

Joseph D. Busch

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RESEARCH INTERESTS

Microevolution in vertebrate populations, mating systems, and conservation genetics

EDUCATION

- 2003-present Ph.D. student at Purdue University, Department of Forestry & Natural Resources, W. Lafayette, IN. *Dissertation: Population genetics and MHC-based mate choice: microevolutionary studies using kangaroo rats.* Advisor: Dr. J. Andrew DeWoody.
- 1991-1996 M.S. Biology, Northern Arizona University, Flagstaff, AZ. *Thesis: A phylogenetic study of pinyon pines (Pinus subsection Cembroides) based on nuclear DNA sequence.* Advisor: Dr. Paul Keim.
- 1986-1990 B.S. Biology, Northern Arizona University, Flagstaff, AZ

HONORS AND AWARDS

- 2006-2007 Bilsland Strategic Initiatives Fellowship. Purdue University (1 yr-\$18,000 annual).
- 2003-2005 Andrews Doctoral Fellowship. Purdue University (2 yrs-\$14,000 annual).
- 1990 Graduated *Summa Cum Laude*. Northern Arizona University.
- 1990 Senior Scholastic Award - Biology Department. Northern Arizona University.

MEMBERSHIPS

- 2005-present American Society of Mammalogists
- 2003-present American Ornithologist's Union
- 2005-2006 Purdue FNR Graduate Student Council, Secretary 1 yr.
- 1991-1994 NAU Biology Graduate Student Association, Vice President 2 yrs.
- 1988-1990 NAU Alpha Lambda Delta honor society

PROFESSIONAL EXPERIENCE

- 2003-present **GRADUATE RESEARCH ASSISTANT**
Purdue University - FNR Department, W. Lafayette, Indiana
Use molecular genetics to investigate questions of dispersal, bottlenecks, and MHC-based mate choice in the banner-tailed kangaroo rat.
- 2002-2003 **RESEARCH ASSOCIATE I**
Northern Arizona University - Biology Department, Flagstaff, Arizona
Supervise a team of technicians and students working on SNP development in *B. anthracis* (anthrax).
- 2000-2002 **COORDINATOR I**
Northern Arizona University - Biology Department, Flagstaff, Arizona

Laboratory Manager for all operations and personnel in Dr. Paul Keim's molecular genetics group (30+ people). Responsible for implementing safety regulations, upkeep of laboratory equipment, and conducting a positive learning environment.

1996-2000

RESEARCH SPECIALIST I

Northern Arizona University - Biology Department, Flagstaff, Arizona

Perform grant-funded research in conservation genetics, grass systematics, and soybean mapping.

1994-1996

GRADUATE RESEARCH ASSISTANT

Los Alamos National Laboratory - Life Sciences, Los Alamos, New Mexico

Conduct independent research on molecular typing of soil bacteria associated with pinyon pine rhizosphere (16S rRNA gene sequencing). Responsible for implementing laboratory safety guidelines provided by DOE and LANL.

1991-1994

GRADUATE RESEARCH ASSISTANT

Northern Arizona University - Biology Department, Flagstaff, Arizona

Perform thesis research on phylogeny of pinyon pines.

1992

FIELD ASSISTANT

CSWTA, Inc. - Environmental Consultants, Tuba City, Arizona

Conduct surveys to locate Mexican spotted owl territories along a proposed power line construction site. Inventory bird species in the area.

1991

WILDLIFE SPECIALIST I

Arizona Department of Game and Fish - Nongame Branch, Phoenix, Arizona

Monitor peregrine falcon nesting territories. Assist other field teams with monitoring goshawk and bald eagle nesting territories.

TEACHING EXPERIENCE

2003-present

TEACHING ASSISTANT

Purdue University – Dept. Forestry and Natural Resources, W. Lafayette, Indiana

Assistant Lecturer (*FNR 305 Conservation Genetics*)

Instruct laboratory courses (*Mammalogy, Ornithology*)

Guest Lecturer (*FNR 373 Wildlife Techniques*)

1994-present

MENTORSHIP

Have trained new technicians and students in molecular genetics methods (4 technicians, 10 graduate students, 15 undergraduate students)

1991-1994

TEACHING ASSISTANT

Northern Arizona University - Biology Department, Flagstaff, Arizona

Instruct laboratory courses (*Zoology, Microbiology, Plant Physiology, and Human Anatomy*)

LABORATORY SKILLS

Extensive experience working in the field of molecular genetics since 1991. Familiar with a broad array of methods using DNA sequencing and fragment analysis for analyzing eukaryotic and prokaryotic evolution. Specialties include 14 years of experience running ABI automated fluorescent sequencers (3100, 377, and 373), microsatellite marker development (pinyon jays, eagles, and willow flycatchers), single-

gene sequencing (mitochondrial D-loop, *Mhc*, and 16S rRNA), cDNA synthesis, SNP markers (SNaPshot™), flow cytometry (Luminex-100, BioPlex), real-time PCR (ABI 7900, BIORAD iQ5), analysis of PCR-based markers (microsatellites, SNPs, AFLPs, RAPDs), PCR-based gender determination in birds, primer and probe design, clone library production, basic microbiology, DNA extraction from difficult tissues, and gel electrophoresis.

SOFTWARE

ABI software (Sequence Analysis, GeneMapper, Genotyper), ArcGIS 9.0, programming in C, DNA alignment (Seqman, Sequencher, BioEdit), phylogenetics (PAUP*), population genetics (GENEPOP, STRUCTURE, BOTTLENECK, *M*-ratio)

PUBLICATIONS

1. **Joseph D. Busch**, Peter Waser, and J. Andrew DeWoody. 2007. Demographic bottlenecks are not accompanied by a genetic signature in banner-tailed kangaroo rats (*Dipodomys spectabilis*). *Molecular Ecology*, **16**, 2450-2462.
2. Peter Waser, **Joseph D. Busch**, Cory R. McCormick, and J. Andrew DeWoody. 2006. Parentage analysis detects cryptic pre-capture dispersal in a philopatric rodent. *Molecular Ecology* 15: 1929-1937.
3. **Busch, Joseph D.**, Todd E. Katzner, Evgeny Bragin, and Paul Keim. 2005. Tetranucleotide microsatellites for *Aquila* and *Haliaeetus* eagles. *Molecular Ecology Notes* 5:39-41.
4. Talima Pearson, **Joseph D. Busch**, Jacques Ravel, Timothy D. Read, Shane D. Rhoton, Jana M. U'Ren, Tatum S. Simonson, Sergey M. Kachur, Rebecca R. Leadem, Michelle L. Cardon, Matthew N. Van Ert, Lynn Y. Huynh, Claire M. Fraser, and Paul Keim. 2004. Phylogenetic discovery bias in *Bacillus anthracis* using single-nucleotide polymorphisms from whole-genome sequencing. *Proceedings of the National Academy of Sciences* 101(37):13536-13541.
5. Van Ert, Matthew N., Steven A. Hofstadler, Yun Jiang, **Joseph D. Busch**, David M. Wagner, Jared J. Drader, David J. Ecker, James C. Hannis, Lynn Y. Huynh, James M. Schupp, Tatum S. Simonson, and Paul Keim. 2004. Mass spectrometry provides accurate characterization of two genetic marker types in *Bacillus anthracis*. *Biotechniques* 37(4):642-643.
6. DeWoody, J. Andrew, James M. Schupp, Leo Kenefic, **Joseph D. Busch**, Lisa Murfitt, and Paul Keim. 2004. A universal method for producing ROX-labeled size standards suitable for automated genotyping. *Biotechniques* 37(3):348-352.
7. Price, Lance B., Amy Vogler, Talima Pearson, **Joseph D. Busch**, James M. Schupp, and Paul Keim. 2003. In vitro selection and characterization of *Bacillus anthracis* mutants with high-level resistance to ciprofloxacin. *Antimicrobial Agents and Chemotherapy* 47(7):2362-2365.
8. Kuske, Cheryl R., Lawrence O. Ticknor, **Joseph D. Busch**, Catherine A. Gehring, and Thomas G. Whitham. 2003. The pinyon rhizosphere, plant stress, and herbivory affect abundance of microbial decomposers in soils. *Microbial Ecology* 45(4):340-352.
9. Read, Timothy D., Steven L. Salzberg, Mihai Pop, Martin Shumway, Lowell Umayam, Lingxia Jiang, Eric Holtzapple, **Joseph D. Busch**, Kimothy L. Smith, James M. Schupp, Daniel Solomon, Paul

- Keim, and Claire M. Fraser. 2002. Comparative genome sequencing for discovery of novel polymorphisms in *Bacillus anthracis*. *Science* 296:2028-2033.
10. Vogler, Amy J., **Joseph D. Busch**, Stephanie Percy-Fine, Christine Tipton-Hunton, Kimothy L. Smith, and Paul Keim. 2002. Molecular analysis of rifampicin resistance in *Bacillus anthracis* and *Bacillus cereus*. *Antimicrobial Agents and Chemotherapy* 46(2):511-513.
11. **Busch, Joseph D.**, Mark P. Miller, Eben H. Paxton, Mark K. Sogge, and Paul Keim. 2000. Genetic variation in the endangered southwestern willow flycatcher. *The Auk* 117(3):586-595.
12. Miller, Mark P., Larry E. Stevens, **Joseph D. Busch**, Jeff A. Sorensen, and Paul Keim. 2000. Amplified fragment length polymorphism and mitochondrial sequence data detect genetic differentiation and relationships in endangered southwestern U.S.A. ambersnails (*Oxyloma* spp.). *Canadian Journal of Zoology* 78:1845-1854.
13. Kuske, Cheryl R., **Joseph D. Busch**, Dante L. Adorada, John M. Dunbar, Susan M. Barns. 1999. Phylogeny, ribosomal RNA gene typing, and relative abundance of new *Pseudomonas* species (*sensu stricto*) isolated from two pinyon-juniper woodland soils of the arid southwest U.S. *Systematic and Applied Microbiology* 22:300-311.
14. Kuske, Cheryl R., Susan M. Barns, and **Joseph D. Busch**. 1997. Diverse uncultivated bacterial groups from soils of the arid southwestern United States that are present in many geographic regions. *Applied and Environmental Microbiology* 63:3614-3621.

FUNDING

1. Sexual and natural selection on MHC genes in the banner-tailed kangaroo rat. May 2007, \$1,500.
2. Creation of internet tools to increase accessibility of Purdue's interdisciplinary research projects. Purdue University Bililand Strategic Initiatives Fellowship. May 2006, \$43,000.
3. MHC-mediated mate choice in the banner-tailed kangaroo rat. American Museum of Natural History, Theodore Roosevelt Memorial Fund. April 2006, \$1,500.

INVITED PRESENTATIONS

- Genetics of kangaroo rats. Kenmare High School, ND. October 2007.
- Using mark-recapture methods and genetics in kangaroo rats. The Wildlife Society, Purdue Chapter. February 2007.

PROFESSIONAL PRESENTATIONS

- American Society of Mammalogists (2004, 2005, 2006, 2007)
- Midwest Ecology & Evolution Conference (2004, 2005, 2006, 2007)
- American Ornithologist's Union (2002)
- Biennial Conference for Research on the Colorado Plateau (1997, 1999, 2001, 2003)