

## PATRICK F. SULLIVAN

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### ACADEMIC TRAINING

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PhD	2005	Colorado State University	Ecology
BA	2000	Colby College	Biology

### PROFESSIONAL EXPERIENCE

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2009-present Research Scientist, University of Alaska Anchorage  
2006-2009 National Science Foundation Polar Postdoctoral Fellow  
2005-2006 Postdoctoral Fellow, University of Alaska Anchorage  
2001-2005 Graduate Research Assistant, Colorado State University

### HONORS AND AWARDS

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2011 Researcher of the Year, Environment and Natural Resources Institute  
2006-2009 National Science Foundation Polar Postdoctoral Fellowship  
2008-2009 Murie Science and Learning Center Fellowship  
2002-2003 Francis Clark Soil Biology Scholarship, Colorado State University  
2001 Plummer Scholarship, University of Wyoming  
2000 Phi Beta Kappa, Elected Member  
2000 Honors in Biology, Colby College

### CITATION STATISTICS

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Total Publications (Published and in Press): **23**  
Average Journal ISI Impact Factor: **4.01**  
Maximum Journal ISI Impact Factor: **17.56**  
Total Citations: **330**  
H-Index: **11**

### PUBLICATIONS (\*student author)

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McNown RW\*, **Sullivan PF**. 2013. Low photosynthesis of treeline white spruce is associated with limited soil nitrogen availability in the Western Brooks Range, Alaska. *Functional Ecology* 27: 672-683.

- Sharp ED\*, **Sullivan PF**, Steltzer H, Czank AZ, Welker JM. 2013. Complex carbon cycle responses to multi-level warming and supplemental summer rain in the High Arctic. *Global Change Biology* 19: 1780-1792.
- Ives SL\*, **Sullivan PF**, Dial R, Berg EE, Welker JM. 2013. CO<sub>2</sub> exchange along a hydrologic gradient in the Kenai Lowlands, AK: feedback implications of wetland drying and vegetation succession. *Ecohydrology* 6: 38-50.
- Cahoon SMP\*, **Sullivan PF**, Shaver GR, Welker JM, Post E. 2012. Interactions among shrub cover and the soil microclimate may determine future Arctic carbon budgets. *Ecology Letters* 15: 1415-1422.
- Cahoon SMP\*, **Sullivan PF**, Post E, Welker JM. 2012. Herbivores limit CO<sub>2</sub> uptake and suppress carbon cycle responses to warming in west Greenland. *Global Change Biology* 18: 469-479.
- Iversen CM, Murphy MT, Allen MF, Childs J, Eissenstat DM, Lilleskov EA, Sarjala TM, Sloan VL, **Sullivan PF**. 2012. Advancing the use of minirhizotrons in wetlands. *Plant and Soil* 352: 23-39.
- Wolken JM, Hollingsworth TN, Rupp TS, Chapin FS III, Trainor SF, Barrett TM, **Sullivan PF**, McGuire AD, Euskirchen ES, Hennon PE, Beaver EA, Conn JS, Crone LK, D'Amore DV, Fresco N, Hanley TA, Kielland K, Kruse JJ, Patterson T, Schuur EAG, Verbyla DL, Yarie J. 2011. Evidence and implications of recent and projected climate change in Alaska's forest ecosystems. *Ecosphere* 2: 124.
- Sullivan PF**, Sveinbjörnsson B. 2011. Environmental controls on needle gas exchange and growth of white spruce (*Picea glauca*) on a riverside terrace near the Arctic treeline. *Arctic, Antarctic and Alpine Research* 43: 279-288.
- Rogers MC\*, **Sullivan PF**, Welker JM. 2011. Evidence of nonlinearity in the response of net ecosystem CO<sub>2</sub> exchange to increasing levels of winter snow depth in the High Arctic of northwest Greenland. *Arctic, Antarctic and Alpine Research* 43: 95-106.
- Cable JM, Ogle K, Lucas RW, Huxman TE, Loik ME, Smith SD, Tissue DT, Ewers BE, Pendall E, Welker JM, Charlet TN, Cleary M, Griffith A, Nowak RS, Rogers M, Steltzer H, **Sullivan PF**, van Gestel NC. 2011. The temperature responses of soil respiration in deserts: a seven desert synthesis. *Biogeochemistry* 103: 71-90.
- Sullivan PF**, Arens SJT\*, Sveinbjörnsson B, Welker JM. 2010. Modeling the seasonality of belowground respiration along an elevation gradient in the western Chugach Mountains, Alaska. *Biogeochemistry* 101: 61-75.
- Sveinbjörnsson B, Smith M\*, Traustason T\*, Ruess RW, **Sullivan PF**. 2010. Variation in carbohydrate source-sink relations of forest and treeline white spruce in southern, interior and northern Alaska. *Oecologia* 163: 833-843.
- Sullivan PF**, Sveinbjörnsson B. 2010. Microtopographic control of treeline advance in Noatak National Preserve, northwest Alaska. *Ecosystems* 11: 275-285.
- Sullivan PF**. 2010. Snow distribution, soil temperature and late winter CO<sub>2</sub> efflux from soils near the Arctic treeline in northwest Alaska. *Biogeochemistry* 99: 65-77.
- Sullivan PF**, Welker JM, Arens SJT\*, Sveinbjörnsson B. 2008. Continuous estimates of CO<sub>2</sub> efflux from arctic and boreal soils during the snow-covered season in Alaska. *Journal of Geophysical Research* 113: G04009.

- Sullivan PF**, Arens SJT\*, Chimner RA, Welker JM. 2008. Temperature and microtopography interact to control carbon cycling in a high arctic fen. *Ecosystems* 11: 61-76.
- Arens SJT\*, **Sullivan PF**, Welker JM. 2008. Nonlinear responses to nitrogen and strong interactions with nitrogen and phosphorus additions drastically alter the structure and function of a high arctic ecosystem. *Journal of Geophysical Research* 113: G03S09.
- Steltzer H, Hufbauer RA, Welker JM, Casalis M, **Sullivan PF**, Chimner RA. 2008. Frequent sexual reproduction and high intraspecific variation in *Salix arctica*: implications for a terrestrial feedback to climate change in the High Arctic. *Journal of Geophysical Research* 113: G03S10.
- Sullivan PF\***, Welker JM, Steltzer H, Sletten R, Hagedorn B, Arens SJT\*, Horwath JL\*. 2008. Energy and water additions give rise to simple responses in plant canopy and soil microclimates of a high arctic ecosystem. *Journal of Geophysical Research* 113: G03S08.
- Sullivan PF\***, Sommerkorn M, Rueth HM, Nadelhoffer KJ, Shaver GR, Welker JM. 2007. Climate and species affect fine root production with long-term fertilization in acidic tussock tundra near Toolik Lake, Alaska. *Oecologia* 153: 643-652.
- Sullivan PF\***, Welker JM. 2007. Variation in leaf physiology of *Salix arctica* within and across ecosystems in the High Arctic: test of a dual isotope conceptual model. *Oecologia* 151: 372-386.
- Sullivan PF\***, Welker JM. 2005. Warming chambers stimulate early season growth of an arctic sedge: results of a minirhizotron field study. *Oecologia* 142: 616-626.
- Welker JM, Fahnestock JT, **Sullivan PF\***, Chimner RA. 2005. Leaf mineral nutrition of arctic plants in response to warming and deeper snow in northern Alaska. *Oikos* 109: 167-177.

## FUNDING STATISTICS

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Total Extramural Funding: **\$4,459,636.00**  
Extramural Funding as Institutional PI: **\$2,286,242.00**  
Extramural Funding as Institutional CO-PI: **\$2,173,394.00**

## CURRENT FUNDING

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**Sullivan PF**, Sveinbjörnsson B. 2012. Longitudinal variation in the physiology, growth and reproduction of white spruce near the Arctic treeline in Alaska. Office of Polar Programs, National Science Foundation (\$680,900-UAA).

Duddleston K, **Sullivan PF**. 2012. Importance of the microbial community as a driver of tree performance and treeline position in northwest Alaska. University of Alaska Anchorage Innovate Fund for Research Scholarship and Entrepreneurship (\$10,000-UAA).

Post E, **Sullivan PF**, Eissenstat DM, Welker JM. 2011. Collaborative Research: Linking belowground phenology and ecosystem function in a warming Arctic. Office of Polar Programs, National Science Foundation (\$497,000-UAA).

Spalinger D, Collins W, **Sullivan PF**, Welker JM, Harris N. 2011. The tundra in transition: unraveling the dynamics of western Alaska caribou- tundra ecosystems. Western Alaska LCC, United States Fish and Wildlife Service (\$199,950-UAA).

Barrett T, **Sullivan PF**, Pattison R. 2011. Biophysical limitations, migration potential, and climatic ranges of tree species in the interface between the boreal forest and the temperate rainforest in Alaska: an information synthesis. USDA Forest Service, Western Wildlands Environmental Threat Assessment Center (\$39,217-UAA).

Oberbauer SF, Hollister R, Tweedie C, Welker JM, **Sullivan PF**. 2009. Sustaining and amplifying the ITEX AON through automation and increased interdisciplinarity of observations. Office of Polar Programs, National Science Foundation (\$591,914-UAA).

## **PAST FUNDING**

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**Sullivan PF**, Sveinbjörnsson B. 2009. Canopy gas exchange and growth of white spruce near the Arctic treeline: confronting measurements with models along natural and experimental resource gradients. Office of Polar Programs, National Science Foundation (\$512,445-UAA).

Weintraub M, **Sullivan PF**, Steltzer H, Wallenstein M, Rastetter E, Schimel J. 2009. The changing seasonality of tundra nutrient cycling: implications for ecosystem and Arctic System functioning. Office of Polar Programs, National Science Foundation (\$301,597-UAA).

Czimczik C, Welker JM, Schimel J, **Sullivan PF**. 2009. Environmental changes alter the carbon cycle of High Arctic ecosystems: shifts in the ages and sources of CO<sub>2</sub> and CH<sub>4</sub>. Office of Polar Programs, National Science Foundation (\$502,530-UAA).

**Sullivan PF**. 2006. Constraints on the physiology and growth of trees at the latitudinal treeline: integration of experimental and gradient approaches. Office of Polar Programs, National Science Foundation (\$277,000-UAA).

**Sullivan PF**. 2008. Microtopographic controls on treeline advance in Noatak National Preserve, northwest, AK. Murie Science and Learning Center, National Park Service (\$3,500-UAA).

Welker JM, Sveinbjörnsson B, **Sullivan PF**. 2006. Mechanisms and feedback consequences of shrub expansion following long-term increases in winter snow depth in northern Alaska: a legacy for IPY. Office of Polar Programs, National Science Foundation (\$622,000-UAA).

Welker JM, Sveinbjörnsson B, **Sullivan PF**, Boggs K. 2006. IPY: Collaborative Research: Study of arctic ecosystem changes in the IPY using the International Tundra Experiment. Office of Polar Programs, National Science Foundation (\$257,000-UAA).

## INVITED PRESENTATIONS AND GUEST LECTURES (2012-2013)

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Sullivan PF. 2013. Nitrogen availability constrains treeline tree growth and allocation in northwest Alaska. Guest Lecture in Tundra and Taiga Ecosystems, University of Alaska Anchorage, Anchorage, AK.

Sullivan PF. 2012. Causes and consequences of changes in treeline. Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks, AK.

Sullivan PF. 2012. Species effects on fine root production in arctic tundra: implications for soil carbon stocks in a changing climate. Scaling Root Processes: Global Impacts Workshop, Arlington, VA.

Sullivan PF. 2012. Causes and consequences of changes in treeline. Department of Biological Sciences, Idaho State University, Pocatello, ID.

## TEACHING

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Northern Ecotones, Biology 485/685, Spring Semester 2008, University of Alaska Anchorage

Directed Research, Biology 698, Fall Semester 2010-present, University of Alaska Anchorage

Graduate Research Techniques, Biology 696, Fall Semester 2010-present, University of Alaska Anchorage

## PROFESSIONAL SERVICE

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### *Graduate Students*

Sarah Ellison	UAA	
Cassie Gamm	UAA	
Annie Brownlee	UAA	Co-advisor: Sveinbjörnsson
Aliza Segal (M.S. '12)	UAA	
Robert McNown (M.S. '12)	UAA	

### *Graduate Committee Membership*

L. Ebbs	UAA	Advisor: Welker
M. MacNeille	UAA	Advisor: Sveinbjörnsson
K. Legner (M.S. '13)	UAA	Advisor: Spalinger
A. Anderson-Smith (M.S. '13)	UAA	Advisor: Welker
E. Sharp (M.S. '12)	UAA	Advisor: Welker
M. Mazzacavallo (M.S. '12)	UAA	Advisor: Kulmatiski
S. Cahoon (M.S. '10)	UAA	Advisor: Welker
S. Ives (M.S. '10)	APU	Advisor: Dial
M. Rogers (M.S. '10)	UAA	Advisor: Welker

## Reviewer

National Environmental Research Council, United Kingdom  
Arctic Natural Sciences, Office of Polar Programs, National Science Foundation  
Arctic System Sciences, Office of Polar Programs, National Science Foundation  
Geobiology and Low-temperature Geochemistry Program, National Science Foundation  
Nature  
Global Change Biology  
New Phytologist  
Philosophical Transactions of the Royal Society B  
Ecology  
Journal of Ecology  
Ecological Applications  
Functional Ecology  
Ecosystems  
Agricultural and Forest Meteorology  
Biogeochemistry  
Biogeosciences  
Progress in Physical Geography  
Tellus B  
Soil Biology and Biochemistry  
Canadian Journal of Forest Research  
Arctic, Antarctic and Alpine Research  
Forest Ecology and Management  
Canadian Journal of Botany  
Polar Research  
Canadian Journal of Soil Science  
Climate Research  
Plant Ecology and Diversity

## PUBLISHED ABSTRACTS

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Darrouzet-Nardi A, Weintraub MN, Steltzer H, **Sullivan PF**, Wallenstein MD. 2012. Soil nitrogen dynamics during snowmelt in moist acidic tussock tundra soils. Eos Trans AGU, 93(52), Fall Meet. Suppl., Abstract B22D-03.

Weintraub MN, Steltzer H, **Sullivan PF**, Darrouzet-Nardi A, Schimel J, Wallenstein MD, Livensberger C, Segal AD. 2012. Interactions between spring temperatures and snow cover alter plant-soil nutrient feedbacks in moist acidic arctic tundra. Eos Trans AGU, 93(52), Fall Meet. Suppl., Abstract B23J-07.

**Sullivan PF**, McNown RW, Sveinbjörnsson B. 2011. Canopy gas exchange of white spruce in contrasting habitats near the Arctic treeline in northwest Alaska. Eos Trans AGU, 92(52), Fall Meet. Suppl., Abstract B12B-05.

Sveinbjörnsson B, Traustason T, **Sullivan PF**, Ruess RW. 2011. Environment and performance of white spruce below and above the forest limit across the boreal forest in Alaska. Eos Trans AGU, 92(52), Fall Meet. Suppl., Abstract B12B-08.

McNown RW, **Sullivan PF**. 2011. Seasonality of needle gas exchange and growth in all major organs of white spruce in contrasting habitats near the Arctic treeline. Eos Trans AGU, 92(52), Fall Meet. Suppl., Abstract B13D-0598.

Segal AD, **Sullivan PF**, Weintraub MN, Darrouzet-Nardi A, Steltzer H. 2011. Relative contributions of rhizosphere and microbial respiration to belowground and total ecosystem respiration in arctic tussock tundra: results of a  $^{13}\text{C}$  pulse-chase experiment. Eos Trans AGU, 92(52), Fall Meet. Suppl., Abstract GC51F-1077.

Darrouzet-Nardi A, Wallenstein MD, Steltzer H, **Sullivan PF**, Melle C, Segal AD, Weintraub MN. 2011. Early season nitrogen limitation of microbial respiration in the organic horizon of tussock tundra soils. Eos Trans AGU, 92(52), Fall Meet. Suppl., Abstract GC51F-1070.

Steltzer H, Weintraub MN, Darrouzet-Nardi A, Melle C, Segal A, **Sullivan PF**, Landry C, Wallenstein MD. 2010. Changing the seasonality of an arctic tundra ecosystem: earlier snowmelt and warmer temperatures. Eos Trans AGU, 91(52), Fall Meet. Suppl., Abstract GC43A-0955.

Sharp ED, **Sullivan PF**, Czimczik CI, Welker JM. 2010. Warmer summers combined with increases in rain lead to major changes in trace gas feedbacks from high arctic polar semi-deserts in NW Greenland to the atmosphere. Eos Trans AGU, 91(52), Fall Meet. Suppl., Abstract GC43A-0956.

Anderson-Smith A, Lewis A, **Sullivan PF**, Welker JM. 2010. Increasing NDVI values in northern Alaska: studies that mix shrub density, spectral and  $\text{CO}_2$  exchange measurements. Eos Trans AGU, 91(52), Fall Meet. Suppl., Abstract GC43B-0974.

Ebbs LM, **Sullivan PF**, Welker JM. 2010. Water sources of evergreen and deciduous species depend upon season, ecosystem type and snowpack depth in arctic tundra near Toolik Lake, Alaska. Eos Trans AGU, 91(52), Fall Meet. Suppl., Abstract GC43B-0978.

Darrouzet-Nardi A, Wallenstein MD, Steltzer H, **Sullivan PF**, Melle C, Segal A, Weintraub MN. 2010. Seasonal patterns in soil N availability in the arctic tundra in response to accelerated snowmelt and warming. Eos Trans AGU, 91(52), Fall Meet. Suppl., Abstract GC52A-07.

**Sullivan PF**. 2009. Snow distribution, soil temperature and late winter  $\text{CO}_2$  efflux from soils at the Arctic treeline in northwest Alaska. Eos Trans AGU, 90(52), Fall Meet. Suppl., Abstract B41C-0329.

Sharp ED, Welker JM, **Sullivan PF**. 2009. Warmer summers combined with increases in rain led to major changes in the trace gas feedbacks from high arctic polar semi-deserts in NW Greenland to the atmosphere. *Eos Trans AGU*, 90(52), Fall Meet. Suppl., Abstract GC51A-0710.

Ebbs LM, Taneva L, **Sullivan PF**, Welker JM. 2009. Trace gas and vegetation feedback responses of Alaskan tussock tundra to long-term snow depth manipulations. *Eos Trans AGU*, 90(52), Fall Meet. Suppl., Abstract B41C-0323.

Cahoon SMP, **Sullivan PF**, Welker JM, Post E. 2009. Herbivores modify the carbon cycle in a warming arctic. *Eos Trans AGU*, 90(52), Fall Meet. Suppl., Abstract GC51A-0711.

Anderson-Smith A, Pattison RR, **Sullivan PF**, Welker JM. 2009. Photosynthetic response of *Eriophorum vaginatum* to *in situ* shrub shading in tussock tundra of northern Alaska. *Eos Trans AGU*, 90(52), Fall Meet. Suppl., Abstract GC51A-0709.

Welker JM, **Sullivan PF**, Rogers MC, Sharp ED, Sletten RS, Burnham JL, Hallet B, Hagedorn B. 2009. Climate change consequences for terrestrial ecosystem processes in NW Greenland: results from the High Arctic Biocomplexity project. *Eos Trans AGU*, 90(52), Fall Meet. Suppl., Abstract GC41D-04.

Dynes E, Welker JM, Moore DJ, **Sullivan PF**, Ebbs L, Pattison RR. 2009. Photosynthesis, plant growth and nitrogen nutrition in Alaskan tussock tundra: response to experimental warming. *Eos Trans AGU*, 90(52), Fall Meet. Suppl., Abstract B41C-0318.

**Sullivan PF**, Sveinbjornsson B. 2008. Insects extend the consequences of a warm, dry summer for tree growth in the subsequent summer near the Arctic treeline in Alaska. *Eos Trans AGU*, 89(53), Fall Meet. Suppl., Abstract B21C-0375.

Welker JM, **Sullivan PF**, Pattison RR, Schimel JP, Kielland K, Taneva L, Nowinski N, Trumbore S, Sveinbjornsson B, Rogers MC. 2008. Experimental increases in snow depth alter the seasonality, structure and function of ecosystems in Alaska and Greenland. *Eos Trans AGU*, 89(53), Fall Meet. Suppl., Abstract C34A-04.

Pattison RR, Welker JM, Sveinbjornsson B, **Sullivan PF**. 2007. Differential photosynthetic response of two deciduous shrub species to short and long-term snow accumulation in the arctic tundra of northern Alaska. *Eos Trans AGU*, 88(52), Fall Meet. Suppl., Abstract B51C-0607.

Taneva L, **Sullivan PF**, Sveinbjornsson B, Welker JM. 2007. Effects of deeper snow on ecosystem CO<sub>2</sub> fluxes in tussock tundra in northern Alaska. *Eos Trans AGU*, 88(52), Fall Meet. Suppl., Abstract B51C-0608.

Rogers MC, Welker JM, **Sullivan PF**, Sletten RS, Arens SJT, Kristenson H. 2007. Experimental increases in snow alter physical, chemical and feedback processes in the High Arctic. *Eos Trans AGU*, 88(52), Fall Meet. Suppl., Abstract B51C-0605.



**Sullivan PF**, Welker JM, Sletten RS, Horwath J, Steltzer H, Arens SJT, Hagedorn B. 2006. Unexpected effects of energy and water additions on the microclimate of a high arctic ecosystem. *Eos Trans AGU*, 87(52), Fall Meet. Suppl., Abstract C51A-0394.

Steltzer H, Welker JM, **Sullivan PF**. 2006. The effect of temperature and increased rainfall on carbon dioxide exchange in a high arctic ecosystem: improving models and testing linearity of response. *Eos Trans AGU*, 87(52), Fall Meet. Suppl., Abstract C21B-1155.

Arens SJT, **Sullivan PF**, Welker JM, Rogers MC, Holland K, Schimel JP, Persson K. 2006. Nutrient limitations constrain the feedback capacity of landscapes in the high arctic: nonlinearities and synergism. *Eos Trans AGU*, 87(52), Fall Meet. Suppl., Abstract C51A-0387.

Welker JM, Sletten RS, Hallet B, Schimel JP, Hagedorn B, **Sullivan PF**, Steltzer H, Holland K, Horwath J, Arens SJT, Rogers MC, Garnes D, Persson K. 2006. Biocomplexity in the High Arctic: linearities, interactions and hidden secrets in surface processes. *Eos Trans AGU*, 87(52), Fall Meet. Suppl., Abstract C43A-05.

**Sullivan PF**, Welker JM. 2005. Variation in leaf physiology along experimental and natural gradients in the High Arctic: test of a dual isotope conceptual model. *Eos Trans AGU*, 86(52), Fall Meet. Suppl., Abstract B22B-06.

Holland KJ, **Sullivan PF**, Wallenstein M, Arens SJT, Schimel JP, Welker JM. 2005. Interactions between temperature and nutrient availability in mediating microbial respiration in high arctic polar semi-desert soils. *Eos Trans AGU*, 86(52), Fall Meet. Suppl., Abstract B52A-04.

Steltzer H, **Sullivan PF**, Welker JM. 2004. Short-term increases in summer temperature and rainfall do not lead to carbon storage in the High Arctic. *Eos Trans AGU*, 85(47), Fall Meet. Suppl., Abstract B41B-0121.

**Sullivan PF**, Welker JM, Fahnestock JT. 2002. Growing season patterns in *Eriophorum vaginatum* L. biomass allocation: the influence of experimental manipulation. *Eos Trans AGU*, 83(47), Fall Meet. Suppl., Abstract B21B-0732.