus antibody in passerine birds in Maine

Funding Agency: Maine Outdoor Heritage Fund (#122-04-05)

Amount: \$12,600

Period: 5/1/2013-3/31/2014

Role: grant author, research design, research coordinator, statistician/analyst, manuscript first author

Grant Title: Pathogenic *Babesia microti* versus *B. odocoilei* in Maine

Funding Agency: Maine Medical Center Mentored Research Program

Amount: \$9,525

Period: 8/1/13-6/30/14

Role: grant co-author, research design, ID fellow mentor, research coordinator, statistician/analyst, manuscript co-author

Grant Title: Seroprevalence of Powassan virus in persons bitten by tick vectors

Funding Agency: Maine Medical Center Neuroscience Institute

Amount: \$29,963

Period: 1/1/13-12/31/15

Role: grant co-author, research design, ID Fellow mentor, clinical research coordinator, statistician/analyst, manuscript co-author

Grant Title: Initiatives to control vector-borne disease in Maine

Funding Agency: Elmina B. Sewall Foundation

Amount: \$28,610

Period: 10/15/2013-10/14/2014

Role: statistician/analyst, database manager, field biologist

Grant Title: **Vector-borne disease (Arboviral) surveillance**

Funding Agency: Maine Board of Pesticides Control

Amount: \$25,000

Period: 07/01/2014-06/30/2015

Role: statistician/analyst, database management

Grant Title: **Barberry removal to decrease Lyme disease risk: a demonstration project**

Funding Agency: USDA (NE IPM Partnership)

Amount: \$37,991

Period: 05/01/2013-8/31/2015

Role: grant co-author, field biologist, statistician, first author on final report and publication

Grant Title: **Web-based decision support for prevention of tick-borne diseases**

Funding Agency: Maine Medical Center Research Grant Program

Amount: \$28,910

Period: 10/01/11-12/31/14

Role: grant co-author, research design, statistician/analyst

Grant Title: **Dragonfly (Odonata) larvae as biological control agents for disease-carrying mosquitoes (Diptera: Culicidae)**

Funding Agency: Maine Outdoor Heritage Fund (#122-04-05)

Amount: \$8,049

Period: 07/1/2012-12/31/2013

Role: grant co-author, research design, research coordinator, statistician/analyst, manuscript first author

Grant Title: **Initiatives to control vector-borne disease in Maine**

Funding Agency: Elmina B. Sewall Foundation

Amount: \$30,000

Period: 06/03/2011-06/02/2012

Role: statistician/analyst, field biologist

Grant Title: **Vector-borne disease (Arboviral) surveillance**

Funding Agency: Maine Board of Pesticides Control

Amount: \$25,000

Period: 07/01/2013-06/30/2014

Role: statistician/analyst, field biologist

Grant Title: **Vector-borne disease (Arboviral) surveillance**

Funding Agency: Maine CDC -CDC 12-5002.RFP# 201005695

Amount: \$29,883

Period: 06/03/2011-06/02/2012

Role: statistician/analyst, field biologist

Grant Title: **Vector-borne disease and climate change (CDC/NCEH: Human Health Effects of Climate Change)**

Funding Agency: Maine CDC/Maine Department of Health and Human Services

Amount: \$30,000

Period: 12/01/2010-08/31/2014

Role: experimental design (data mining/time series), statistician/analyst, database management

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Grant Title: **Trial of a minimum risk botanical compound to control *I. scapularis***

Funding Agency: USDA (NE IPM Partnership)

Amount: \$41,000

Period: 05/01/2009-05/01/2011

Role: grant co-author, experimental design, field biologist, statistician, manuscript first author

Grant Title: **Trial of a novel, pasture-safe, botanical compound to control Lyme disease vector ticks**

Funding Agency: USDA (NE IPM Partnership Minigrant)

Amount: \$7,785

Period: 07/01/2008-06/30/2009

Role: grant co-author, field biologist, statistician, manuscript co-author

Grant Title: **Infrastructure support for MMCRI Vector-Borne Disease Laboratory**

Funding Agency: Elmina B. Sewall Foundation

Amount: \$49,000

Period: 05/21/2010-04/30/2011

Role: statistician/analyst, field biologist

Grant title: **Prevalence of *Anaplasma phagocytophilum* in *Dermacentor albopictus* ticks**

Funding Agency: Maine Outdoor Heritage Fund (#091-04-08)

Amount: \$9,500

Period: 06/01/09-05/30/2010

Role: laboratory (PCR), statistician/analyst

Grant Title: **CSF Proteome of Lyme meningitis**

Funding Agency: Maine Medical Center Neuroscience Institute

Amount: \$10,000

Period: 2009

Role: research coordinator, laboratory (culture *Borrelia*), statistician/analyst, manuscript co-author

Grant Title: **Updating the advance of deer ticks in Maine: field studies and public education**

Funding Agency: Maine Outdoor Heritage Fund

Amount: \$20,000

Period: 2007-2008

Role: statistician/analyst, outreach and education

Grant Title: **Canine serosurvey of Anaplasmosis**

Funding Agency: Elmina B. Sewell Foundation

Amount: \$23,000

Period: 2007

Role: statistician/analyst, laboratory (PCR), manuscript co-author

Grant Title: **Survey for ticks infected with *Borrelia garinii***

Funding Agency: Centers for Disease Control and Prevention

Amount: \$24,000

Period: 2007

Role: statistician/analyst, laboratory (PCR), manuscript co-author

Grant Title: **Strain diversity of *Borrelia burgdorferi* in coastal Maine**

Funding Agency: Maine Medical Center Mentored Research Program

Amount: \$14,000

Period: 2003-2004

Role: statistician/analyst, ID fellow mentor, manuscript co-author

Grant Title: **Ecological determinants of Lyme disease risk**

Funding Agency: Centers for Disease Control and Prevention

Amount: \$219,000

Period: 2001-2004

Role: statistician/analyst, manuscript co-author

Grant Title: **Vector-Borne Disease Surveillance (Lyme, Anaplasma, WNV)**

Funding Agency: Maine CDC/Maine Department of Health and Human Services

Amount: \$310,000

Period: 2000-2009

Role: statistician/analyst, field biologist, manuscript co-author

Grant Title: **Environmental factors that determine Lyme disease risk**

Funding Agency: Centers for Disease Control and Prevention

Amount: \$210,000

Period: 1998-2000

Role: statistician/analyst, manuscript co-author

PUBLICATIONS

Cavanaugh CE, Muscat PL, Telford SR 3rd, Goethert H, Pendlebury W, **Elias SP**, Robich R, Welch M, Lubelczyk CB, Smith RP. 2017. Fatal Deer Tick Virus Infection in Maine. *Clinical Infectious Diseases*. 65:1043-1046.

Saunders M, **Elias S**, Robinson S and Lubelczyk C. 2017. Update on the distribution of *Aedes japonicus* in Maine. *Journal of the American Mosquito Control Association*. 33:136-138.

Elias SP, P Keenan, J Kenney, S Morris, K Covino, S Robinson, K Foss, PW Rand, CB Lubelczyk, EH Lacombe, J-P Mutebi, D Evers, RP Smith Jr. 2017. Seasonal Patterns in eastern equine encephalitis virus antibody in songbirds in southern Maine. *Vector-borne and Zoonotic Diseases* 17:325-330.

Smith RP, **SP Elias**, TJ Borelli, B Missaghi, BJ York, RA Kessler, CB Lubelczyk, EH Lacombe, CM Hayes, MS Coulter, PW Rand. Human Babesiosis, 1995-2011, Maine, USA. *Emerging Infectious Diseases* 2014;20:1727-1730.

Lubelczyk, C, **SP Elias**, L Kantar, J Albert, S Hansen, K Saxton-Shaw, K MacMillan, LB Smith, R Eisen, B Swope, RP Smith and J-P Mutebi. Detection of Eastern equine encephalitis virus antibodies in moose (*Alces americana*), Maine, 2010. *Vector-borne and Zoonotic Diseases* 2014;14:77-81.

Elias SP, CB Lubelczyk, PW Rand, JK Staples, TW St. Amand, CS Stubbs, EH Lacombe, LB Smith and RP Smith Jr. Effect of a botanical acaricide on *Ixodes scapularis* (Acari: Ixodidae) and non-target arthropods. *Journal of Medical Entomology* 2013;50:126-136.

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- Lubelczyk C, J-P Mutebi, S Robinson, **SP Elias**, LB Smith, S Juris, K Foss, A Lichtenwalner, KJ Shively, DE Hoenig, L Webber, S Sears, and RP Smith Jr. An epizootic of eastern equine encephalitis virus, Maine, U.S.A. in 2009: outbreak description and entomological studies. *American Journal of Tropical Medicine and Hygiene* 2013;88:95-102.
- Angel TE, JM Jacobs, RP Smith, MS Pasternack, **S Elias**, MA Gritsenko, A Shukla, EC Gilmore, C McCarthy, DG Camp 2nd, RP Smith, Warren HS. Cerebrospinal fluid proteome of patients with acute Lyme disease. *Journal of Proteome Research* 2012;11:4814-4822.
- MacQueen DM, C Lubelczyk, **S Elias**, B Cahill, A Mathers, EH Lacombe, PW Rand, RP Smith Jr. Genotypic diversity of an emergent population of *Borrelia burgdorferi* at a coastal island recently colonized by *Ixodes scapularis*. *Journal of Vector Borne and Zoonotic Diseases* 2012;12:456-461.
- Elias, SP**, RP Smith, Jr, SR Morris, PW Rand, and C Lubelczyk. Density of *Ixodes scapularis* ticks on Monhegan Island after complete deer removal: A question of avian importation? *Journal of Vector Ecology* 2011;36:11-23.
- Mathers A, RP Smith Jr, B Cahill, C Lubelczyk, **SP Elias**, E Lacombe, SR Morris, CP Vary, CE Parent, and PW Rand. Strain diversity of *Borrelia burgdorferi* in ticks dispersed in North America by migratory birds. *Journal of Vector Ecology* 2011;36:24-29.
- Rand PW, EH Lacombe, **SP Elias**, BK Cahill, CB Lubelczyk, and RP Smith Jr. 2011. Multitarget test for emerging Lyme disease and anaplasmosis in a survey of dogs, Maine, USA. *Emerging Infectious Diseases* 2011;17:899-902.
- Rand, PW, E H Lacombe, **SP Elias**, C B Lubelczyk, T St. Amand, and RP Smith, Jr. Trial of a minimal-risk botanical compound to control the vector tick of Lyme disease. *Journal of Medical Entomology* 2010;47:695-698.
- Lubelczyk C, BK Cahill, J Turmel, E Lacombe, PW Rand, **SP Elias**, and RP Smith Jr. Tick (Acari:Ixodidae) infestation at two rural, seasonal camps in Maine and Vermont. *Journal of Parasitology* 2010;96:442-443.
- Wang G, JO Wolff, SH Vessey, NH Slade, JW Witham, JF Merritt, ML Hunter Jr, **SP Elias**. Comparative population dynamics of *Peromyscus leucopus* in North America: influences of climate, food, and density dependence. *Population ecology*. 2009;51:133-142
- Rand PW, EH Lacombe, R Dearborn, BKCahill, **SP Elias**, C Lubelczyk, GA Beckett and RP Smith, Jr. Passive surveillance in Maine, an area emergent for tick-borne diseases. *Journal of Medical Entomology* 2007;44:1118-1129.
- Elias, SP**, CB Lubelczyk, PW Rand; EH Lacombe, MS Holman, and RP Smith, Jr. Deer browse resistant exotic-invasive understory: an indicator of elevated human risk of exposure to *Ixodes scapularis* (Acari: Ixodidae) in southern coastal maine woodlands. *Journal of Medical Entomology* 2006;43:1142-1152.

Elias, SP, JW Witham, and ML Hunter, Jr. A cyclic red-backed vole (*Clethrionomys gapperi*) and seedfall over 22 years in Maine. *Journal of Mammalogy* 2006;87:440-445.

Lubelczyk C, **SP Elias**, PW Rand, MS Holman, EH Lacombe, and RP Smith, Jr. 2004. Habitat associations of *Ixodes scapularis* (Acari: Ixodidae) in Maine. *Environmental Entomology* 2004;33:900-906.

Elias, SP, JW Witham, and ML Hunter, Jr. 2004. *Peromyscus leucopus* abundance and acorn mast: population fluctuations over 20 years. *Journal of Mammalogy* 2004;85:743-747.

Rand, PW, C Lubelczyk, GR Lavigne, **S Elias**, MS Holman, EH Lacombe, and RP Smith, Jr. Deer density and the abundance of *Ixodes scapularis* (Acari: Ixodidae). *Journal of Medical Entomology* 2003;40:179-184.

Elias, SP, JD Fraser, and PA Buckley. Piping plover brood foraging ecology on New York barrier islands. *Journal of Wildlife Management* 2000;64:346-354.

RECENT INVITED TALKS AND POSTERS

2017 Medical, Urban, & Veterinary Entomology (MUVE) Section, Entomological Society of America Annual Meeting, Denver, CO (talk)

2017 Holt Research Forest planning conference (poster)

2017 UMaine Climate Change Institute Retreat (poster, talk)

2017 Lecture series, Maine's off-shore island communities

2017 Borns Symposium, Orono (talk)

2017 8th Northeastern Eastern Equine Encephalitis Virus Conference, NH (talk)

2017 Climate Change Institute Rundown (talk)

2016 Climate Change Impacts on Maine's Wabanaki People, Old Town (talk)

2016 UMaine Climate Change Institute Retreat (talk)

2015 Borns Symposium, Orono (poster)

2014 Vector-borne Disease Working Group, Augusta (talk)

2014 Maine CDC at Wells National Estuarine Reserve, Wells (talk)

2014 Northeast Fish and Wildlife Conference, Portland (talk)

2014 Eastern Equine Encephalitis Conference, NH (talk)

2013 Maine CDC Division of Infectious Disease Annual Conference (posters)

2013 13th International Conference on Lyme Borreliosis and Other Tick-borne Diseases (posters)

2013 Maine CDC Lyme Disease Prevention Forums, Portland & Lewiston (expert panel)

2013 Maine CDC Division of Infectious Disease Annual Conference (poster)

2012 Maine CDC, Augusta (talk)

2011 Maine CDC Division of Infectious Disease Annual Conference (poster); Pump-Handle Award for outstanding contribution to the reporting, monitoring, prevention, and control of communicable diseases presented to the Vector-borne Disease Lab

RECENT PROFESSIONAL TRAINING

2007-present CITI Training: Biosafety, Institutional Review Board (human subjects), Institutional Animal Care and Use Committee (animal subjects)

2016 Complex Systems, New England Complex Systems Institute, Cambridge, Ma

2016 Science Communication, UMaine

2014 Research Data Management Workshop, Maine Medical Center Research Institute
2012 ArcGIS Desktop introductory training, ESRI® webinar
2010 Introduction to Modern Phylogenetic Methods, Humboldt Field Research Institute
2009 Advanced Statistical Modeling Using the NLMIXED Procedure, SAS® Institute webinar

SCHOLARSHIPS, FELLOWSHIPS, HONORS AND AWARDS

2017 Harold Borns Symposium - Best Student Presentation, 2nd place
2017 University of Maine Chase Distinguished Research Assistantship
2015-2017 National Science Foundation Integrative Graduate Education and Research Traineeship
2011 Maine Center for Disease Control Pump-Handle Award to staff of the Maine Medical Center Vector-borne Disease Lab for outstanding contribution to the reporting, monitoring, prevention, and control of communicable diseases
1997 University of Maine UMaine Sports Hall of Fame Inductee
1994 Master's National Road Cycling Champion
1992 Virginia Tech Burd S. McGuinnes Fellowship
1989 Governor of the State of Maine, Susan Elias Day, in recognition of outstanding athletic performance and community service on behalf of the Maine Lung Association
1989 Points Champion (Maillot Bleu) Tour de France Feminin
1984 University of Maine Special Interest in Conservation Award
1984 The Honor Society of Phi Kappa Phi Honor Society/UMaine Founding Chapter
1982-1984 University of Maine Cross-Country and Track Scholarship

PROFESSIONAL AFFILIATIONS

2017 Entomological Society of America
2017-present One Health Catalyst (Maine)
2000-present Vector-borne Disease Working Group