

**STEPHEN P. DIFAZIO**  
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## **RESEARCH INTERESTS**

Plant genomics; molecular ecology; forest biotechnology; gene flow and establishment in plant populations; plant reproductive biology; landscape ecology; biotechnology risk assessment

## **PROFESSIONAL EXPERIENCE**

### **Director, West Virginia University Genomics Core Facility.**

April 2011 to present.

### **Director, Biology Genomics Core Facility, West Virginia University.**

July 2009 to April 2011.

### **Associate Professor, Department of Biology, West Virginia University.**

August 2010 to present.

### **Assistant Professor, Department of Biology, West Virginia University.**

August 2005 to August 2010.

### **Research Scientist, Environmental Sciences Division, Oak Ridge National Lab**

January 2002 to October 2005

### **Associate Research Professor, Plant Sciences Department, University of Tennessee**

June 2004 to October 2005

### **Graduate Research Assistant, Dept. of Forest Science, Oregon State University**

October 1995 to December 2001

Led a project to assess genetic impacts of hybrid poplar plantations on wild populations. Developed molecular markers and performed paternity analyses for poplar populations. Designed and implemented spatial simulation model for transgene flow.

### **Faculty Research Assistant, Department of Forest Science, Oregon State University**

March 1995 to October 1995

Sequencing of genes controlling flower development in Douglas-fir and black cottonwood. Bulked segregant for molecular markers associated with stem forking in Douglas-fir.

### **General Biology Teaching Assistant, Oregon State University, Corvallis**

January 1994 to March 1994

Taught laboratory classes for 80 students

### **Graduate Research Assistant, Pacific Northwest Research Station, U.S. Forest Service/Oregon State University, Corvallis**

July 1992 to March 1995

Studied factors influencing the reproductive biology of Pacific yew populations

### **Forestry Extension Worker, Peace Corps, Totonicapan, Guatemala**

July 1989 to March 1992

Promoted forestry, agroforestry and soil conservation in Mayan villages

### **Research Technician, Repligen Corporation, Cambridge, Massachusetts**

January 1989 to June 1989

Tested anti-microbial polymer surfaces with yeast

### **Research Technician, Children's Hospital Medical Center, Boston, Massachusetts**

June 1987 to January 1989

Performed genetic analysis of neurological mutations in mice

## EDUCATION

Ph.D. 2002 Oregon State University (Corvallis), Forest Genetics, GPA, 4.0

M.S. 1995 Oregon State University (Corvallis), Ecology, GPA, 3.84

B.S. 1989 Northeastern University (Boston, Massachusetts), Biology, GPA, 3.95

## HONORS

Outstanding PhD Student, 1999; Fowells Fellowship, 1998; EPA STAR Fellowship, 1997-1999; Moldke Fellowship, 1996; Ell Presidential Scholarship, 1984-1989; Phi Kappa Phi, 1988-1989; Alumni Award for Most Professional Promise, 1989; Junior Ring Award, 1988

**FOREIGN LANGUAGE :** Fluent in Spanish

## PUBLICATIONS

### Peer Reviewed

Rodgers-Melnick, E., M. Culp, and **S.P. DiFazio**. 2013. Predicting whole genome protein interaction networks from primary sequence data in model and non-model organisms using ENTS. *BMC Genomics* 14:608.

Porth, I., J. Klapšte, O. Skyba, J. Hannemann, A.D. McKown, R.D. Guy, **S.P. DiFazio**, W. Muchero, P. Ranjan, G.A. Tuskan, M.C. Friedmann, J. Ehlting, Q.C.B. Cronk, Y.A. El-Kassaby, C.J. Douglas and S.D. Mansfield. 2013. Genome-wide association mapping for wood characteristics in *Populus* identifies an array of candidate single nucleotide polymorphisms. *New Phytologist* 10.1111/nph.12422.

Geraldes, A., **S.P. DiFazio**, G.T. Slavov, P. Ranjan, W. Muchero, J. Hannemann, L.E. Gunter, A.M. Wymore, C.J. Grassa, N. Farzaneh, I. Porth, A.D. McKown, O. Skyba, E. Li, M. Fujita, J. Kl-p?t?, J. Martin, W. Schackwitz, C. Pennacchio, D. Rokhsar, M.C. Friedmann, G.O. Wasteneys, R.D. Guy, Y.A. El-Kassaby, S.D. Mansfield, Q.C.B. Cronk, J. Ehlting, C.J. Douglas, and G.A. Tuskan. 2013. A 34K SNP genotyping array for *Populus trichocarpa*: Design, application to the study of natural populations and transferability to other *Populus* species. *Molecular Ecology Resources* 13:306-323.

Wullschleger, S.D., D.J. Weston, **S.P. DiFazio**, and G.A. Tuskan. 2013. Revisiting the sequencing of the first tree genome: *Populus trichocarpa*. *Tree Physiology* DOI:10.1093/treephys/tps081.

Slavov, G.T., **S.P. DiFazio**, J. Martin, W. Schackwitz, W. Muchero, E. Rodgers-Melnick, M.F. Lipphardt, C.P. Pennacchio, U. Hellsten, L. Pennacchio, L.E. Gunter, P. Ranjan, K. Vining, K.R. Pomraning, L.J. Wilhelm, M. Pellegrini, T. Mockler, M. Freitag, A. Geraldes, Y.A. El-Kassaby, S.D. Mansfield, Q.C. B. Cronk, C.J. Douglas, S.H. Strauss, D. Rokhsar, and G.A. Tuskan. 2012. Genome Resequencing Reveals Multiscale Geographic Structure and Extensive Linkage Disequilibrium in the Forest Tree *Populus trichocarpa*. *New Phytologist* 196:713-725.

Tuskan, G.A., J. Chen, **S.P. DiFazio**, P. Faivre Rampant, M. Gudet, A. Harfouche, V. Jorge, J.L. Labbe, P. Ranjan, M. Sabatti, G. Slavov, N. Street, T.J. Tschaplinski, T.M. Yin. 2012. The obscure events contributing to the evolution of an incipient sex chromosome in *Populus* — A retrospective working hypothesis. *Tree Genetics and Genomes* 8:559-571.

Induri, B.R., D.R. Ellis, G.T. Slavov, T.M. Yin, X.Y. Zhang, W. Muchero, G.A. Tuskan, and **S.P. DiFazio**. 2012. Identification of quantitative trait loci and candidate genes for cadmium tolerance in *Populus*. *Tree Physiology* 32: 626-638.

**DiFazio, S.P.**, S. Leonardi, G.T. Slavov, S.L. Garman, W.T. Adams, and S.H. Strauss. 2012. Gene flow and simulation of transgene dispersal from hybrid poplar plantations. *New Phytologist* 193:903-915.

Rodgers-Melnick, E., S.P. Mane, P. Dharmawardhana, G.T. Slavov, O.R. Crasta, S.H. Strauss, A.M. Brunner, and **S.P. DiFazio**. 2012. Contrasting Patterns of Evolution Following Whole Genome versus Tandem Duplication Events in *Populus*. *Genome Research* 22:95-105.

Slavov, G.T., S. Leonardi, W.T. Adams, S.H. Strauss, and **S.P. DiFazio**. 2010. Population substructure in continuous and fragmented stands of *Populus trichocarpa*. *Heredity* 105:348-357.

Yang, X.H., U. Kalluri, **S.P. DiFazio**, S.D. Wullschleger, T.J. Tschaplinski, Z.M. Cheng, and G.A. Tuskan. 2009. Poplar genomics: state of the science. *Critical Reviews in Plant Science* 28:285–308.

- Slavov, G.T., S. Leonardi, S., J. Burczyk, W.T. Adams, S.H. Strauss, and **S.P. DiFazio**. 2009. Extensive pollen flow in two ecologically contrasting populations of *Populus trichocarpa*. *Molecular Ecology* 18: 357-373.
- Islam-Faridi, M.N., C.D. Nelson, **S.P. DiFazio**, L.E. Gunter, and G.A. Tuskan. 2009. Cytogenetic analysis of *Populus trichocarpa*— ribosomal DNA, telomere repeat sequence, and marker-selected BACs. *Cytogenetics and Genome Research* 125: 74-80.
- Whitham, T.G., **S.P. DiFazio**, J.A. Schweitzer, S.M. Shuster, G.J. Allan, J.K. Bailey, and S.A. Woolbright. 2008. Extending genomics to natural communities and ecosystems. *Science* 320: 492-495.
- Ma, H., and **S.P. DiFazio**. 2008. An efficient method for purification of PCR products for sequencing. *Biotechniques* 44: 921-923.
- Yin, T., **S.P. DiFazio**, L.E. Gunter, X. Zhang, M.M. Sewell, S.A. Woolbright, G.J. Allan, C.T. Kelleher, C.J. Douglas, M. Wang, and G.A. Tuskan. 2008. Genome structure and emerging evidence of an incipient sex chromosome in *Populus*. *Genome Research* 18: 422-430.
- Martin, F., A. Aerts, D. Ahren, A. Brun, E.G.J. Danchin, F. Duchaussoy, J. Gibon, A. Kohler, E. Lindquist, V. Pereda, A. Salamov, H.J. Shapiro, J. Wuyts, D. Blaudez, M. Buee, P. Brokstein, B. Canback, D. Cohen, P.E. Courty, P. M. Coutinho, C. Delaruelle, J.C. Detter, Deveau, A., **S.P. DiFazio**, + 44 additional authors. 2008. The genome of *Laccaria bicolor* provides insights into mycorrhizal symbiosis. *Nature* 452: 88-92.
- Woolbright, S., **S.P. DiFazio**, T.M. Yin, G.D. Martinsen, X. Zhang, G.J. Allan, T.G. Whitham, and P. Keim. 2008. A dense linkage map of a hybrid (*Populus fremontii* x *P. angustifolia*) BC1 family contributes to long-term ecological research and comparison mapping in a model forest tree. *Heredity* 100: 59-70.
- Kalluri, U.C., **S.P. DiFazio**, A.M. Brunner, and G.A. Tuskan. 2007. Genome-wide analysis of *Aux/IAA* and *ARF* gene families in *Populus trichocarpa*. *BMC Plant Biology*, 7: 59.
- Filichkin, S.A., **S.P. DiFazio**, A.M. Brunner, J.M. Davis, Z.K. Yang, U.C. Kalluri, R.S. Arias, E. Etherington, G.A. Tuskan, and S.H. Strauss. 2007. Efficiency of gene silencing in Arabidopsis. *Plant Biotech J.* 5: 615-626
- Kelleher, C., R. Chiu, H. Shin, I.E. Bosdet, M. Krzywinski, C. Fjell, J. Wilkin, T.M. Yin, **S.P. DiFazio**, + 32 additional authors. 2007. A physical map of the highly heterozygous *Populus* genome: integration with the genome sequence and genetic map and analysis of haplotype variation. *Plant Journal* 50: 1063-1078.
- Brunner, A.M., J. Li, **S.P. DiFazio**, O. Shevchenko, B.E. Montgomery, R. Mohamed, H. Wei, C. Ma, A.A. Elias, K. Van Wormer, and S.H. Strauss. 2007. Genetic containment of forest plantations. *Tree Genetics and Genomes* 3: 75-100.
- Tuskan, G.A., **S.P. DiFazio**, + 108 coauthors. 2006. The Genome of Black Cottonwood, *Populus trichocarpa* (Torr. & Gray). *Science* 313: 1596-1604.
- Whitham, T.G., J.K. Bailey, J.A. Schweitzer, S.M. Shuster, R.K. Bangert, C.J. LeRoy, E. Lonsdorf, G.J. Allan, **S.P. DiFazio**, B.M. Potts, D.G. Fischer, C.A. Gehring, R.L. Lindroth, J. Marks, S.C. Hart, G.M. Wimp, and S.C. Wooley. 2006. A framework for community and ecosystem genetics: from genes to ecosystems. *Nature Reviews Genetics* 7: 510-523.
- Groover, A.T., S.D. Mansfield, **S.P. DiFazio**, G. Dupper, J.R. Fontana, R. Millar, and Y. Wang. 2006. The *Populus* homeobox gene *ARBORKNOX1* reveals overlapping mechanisms regulating the shoot apical meristem and the vascular cambium. *Plant Molecular Biology* 61: 917-932.
- Wullschleger, S.D., T.M. Yin, **S.P. DiFazio**, T.J. Tschaplinski, L.E. Gunter, M.F. Davis, and G.A. Tuskan. 2005. Genotypic variation in growth and biomass distribution for two advanced-generation (F<sub>2</sub>) pedigrees of hybrid poplar (*Populus* spp.). *Canadian Journal of Forest Research* 35: 1779-1789.
- Yin, T.-M., **S.P. DiFazio**, L.E. Gunter, S.S. Jawdy, W. Boerjan, and G.A. Tuskan. 2004. Genetic and physical Mapping of *Melampsora* Rust Resistance genes in *Populus* and characterization of linkage disequilibrium and flanking genomic sequence. *New Phytologist* 165: 95-105. (Shared first authorship)
- Yin, T.M., **S.P. DiFazio**, L.E. Gunter, D. Riemenschneider, and G.A. Tuskan. 2004. Large-scale heterospecific segregation distortion in *Populus* revealed by a dense genetic map. *Theoretical and Applied Genetics* 109: 451-463.

- Tuskan, G.A., L.E. Gunter, Z.K. Yang, T.M. Yin, M.M. Sewell, and **S.P. DiFazio**. 2004. Characterization of microsatellites revealed by genomic sequencing of *Populus trichocarpa*. *Canadian Journal of Forest Research* 34: 85-93.
- Burczyk, J., **S.P. DiFazio**, and W.T. Adams. 2004. Gene flow in forest trees: How far do genes really travel? *Forest Genetics* 11: 179-192.
- Wullschleger, S.D., and **S.P. DiFazio**. 2003. Emerging use of gene expression microarrays in plant physiology. *Comparative and Functional Genomics* 4: 216-224.
- Wullschleger, S.D., G.A. Tuskan, and **S.P. DiFazio**. 2002. Genomics and the Tree Physiologist. *Tree Physiology* 22: 1273-1276.
- Meilan, R., K.-H. Han, C. Ma, **S.P. DiFazio**, J.A. Eaton, E. Hoiem, B.J. Stanton, R.P. Crockett, M.L. Taylor, R.R. James, J.S. Skinner, L. Jouanin, G. Pilate, and S.H. Strauss. 2002. Growth and glyphosate tolerance of transgenic poplars I. Two-year field performance. *Canadian Journal of Forest Research* 32: 967-976.
- Meilan, R., D.J. Auerbach, C. Ma, **S.P. DiFazio**, and S.H. Strauss. 2002. Stability of herbicide resistance and GUS expression in transgenic hybrid poplars (*Populus spp.*) during several years of field trials and vegetative propagation. *HortScience* 37: 277-280.
- Strauss, S.H., **S.P. DiFazio**, and R. Meilan. 2001. Genetically modified poplars in context. *Forestry Chronicle* 77: 1-9.
- Brunner, A.M., W.H. Rottmann, L.A. Sheppard, K. Krutovskii, **S.P. DiFazio**, S. Leonardi and S.H. Strauss. 2000. Structure and expression of duplicate AGAMOUS orthologs in poplar. *Plant Molecular Biology* 44: 619-634.
- James, R., **S.P. DiFazio**, A. Brunner and S.H. Strauss. 1998. Environmental effects of genetic engineering of woody biomass crops. *Biomass & Bioenergy* 14: 403-414.
- DiFazio, S.P.**, M.V. Wilson, and N.C. Vance. 1998. Factors limiting seed production of *Taxus brevifolia* (Taxaceae) in western Oregon. *American Journal of Botany* 85: 910-918.
- DiFazio, S.P.**, N.C. Vance, and M.V. Wilson. 1997. Strobilus Production and growth of Pacific yew under a range of overstory conditions in western Oregon. *Canadian Journal of Forest Research* 27: 986-993.
- DiFazio, S.P.**, N.C. Vance and M.V. Wilson. 1996. Variation in sex expression of Pacific yew in western Oregon. *Canadian Journal of Botany* 74: 1943-1946.

## Book Chapters

- Muchero, W., J. Labbé, R. Priya, **S. DiFazio**, and G.A. Tuskan. 2013. Genome resequencing in *Populus*: Revealing large-scale genome variation and implications on specialized-trait genomics. In T. Fenning (ed.), *Challenges and Opportunities for the World's Forests in the 21st Century*, Forestry Sciences 81, DOI 10.1007/978-94-007-7076-8\_25, Springer, Dordrecht.
- DiFazio, S.P.**, X.H. Yang, and G.A. Tuskan. 2011. The *Populus* Genome. In Joshi, C.P., and S.P. DiFazio (eds). *Genetics, Genomics and Breeding of Poplar*. Science Publishers, Enfield, New Hampshire.
- DiFazio, S.P.**, G.T. Slavov, and C.S. Joshi. 2011. *Populus*: A premier pioneer system for plant genomics. In Joshi, C.P., and S.P. DiFazio (eds). *Genetics, Genomics and Breeding of Poplar*. Science Publishers, Enfield, New Hampshire.
- Tsai, C.J., P. Ranjan, **S.P. DiFazio**, G.A. Tuskan, and V. Johnson. 2011. Poplar Genome Microarrays. In Joshi, C.P., and S.P. DiFazio (eds). *Genetics, Genomics and Breeding of Poplar*. Science Publishers, Enfield, New Hampshire.
- DiFazio, S.P.** The *Populus* Genome Project. 2010. In Kole, C., and A. Albert (eds). *Principles and Practices of Plant Genomics Vol. 3: Advanced Genomics*. Science Publishers, Inc., New Hampshire.
- Douglas, C.J., and **S.P. DiFazio**. 2010. The *Populus* genome and Comparative Genomics. In Jansson, S., R. Bhalerao, and A. Groover (eds). *Genetics and Genomics of Populus*. Springer, New York.
- DiFazio, S.P.**, G. Slavov, J. Burczyk, S. Leonardi, and S.H. Strauss. 2004. Gene Flow From Tree Plantations and Implications for Transgenic Risk Assessment. In C. Walter and M. Carson (eds.), *Plantation Forest Biotechnology for the 21<sup>st</sup> Century*. Research Signpost, Kerala, India. pp. 405-422.
- Slavov, G., **S.P. DiFazio**, and S.H. Strauss. 2004. Gene flow in forest trees: Gene migration patterns and landscape modelling of transgene dispersion in hybrid poplar. In H.C.M. den Nijs, D. Bartsch, and J.

Sweet (eds.), *Introgression from Genetically Modified Plants into Wild Relatives*. CABI Publishing, Wallingford, Oxfordshire.

Meilan, R., C. Ma, S. Cheng, J.A. Eaton, L.K. Miller, R.P. Crockett, **S.P. DiFazio**, and S.H. Strauss. 2000. High levels of Roundup® and leaf-beetle resistance in genetically engineered hybrid cottonwoods. *In*: K.A. Blatner, J.D. Johnson, and D.M. Baumgartner, eds., *Hybrid Poplars in the Pacific Northwest: Culture, Commerce and Capability*. Washington State University Cooperative Extension Bulletin MISC0272, Pullman, WA. pp. 29-38.

### **Book Edited**

C.S. Joshi and **S.P. DiFazio** (eds). 2011. *Genetics, Genomics and Breeding of Poplar*. Science Publishers, Enfield, New Hampshire.

### **Other Publications**

Brunner, A.M., **S.P. DiFazio**, and A.T. Groover. 2007. Forest genomics grows up and branches out. *New Phytologist* 174: 710-713.

**DiFazio, S.P.** 2005. A pioneer perspective on adaptation. *Functional Genomics of Environmental Adaptation in Populus - The 12<sup>th</sup> New Phytologist Symposium*, Gatlinburg Tennessee, USA, October 2004. *New Phytologist*. 165: 661-664.

**DiFazio, S.P.**, L. E. Gunter, G. Wickham, J. Zhou, C. C. Brandt, J. C. Schryver, and R. J. Norby. 2004. Genomic Characterization of Belowground Ecosystem Responses to Climate Change. *Laboratory Directed Research And Development Program Fy 2004 Annual Report*. Oak Ridge National Laboratory, Oak Ridge, TN.

**DiFazio, S.P.**, S. Jawdy, L. Gunter, B. Wilson, and A. Brunner. 2004. Ecosystem Genomics—An Emerging Opportunity for Environmental Research. *Laboratory Directed Research And Development Program Fy 2003 Annual Report*. Oak Ridge National Laboratory, Oak Ridge, TN. pp. 342-351.

Martin, F., G.A. Tuskan, **S.P. DiFazio**, P. Lammers, G. Newcombe, and G.K. Podila. 2004. Symbiotic sequencing for the *Populus* mesocosm. *New Phytologist* 161: 330-335.

Lammers, P., G.A. Tuskan, **S.P. DiFazio**, G.K. Podila, and F. Martin. 2004. Mycorrhizal symbionts of *Populus* to be sequenced by the United States Department of Energy's Joint Genome Institute. *Mycorrhiza* 14: 63-64.

Tuskan, G.A., **S.P. DiFazio**, and T. Teichmann. 2004. Poplar genomics is getting popular: The impact of the poplar genome project on tree research. *Plant Biology*. 6: 2-4.

Strauss, S.H., and **S.P. DiFazio**. 2004. Hybrids Abounding (Book Review). *Nature Biotechnology* 22: 29-30.

**DiFazio, S.P.** 2002. Biotechnology in tree improvement: Controversy versus capability. *Southeast Biology* 49: 288-289.

Slavov, G.T., **S.P. DiFazio**, and S.H. Strauss. 2002. Gene flow in forest trees: From empirical estimates to transgenic risk assessment. *In Ecological and Agronomic Consequences of Gene Flow from Transgenic Crops to Wild Relatives*. Ohio State University, Columbus, pp. 106-119.

**DiFazio, S.P.** 2002. Potential Impacts of Hybrid Poplar Cultivation on Black Cottonwood Populations: Gene Flow and Simulation Modeling. PhD Dissertation. Oregon State University, Corvallis. 244 pp.

Butler, B.J., **S.P. DiFazio**, M. Duane, M. Stoddard, and T. Neal. 2000. Sustainability and biodiversity of tropical ecosystems symposium. Meeting Report. *Environmental Conservation* 27: 82-83.

**DiFazio, S.P.**, S. Leonardi, S. Cheng, and S.H. Strauss. 1999. Assessing potential risks of transgene escape from fiber plantations. In P.W. Lutman (ed.) *Gene flow and agriculture: relevance for transgenic crops*. Symposium Proceedings No. 72. British Crop Protection Council, Farnham, UK. pp. 171-176.

**DiFazio, S.P.** 1995. The Reproductive Ecology of Pacific Yew (*Taxus brevifolia* Nutt.) Under a Range of Overstory Conditions in Western Oregon. M.S. Thesis, Oregon State University, Corvallis, OR. 178 pp.

### **GRANTS FUNDED**

DOE Bioenergy Science Center. 10/12-09/15. \$540K (\$15,000K total). Association Genetics of Cell Wall Biosynthesis in *Populus trichocarpa*. S.P. DiFazio (subcontract).

USDA AFRI Coordinated Agricultural Project, 8/12 to 8/17, \$155K (\$5000K total). NewBIO: Northeast Woody Biomass and Warm Season Grass Consortium. T. Richard, L. Smart, J. Wang, T. Volk, et al.

NE Sun Grant Program, 8/11 to 6/14, \$164K (\$946K total). Genetic Improvement for Yield and Establishment of Short Rotation Woody Biomass Crops on Marginal Lands. L.B. Smart, S.P. DiFazio, J. Carlson, R. Miller, L. Abrahamson, T. Volk, et al.

WVU Advanced Energy Initiative. 01/10-01/11. \$48,574. Land Reclamation for Bioenergy: Development of Genomic Resources for Salt Tolerant *Populus euphratica*. S.P. DiFazio and D.R. Ellis.

DOE Bioenergy Science Center. 07/08-09/12. \$648,690v (\$25,000K total). Association Genetics of Cell Wall Biosynthesis in *Populus trichocarpa*. G.T. Slavov and S.P. DiFazio (subcontract).

USDA Plant Feedstocks for Bioenergy Program. 09/08-08/11. \$82,793 (\$349,130 total). MAX Pathway Regulation of Crown Architecture in Poplar. A.M. Brunner, G.T. Slavov, and S.P. DiFazio.

DOE Experimental Program to Stimulate Competitive Research Laboratory Partnership Program. 7/08-7/12, \$445,000. Land Reclamation for Bioenergy: Genomics of Adaptation of *Populus* to Marginal Sites. S.P. DiFazio, D. Ellis, G.T. Slavov, J.R. Cumming, and T.J. Tschaplinski.

WVU Wood Utilization Research. 1/08-6/10. \$24,893. Identification of Enzymes for Biofuel Conversion from the Microbial Community of the Termite Hindgut. R.V.M. Rio, S.P. DiFazio, A. Adebayo, and J. Wang.

DOE Office of Science/Plant Feedstocks for Bioenergy. 7/07-12/09. \$171,543 (\$1,000,000 total). A Functional Genomics Approach to Altering Crown Architecture in *Populus*: Maximizing Carbon Capture in Trees Grown in Dense Plantings. G.A. Tuskan, S.D. Wullschleger, U. Kalluri, G.T. Slavov, S.P. DiFazio, and G. Howe.

West Virginia University Awards for Research Team Scholarship. 7/06-7/07, \$39,756. Mechanisms of Cadmium Tolerance in Poplar Trees. S.P. DiFazio, C. Barth, and B. Van Aken.

West Virginia University Program to Stimulate Competitive Research. 7/06-7/07, \$50,000. Developing Plants for Phytoremediation of Heavy Metals. B. Van Aken, S.P. DiFazio, and C. Barth.

West Virginia University Faculty Senate, 7/06-7/07, \$13,000, Elucidating Patterns of Adaptive Molecular Variation in Aspen Trees. S. P. DiFazio

DOE/Terrestrial Carbon Sequestration, 10/06-9/10, \$219,725 (\$4,084,481 total). Genome-Enabled Discovery of Carbon Sequestration Genes in Poplar (renewal). G.A. Tuskan, J. Davis, S.P. DiFazio, and 14 co-PI's.

DOE/Program for Ecosystem Research. 2/05-2/08. \$5,042,000. HERMES: Hierarchical Experimental Responses from Macromolecular to Ecosystem Scales. S.P. DiFazio, S.D. Wullshcleger, T.J. Tschaplinski, C.W. Schadt, A. Rogers, and C.R. Kuske.

NSF/FIBR. 10/04-10/10. \$349,420 (\$5,000,000 total). Community Genetics, Heritability & Evolution: Consequences of Extended Phenotypes. T.G. Whitham, R. Lindroth, S.P. DiFazio, B. Potts, S. Shuster, C. Gehring, G. Allan, J. Marks, S. Hart, and P. Keim.

NSF Plant Genome. 10/04-10/06. \$1,385,384. VCA: Populus Genome Curation. G.A. Tuskan, S.P. DiFazio, Z.M. Cheng, E. Retzel, and D. Rokhsar.

DOE/Basic Energy Science. 10/04-10/06. \$602,000. Chromosome-Scale Assembly of the Poplar Genome. S.P. DiFazio, N. Islam-Faridi, L.E. Gunter, and G.A. Tuskan.

Oak Ridge National Laboratory Directed Research and Development Program, 5/02-10/03, \$140,000. Ecosystem Genomics: An Emerging Opportunity for Environmental Research. S.P. DiFazio.

Oak Ridge National Laboratory Directed Research and Development Program, 9/02-10/04, \$670,000. Genomic Characterization of Belowground Ecosystem Responses to Climate Change. S.P. DiFazio, M.W. Fields, S. M. Tiquia, C.C. Brandt, R.J. Norby, J. Zhou, J. C. Schryver, and J.F. Weltzin.

DOE/Terrestrial Carbon Sequestration. 10/02-9/05, \$5,142,024. Genome-Enabled Discovery of Carbon Sequestration Genes in Poplar. G.A. Tuskan, J. Davis, S. Strauss, S.P. DiFazio, and 14 co-PI's.

USDA Initiative for Future Agriculture and Food Systems, 9/00-9/04, \$539,000. Flowering control in Transgenic Trees: Stability and RNAi Gene Suppression. S. H. Strauss, A. Brunner, S.P. DiFazio, J. Skinner, and R. Meilan.

USDA Biotechnology Risk Assessment, 10/97-9/00, \$166,000. Gene flow and simulation modeling of transgene spread in poplar. S. H. Strauss, S. P. DiFazio, S. Leonardi, S. Garman, W. T. Adams, and D. Hibbs. (Lead author and project leader)

EPA STAR Graduate Fellowship, 10/97-9/00, \$90,000. Potential impacts of transgenic poplar cultivation. S.H. Strauss and S.P. DiFazio. (Lead author and project leader)

## **SYMPOSIA ORGANIZED**

Functional Genomics of Environmental Adaptation in *Populus*. with M. Campbell, F. Martin, R. Norby, H. Slater, and J. Tuskan. October 10-13, 2004. Gatlinburg, Tennessee

Sustainability and Biodiversity of Tropical Ecosystems, with B.J. Butler, M. Duane, M. Stoddard, and T. Neal. May 27 2000. Corvallis, Oregon.

## **INVITED PRESENTATIONS**

Population Genomics and Association Mapping in *Populus trichocarpa*. Argonne National Laboratory, June 3, 2013

Exploring the Molecular Bases of Adaptive Variation in *Populus* using Whole Genome Sequencing, IUFRO Forest Biotechnology meeting, Asheville, NC, May 30, 2013

Using Kbase to gain Insights into Vegetative Phenology in *Populus*. DOE Contractor's Meeting, Washington D.C. February 26, 2013

Population Genomics of *Populus trichocarpa*. University of Maryland Appalachian Ecology Lab, November 15, 2012

Implications of Genome Duplication for Evolution and Adaptation in *Populus*. S.P. DiFazio. Nanjing Forestry University, Nanjing, China, May 1, 2012

Implications of Genome Duplication for Evolution and Adaptation in *Populus*. S.P. DiFazio. Chinese Academy of Forestry, Beijing, China, May 3, 2012

Integration of Short-Term Breeding Strategies with Long-Term Goals Using Molecular Markers. S.P. DiFazio. Greenwood Resources, Clatskanie, Oregon, April 25, 2012

Pathways to *Populus* Improvement in the New Genomics Era. S.P. DiFazio, G.T. Slavov, E. Rodgers-Melnick, W. Muchero, and G.A. Tuskan. Poplar Council of Canada Conference & Annual Meeting. September 18-22, 2011, Edmonton, Alberta. (Keynote Address)

Prospects for marker-assisted breeding for heterosis in *Populus*. S. DiFazio, B.J. Stanton, G.T. Slavov, E. Rodgers-Melnick, and G.A. Tuskan. Conifer Translational Genomics International Symposium: Genomics-Based Breeding in Forest Trees. University of California, Davis CA. June 22, 2011.

S. DiFazio. Approaches for Gene Discovery in Forest Trees. First Annual Meeting of the NSF Hardwood Genomics Project. Mont Alto, PA, USA. July 14, 2011.

The *Populus* Genome from Macroevolutionary to Molecular Perspectives. Sustainable Forest Management: Genomic and Biotechnological Resources. Universidad Internacional de Andalucia, Baeza, Spain. September 28, 2009.

Population Genomics of *Populus trichocarpa*. IUFRO Forest Biotechnology Meeting. Whistler, B.C., July 1, 2009.

The Influence on Genome Architecture on Genetic Variation in *Populus*. Northern Arizona University, IGERT Featured Speaker. November 20, 2008.

*Populus* as a Model System for Genome-Enabled Ecology. Texas A&M University, College Station, Texas. April 29, 2008.

The Influence on Genome Architecture on Introgression in *Populus* Hybrid Zones. University of Florida, Gainesville, Florida. April 9, 2008.

Insights into the Evolutionary Significance of Whole Genome Duplications Provided by *Populus* Expression Arrays. Roche-NimbleGen Workshop, Plant and Animal Genome Conference, San Diego, California, January 15, 2008.

Physical Movement of Seed, Pollen, and Vegetative Propagules. Genetically Engineered Forest Trees: Identifying Priorities For Ecological Risk Assessment. Raleigh, NC. May 3, 2007

*Populus Hybrid* Zones as Natural Functional Genomics Laboratories. Schatz Colloquium on Tree Genomics, Penn State Mont Alto, April 30, 2007.

*Populus Hybrid* Zones as Natural Functional Genomics Laboratories. Michigan Technological University, March 30, 2007

*Populus Genomics*. International Workshop on Conifer Genomics. Banbury Center, Cold Spring Harbor Lab, March 19, 2007

*Populus Hybrid* Zones as Natural Functional Genomics Laboratories. Virginia Polytechnic University, March 11, 2007

Population Genomics of Species Boundaries in *Populus* Hybrid Zones, University of Pittsburgh, January 31, 2007

Discovering Adaptive Polymorphisms in *Populus*. JGI/DOE Workshop, Genomic Technologies for Improving Bioenergy Feedstocks. Joint Genome Institute, Walnut Creek, CA. January 18-19, 2007.

Ecological Ramifications of the *Populus* Genome. Purdue University, February 7, 2005.

The *Populus* Genome Sequence: An Invaluable Resource for Industrial Biotechnology. The World Congress on Industrial Biotechnology and Bioprocessing (Session Chair). Orlando, FL. April 22, 2005.

From Ecosystem Genomics to Genome Ecology: Opportunities at the Interface of Complex Systems. Landscapes, Genomics, and Transgenic Conifer Forests Environmental Leadership Forum. Duke University, Durham, NC. November 17-19, 2004.

Map-Based Assembly and Structural Characterization of the *Populus* Genome. IUFRO Forest Genetics and Tree Breeding in the Age of Genomics. Charleston, SC, November 1-5, 2004

A Structural Overview of the *Populus* Genome. Functional Genomics of Environmental Adaptation in *Populus*. Gatlinburg, TN, October 10-13, 2004.

The International Populus Genome Sequencing Project: Unveiling the Secrets of a Pioneer Tree. II Meeting of the Spanish Forest Functional Genomics Network. Pontevedra, Spain, September 29-30, 2004.

The International Populus Genome Sequencing Project: Unveiling the Secrets of a Pioneer Tree (Keynote Address). 2004 Poplar Council of Canada Annual Meeting. University of British Columbia, Vancouver, BC. August 8-11, 2004.

Outcrossing Risks for Transgenic Hybrid Poplars. IUFRO Forest Biotechnology 1999. University of Oxford, Oxford, UK. July 14, 1999.

## PRESENTATIONS

Population Genomics of Vegetative Phenology in *Populus*. S.P. DiFazio. G.T. Slavov, A.M. Brunner, W. Muchero, and G.A. Tuskan. Plant and Animal Genome Conference XX. San Diego, CA, Jan. 21, 2012. The Next Generation of Genomics in *Populus* (session chair). S.P. DiFazio. Plant and Animal Genome Conference XX. San Diego, CA, Jan. 21, 2012.



Inferring the Evolutionary History of *Populus trichocarpa* from Whole Genome Resequencing Data. S. DiFazio, G. Slavov, E. Rodgers-Melnick, J. Martin, R. Priya, W. Schackwitz, L. Pennacchio, G.A. Tuskan. IUFRO Tree Biotechnology Conference. Arraial D'Ajuda, Bahia, Brazil. June 27, 2011.

Population Genomics of *Populus trichocarpa*. S. DiFazio, G. Slavov, E. Rodgers-Melnick, J. Martin, R. Priya, W. Schackwitz, L. Pennacchio, G.A. Tuskan. IUFRO Fifth International Poplar Symposium (IPS-V) Orvieto, Italy 20-25 September, 2010.

Mechanisms of Cd Toxicity and Tolerance in *Populus*. Ecological Society of America Annual Meeting. Pittsburgh, PA. August 5, 2010.

A SNP Microarray for *Populus trichocarpa*. Plant and Animal Genome Conference XV, San Diego, CA. January 16, 2007.

*Populus* Hybrid Zones as Natural Functional Genomics Laboratories. Plant and Animal Genome Conference XV, San Diego, CA. January 16, 2007.

Tools and Strategies for Identifying Genes for Complex Traits in *Populus* (Keynote). IUFRO Tree Biotechnology 2005. Pretoria, South Africa. (Prepared by S. DiFazio, presented by G. Tuskan).

Structural Characterization of the *Populus* Genome. Plant and Animal Genome Conference XIII. San Diego, CA. January 15-19, 2005.

The Poplar Genome. University of Tennessee Symposium on the Functional Genomics of Woody Plants. October 17, 2003.

Poplar Genomics: Opportunities for Accelerated Domestication and Insights on Adaptation. ORNL Genome Science and Technology Series. July 31, 2003.

Ecological Implications of the Biotechnology Revolution in Forestry. University of Tennessee, February 17, 2003.

Gene Flow from Hybrid Poplar Plantations and Implications for Transgenic Risk Assessment. International Poplar Symposium III, Uppsala, Sweden. August 28, 2002.

Biotechnology in Tree Improvement: Controversy versus Capability. Meeting of the Association of Southeast Biologists, Boone, North Carolina, April 11, 2002.

A Landscape Modeling Approach to Assessing Gene Flow from Transgenic Poplar Plantations. Tree Biotechnology in the New Millennium. Skamania, Washington, July 24, 2001.

Potential Impacts of Hybrid Poplar Plantations on Black Cottonwood Populations. Meeting of the International Poplar Council. Vancouver, Washington. September 26, 2000.

Use of Biotechnology in Improvement of Woody Biomass Crops. Society of American Foresters National Convention. Portland, Oregon. September 14, 1999.

Potential Impacts of Hybrid Poplar Plantations on Black Cottonwood Populations. Western Forest Genetics Association 1999 Annual Meeting. Flagstaff, Arizona. July 27, 1999.

## **CLASSES TAUGHT**

BIOL 321, The Total Science Experience: Genomics, Spring 2013

BIOL 794M, Personal Genomics, Spring 2012

BIOL 493/793. Current Topics in Genomics. Fall 2011, Spring 2012, Fall 2013

BIOL 464/GEN 535. Population Genetics. Fall 2007-2012

BIOL 794H. Professional Presentation Seminar. Fall 2007.

BIOL 493/793. Molecular Ecology. Fall 2006.

FS699. Applications of the Polymerase Chain Reaction in Natural Resource Research. Fall 1999.

FS507. Sustainability and Biodiversity of Tropical Ecosystems. Spring 1999.

FS505. Molecular Biology and Forestry Research: Applications and Principles. Winter 1999.

## **POSTGRADUATES ADVISED**

Luke Evans, PhD, University of Northern Arizona, April 2012-Present  
Danielle Ellis, PhD University of Arizona, Plant Sciences, September 2006-June 2011.  
Gancho Slavov, PhD Forest Science and Statistics, Oregon State University, April 2006-April 2011.  
Mindie Funke, BS, Boise State University, December 2008-June 2011.  
Hao Ma, PhD Molecular Biosciences, University of Hawaii, April 2006-August 2009,  
Damian Christey, BA Computer Science, West Virginia University. May 2007-June 2008.  
Ryan Cunningham, BS Computer Science, Ohio State University. June 2004 –August 2005.

## **GRADUATE COMMITTEES**

### **Committee Chair:**

Hari Chhetri. PhD. Ongoing. Department of Biology, West Virginia University.  
Rose Strickland-Constable. PhD. Ongoing. Department of Biology, West Virginia University.  
Ran Zhou. PhD. Ongoing. Department of Biology, West Virginia University.  
Brahma Reddy Induri. PhD. September 2012. Department of Biology, West Virginia University.  
Eli Rodgers-Melnick. PhD. July 2013. Department of Biology, West Virginia University.

### **Committee Member:**

Adebola Bamikole Adebayo, PhD, 2010, College of Forestry, West Virginia University  
Shalaka Desai, PhD., 2012, Department of Biology, West Virginia University.  
Sara Jawdy, M.S. July 2006. Department of Plant Sciences, University of Tennessee.  
Matt Kaproth, M.S. January 2008. Department of Biology, West Virginia University.  
Hao Ma, M.S., August 2009. Department of Statistics, West Virginia University.  
Emily Mooney, PhD. May 2007. Department of Biology, West Virginia University.  
Christine Picard, PhD., 2010. Department of Biology, West Virginia University.  
Baneshwar Singh, PhD. 2010. Department of Biology, West Virginia University.  
Ernest Smith, M.S., 2010, Department of Biology, West Virginia University  
Sara Souther, PhD., 2012, Department of Biology, West Virginia University.  
Michelle Thompson, M.S., May 2009, Department of Biology, West Virginia University.  
Stephanie Young, PhD., 2011, Department of Biology, West Virginia University.  
Zachary Bradford, PhD., Ongoing, Department of Biology, West Virginia University.  
Michael Carlise, PhD., Ongoing, Department of Biology, West Virginia University.  
Amy Hruska, M.S., Ongoing, Department of Biology, West Virginia University.  
Brittany Ott, M.S., Ongoing, Department of Biology, West Virginia University.  
Darren Wood, M.S., Ongoing, Department of Fisheries and Wildlife Resources, West Virginia University  
Helen Bothwell, PhD., Ongoing, Northern Arizona University Dept. of Biology.  
Mathew Zinkgraf, PhD., 2013. Northern Arizona University Dept. of Biology.

## UNDERGRADUATE HONORS RESEARCH

Niel Sprenkle, 2013, Molecular control of wood anatomy in *Populus*.  
Michael Niemann, 2013, Transcriptional responses of *Populus euphratica* to salt stress.  
Sandy Simon, Summer 2012, The insertion/deletion landscape of *Populus*.  
Adelle Schaefer, 2012, Segregation distortion in interspecific *Populus* pedigrees.  
Amenah Albagle, Spring 2011, Molecular mechanisms of ionic stress tolerance in *Populus*.  
Amanda Black, Summer 2010, NSF REU Program, Population genetics of duplicate genes.  
Amanda Emahizer, Summer 2011, NSF REU Program, Wood Anatomy of *Populus*  
Amy Rowlatt, Summer 2009, NSF REU Program, Population genetics post-fire aspen seedlings.  
Bryce Hartman, Summer 2011, SURE Program, Population genetics of Yellowstone Aspen  
Jonathan Caleb King. May 2010. Population structure in trembling aspen.  
Molly Jean Simis. May 2010. Genetic diversity of disjunct *Cornus canadensis* populations.  
Lucas Hough. May 2010. Population structure in *Populus angustifolia*.  
Dwight Alex Lastinger. Spring 2007. Structural analysis of *Populus* mitochondrion

## PROFESSIONAL ACTIVITIES

**Boards:** Visiting Committee for the Arnold Arboretum, Harvard University, 2006  
Advisory Board for the DOE Plant Genomes for Energy Applications, 2006  
Scientific Advisory Board for the NSF Plant Genome Project “Comparative Genomics of Environmental Stress Responses of North American Hardwoods” 2011-  
Scientific Advisory Board, Greenwood Resources 2012-  
Scientific Advisory Board for the Forest Health Initiative 2013-

### Scientific Committees:

2009 IUFRO Forest Biotechnology Meeting, Vancouver, B.C.  
2011 IUFRO Forest Biotechnology Meeting, Bahia, Brazil  
2013 IUFRO Forest Biotechnology Meeting, Asheville, NC  
2010-2013, Co-Chair, Plant and Animal Genome Forest Trees Workshop

**Proposal Review Panels:** DOE Program for Ecosystem Research;  
ASPB SURF Fellowship Program.  
NSF Molecular and Cellular Biosciences  
Genome Canada

**Proposal Reviews:** NSF CAREER (2), NSF Plant Genome (2), NSF Doctoral Enhancement, NSF Plant Fungal and Microbial Developmental Mechanisms (4), Plant KBBE (2), Genome Canada (9), Kentucky Science Foundation, DOE SBIR (2), DOE EPSCOR, WVU PSCOR program (4), WVU Senate Research Grants (4), Virginia Tobacco Commission (2) German BIO, South African National Research Foundation, Genome British Columbia.

**Editorial Review Board:** Tree Physiology, 2004-; New Phytologist (Advisor to the Editor) 2013

**Manuscripts Reviewed:** American Journal of Botany (3), BMC Genomics (2), Canadian Journal of Forest Research, Comparative and Functional Genomics, Conservation Genetics, Ecology Letters, Forest Ecology and Management (3), Environmental Science and Pollution Research, Genes|Genomes|Genetics, Global Change Biology (3), Heredity, Journal of Experimental Botany, Journal of the Torrey Plant Society, Molecular Breeding, Molecular Ecology (6), New Phytologist (10), Plant, Cell and Environment, Plant Molecular Biology (2), Plant Physiology, Plant Science (2), Plant Species Biology, PLOS One (2), Theoretical and Applied Genetics, Tree Physiology (10), Tree Genetics and Genomes (10), and Trees, Structure and Function.