In Re: Rock Creek Park Deer Management Petition)
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DECLARATION OF OSWALD JOSEPH SCHMITZ, Ph.D.

I, Oswald Schmitz, declare as follows:

1. I hold bachelor's and master's degrees from the University of Guelph Department of Zoology, and a Ph.D. from the University of Michigan School of Natural Resources.

2. I am currently employed by Yale University as the Oastler Professor of Population and Community Ecology within the School of Forestry and Environmental Studies, and as the Director of the Yale Institute for Biospheric Studies.

3. Throughout my career, I have been actively involved in many professional organizations. I am currently affiliated with the Ecological Society of America, American Association for the Advancement of Science, Society of American Naturalists, and Society for Conservation Biology. A copy of my curriculum vitae is attached as Attachment A.

4. My research concentrates on the link between two important components of natural systems: biodiversity and ecosystem services. I conduct field research to study how predator and herbivore species determine the species composition and productivity of plants in ecosystems and ensuing ecosystem processes such as nutrient and carbon cycling.

5. I have expertise on the role of white-tailed deer in ecosystems. I am the author of the books *Ecology and Ecosystem Conservation* and *Resolving Ecosystem Complexity*, among others. I have published extensively in peer-reviewed science journals, including articles in the *Journal of Wildlife Management, Forest Ecology and Management, Annual Review of Ecology, Evolution and Systematics*, *Oecologia, Ecological Applications, Evolutionary Ecology*, and *Holarctic Ecology*, which examined various aspects of the role white-tailed deer play in

biological communities, including their effects on vegetation. I also co-authored a chapter in the book *The Science of Overabundance: Deer Ecology and Population Management*, published by Smithsonian Press, entitled "Rethinking the role of deer in forest ecosystem dynamics."

6. In addition, I have served as a member of the U.S. Environmental Protection Agency ("EPA") Scientific Advisory Board ad hoc panel reviewing the EPA Report on the Environment, and as a proposal reviewer for the National Science Foundation ("NSF") on the Ecology, Population Biology, and Physiology and Behavior panels.

7. I have reviewed two technical reports on the impacts of white-tailed deer on vegetation in Rock Creek Park: J.S. Hatfield, *Analysis of vegetation changes in Rock Creek Park, 1991-2007*, National Park Service Natural Resource Technical Report, NPS/NCR/ NCRO/NRTR-2009/001 (Washington, D.C. 2009) ("2009 Hatfield"), and C.C. Krafft and J.S. Hatfield, *Impacts of deer herbivory on vegetation in Rock Creek Park, 2001-2009*, Natural Resource Technical Report, NPS/NCR/NCRO/NRTR-2011 (Washington, D.C. 2011) ("2011 Krafft & Hatfield"). I have also reviewed the portions of the Rock Creek Park Final White-Tailed Deer Management Plan and EIS ("EIS") pertaining to my areas of expertise, namely NPS's discussion of the deer's impact on vegetation and forest regeneration, which relies in large measure on the 2009 Hatfield and 2011 Krafft & Hatfield studies.

8. I have received no compensation for reviewing these materials or preparing this declaration.

9. For the reasons discussed below, based on my experience and expertise, as well as NPS's own documents, I believe there is no evidence presented that deer are impairing forest regeneration in Rock Creek Park or that deer are facilitating the rise of invasive non-native

vegetation. In fact, for the vast majority of vegetation types in Rock Creek Park, deer are having no effect.

10. The 2009 Hatfield study analyzed vegetation data collected at Rock Creek Park every four years from 1991 to 2007 in 24 long-term unfenced monitoring plots, measuring 20 meters by 20 meters, in three regions of the Park. While the study considered deer browse of twigs, canopy cover species, richness of herbaceous plants, and various aspects of tree seedling abundance, the study was not designed in a way that could discern how different deer abundances across the Park influence vegetation. The authors speculated that deer may have played a role in the vegetation changes, but themselves admitted that "[i]t is not possible to discern causes from these data for the significant differences found among some of these vegetation variables" and that "other causative factors are also possible." Thus, although the 2009 Hatfield study demonstrated changes in vegetation in Rock Creek Park over time, it did not show that deer had any negative effect on plant abundance or diversity or on forest regeneration.

11. The 2011 Krafft & Hatfield study used paired plots to examine the effect of deer presence on vegetation in the Park. The study's comparison of fenced areas to unfenced areas is both well designed and rigorous, employing the use of a control and ensuring replication of the results. Thus, the study effectively measures whether deer are having an effect on some kinds of vegetation (but notably, not tree seedling density), and if so, how much.[1] The data reported do not, however, support the authors' conclusions, and the National Park Service's reliance on this study to conclude in its EIS that the "[r]esults of vegetation monitoring in recent years have documented the adverse effects of the large herd size on forest regeneration" is patently

[1] In fact, the authors of the study recommend adding tree seedling density measurements to future investigations. *See* 2011 Krafft & Hatfield at 12. Figure 2 depicts *cover* from tree species, which is distinct from the *density* of seedlings.

overstated. The study instead shows the opposite: that deer eat tree seedlings in the Park, but that this particular reduction in the number of tree seedlings has no measurable effect on forest regeneration.

12. To the extent that the National Park Service adopted its deer management program based on a belief that deer are adversely affecting "the ability of the forest to regenerate in Rock Creek Park," EIS at 1, the decision relies on a faulty premise. The data presented in Figure 3 of the 2011 Krafft & Hatfield study demonstrate this. The researchers depict measurements of horizontal cover – that is, the thickness of the vegetation at a given height. Where the management goal is forest regeneration, horizontal cover at a foot or less provides useful background information, but does not indicate whether the environmental factor being measured is impairing the forest's ability to regenerate. What matters is the amount of horizontal cover at greater heights. The reason for this is that forests are self-thinning, regardless of the presence of deer. By way of illustration, if there were 1,000 seedlings within a fenced plot, over time, the seedlings would compete for sunlight and other resources, most would die, and in the end, the plot may produce only 20 trees. However, in an unfenced plot that also begins with 1,000 seedlings, the seedlings will also compete for sunlight and other resources, and in addition, deer will eat some. If the unfenced plot also produces 20 trees, then the deer will not have affected the ability of the forest to regenerate, even if they have eaten a portion of the seedlings.

13. Indeed, the data in Figure 3 illustrate a real-world occurrence of this example. They show that at a low height (0-30 centimeters, or approximately 0-1 feet), the horizontal cover is significantly higher in the fenced plots than in the unfenced plots in Rock Creek Park. The difference persists, albeit less dramatically, at a medium height (30-110 centimeters, or approximately 1-3 feet). However, at waist height and above (110-190 centimeters, or

approximately 3-6 feet) – in other words, the height that matters for forest regeneration – there is no difference in the horizontal cover between the fenced and unfenced plots. These data therefore graphically demonstrate that deer in Rock Creek Park are having no net effect on forest regeneration: the horizontal cover at 3-6 feet is not affected by the presence of deer, even though they appear to eat the seedlings at lower heights.

14. Rather than focusing on the fact that forest regeneration is not being limited by deer browsing – the primary result of the 2011 Krafft & Hatfield study – both the authors and the National Park Service have instead selectively used other data from the study to reach certain conclusions about the relationship between deer and vegetation in the Park. In their abstract, the authors make statements that are technically true, but miss the big picture. Thus, they state that:

> Protection from deer herbivory has led to higher overall species richness and higher species richness for woody species [which are comprised of an unspecified mix of trees, shrubs, and woody vines], natives, and shrubs compared to plots not receiving protection. There is also evidence that plots protected from deer herbivory and those not receiving this protection are diverging over time with respect to number of variables such as cover by woody and shrub species, cover in the lowest height class, and species richness of woody and native species.

The National Park Service then repeats this particular language of the study to reach the conclusion that the data demonstrate that "vegetation in plots protected from deer herbivory for 9 years showed significantly greater vegetative cover compared to plots not protected from deer herbivory." EIS at 17. However, in making this statement, the National Park Service misstates the limitation on the results – i.e., that any biologically meaningful effects were essentially *limited to woody species and shrubs* and that deer had no significant impact on the ability of the forest to regenerate – by stating that "[t]his effect was *most pronounced for woody and shrub cover*," implying that deer were having biologically significant impacts on other vegetation as well, which is demonstrably not true. *Id.* (emphasis added).

15. For the vast majority of vegetation types, the paired plots showed that deer had no effect, or an effect so small as to be biologically meaningless. Nonetheless, the authors and the Park Service play up the differences where they exist, but ignore the fact that the study showed that deer have little to no effect on most of the vegetation in Rock Creek Park, and cannot be said to be impairing the ability of the forest to regenerate.

16. Figure 2 in the 2011 Krafft & Hatfield study, for example, depicts the difference in ground cover between the paired plots. The data show no difference in any year between the fenced plots and the unfenced plots for proportion of ground covered by American beech (*F.grandifolia*), mapleleaf viburnum (*V.acerifolium*), spicebush (*L.benzoin*), or English ivy (*H.helix*), and only miniscule differences in some years for herbaceous species, non-native species, trees, shrubs, and woody vines. Thus, for nine of the eleven categories studied, the difference in ground cover between the fenced plots and unfenced plots was insignificant or miniscule – meaning that deer had no biologically significant effect on the growth and spread of those plants. This means that the National Park Service's reduction of deer numbers in Rock Creek Park can be expected to have no noticeable effect on these species.

17. Similarly, according to Figure 4 of the study, when species richness was measured – i.e., the diversity in the number of species present – there were no significant differences between the fenced plots and the unfenced plots for most categories of vegetation – herbaceous species, non-native species, trees, shrubs, and woody vines – in most years.

18. In addition, where effects *were* observed, the 2011 Krafft & Hatfield study fails to explain why the particular resource measured is important to the management of the park or ecosystem health. For example, researchers observed statistically significant differences in the cover and diversity of woody species between the fenced and unfenced plots, but fail to explain

the significance of their finds to the health, diversity, or management of the Park. Beech trees and various shrubs are woody species – and in fact, the 2011 Krafft & Hatfield study states that beech (*F.grandfo1ia*) was the only tree species that provided sufficient cover to meet the "dominant species" threshold – but an abundance of beech trees or shrubs may not be beneficial to a forest community historically comprised of oaks or maples, particularly if beech tree or shrub seedlings outcompete the oak or maple seedlings.

19. Similarly, the study does not indicate whether the species abundance observed in the fenced plots is sufficient to meet the Park's management goals or ensure the health of the biological community. For example, while the difference between species abundance of woody species in the paired plots is statistically significant, the actual numerical difference – e.g., four species of woody vegetation observed in unfenced plots versus seven species observed in fenced plots in one year – may be too small to make a biologically significant difference in how the forest functions. Statistical differences are practically meaningless if they do not achieve a management goal or serve an ecological function. Thus, significantly, the 2011 Krafft & Hatfield study provides no evidence that the Park *would function differently if deer populations are reduced*, or that the minute changes that have been observed between fenced and unfenced plots would in any way diminish the value of wildlife habitat. This is an extremely salient fact because the National Park Service relies heavily on this study to justify its decision to undertake a dramatic management action – i.e., to kill large numbers of native deer in Rock Creek Park – and to reject non-lethal management approaches, such as fertility control, that would reduce the deer population more gradually.

20. The 2011 Krafft & Hatfield study does not demonstrate that deer are having a "major effect" on Rock Creek Park's deciduous forests, as that term is defined by the General

Management Plan for the Park. Final General Management Plan (2005) at 200. The study does not show that deer are having any impact on upland deciduous forests or riparian deciduous forests, or that their presence is affecting rare plant communities, or that deer are disturbing deciduous forests on slopes. *See id.* Nor do any of the data demonstrate that deer are converting upland or riparian areas to or from vegetation types dominated by invasive or non-native species. *See id.*

21. On the other hand, the 2011 Krafft & Hatfield study does provide compelling evidence that the Park Service's deer management program will not affect the rise of invasive, non-native species in the Park. If the National Park Service were correct that deer herbivory causes exotic species to flourish by eliminating native plants that compete with these species, or if deer are responsible for bringing the seeds of non-native ornamental plantings from neighboring properties into the Park, the data should show that fencing deer out of plots would result in less cover by non-native plants, and fewer exotic species. This effect, however, is demonstrably absent from the data collected from the paired plots in the 2011 Krafft & Hatfield study, and hence, nothing in this study shows that deer browsing facilitates the rise of invasive plants in the Park.

22. Thus, Figure 2(d) depicts the cover of non-native species in fenced plots and unfenced plots, showing no significant difference for the first seven years of the nine-year study, and a statistically significant, but vanishingly small, difference for the last two years. The importance of this figure is not that non-native species grow slightly better in plots protected from deer herbivory – although the data undoubtedly show this effect in the last two years of the study – but that *non-native species grow regardless of whether deer are present*. In other words,

whether deer are present or not, these non-native species will continue to flourish in this Park unless they are managed by some other means.

23. Additionally, Figure 4(e) depicts the numbers of non-native species present in fenced and unfenced plots. These data also show no significant difference between the species richness of exotic species between the areas that allowed deer access and those that did not. In other words, regardless of whether the National Park Service fences deer out, eliminates them altogether, reduces their numbers, or allows the population to remain stable, the data suggest that there will also be no difference in the numbers of species of exotic plants present in the Park.

24. Given that one of the objectives of the deer management plan is to "reduce the spread of non-native plant species through effective deer management," EIS at 2, and the EIS's contentions that "[i]nvasive nonnative plants (exotic species) seriously threaten the integrity of native habitats, including eastern deciduous forests," and that the "exotic species problem is particularly acute in urban parklands where extensive edges and frequent human disturbances enhance opportunities for aggressive exotic plants to become established, such as at Rock Creek Park," EIS at 104, the National Park Service should have honed in on the finding of the 2011 Krafft & Hatfield study that reducing deer numbers will not affect the rise of invasive, non-native species in the Park before relying on this study to justify its decision to kill the native deer. At the very least, the 2011 Krafft & Hatfield study suggests that the relationship between the presence of deer and the rise of exotic plant species is not cause-and-effect. In other words, reducing deer numbers will not directly reduce exotic plants in the Park.

25. In my professional opinion, the 2011 Krafft & Hatfield study, in combination with the information presented in the EIS, therefore demonstrate that the National Park Service's

decision to manage deer by dramatically reducing their populations is likely to have no effect on the abundance or diversity of exotic species within the Park.

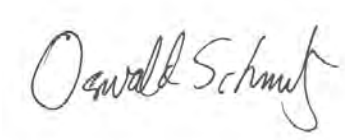
26. On the other hand, the National Park Service's failure to take remedial measures to prevent the increase in exotic plant species in the Park that are not palatable to deer – such as American bittersweet and Japanese barberry – and that are displacing the native species that are the deer's preferred vegetation, may be causing deer to leave the Park in search of food, particularly where neighboring properties provide access to ornamental plants known to be extremely palatable to deer, such as Japanese maples, English ivy, and burning bush (sometimes called "deer candy"). In my opinion, until the National Park Service studies these interrelated issues – the extent to which exotic plants are affecting native vegetation and deer, and conversely, the impact of deer on exotic and native plants – it will have no defensible scientific basis for continuing to kill deer in order to preserve the native vegetation of the Park. I also concur with other scientists that the complex interactions among deer, other wildlife, native plants, and exotic plants should be studied in the context of the surrounding landscape, as described in S.L. Stout, *Assessing the Adequacy of Tree Regeneration on the Cuyahoga Valley National Recreation Area: A Literature Review and Recommendations* (1998). Geographic Information System ("GIS") technology should be employed, together with sampling, to determine concentrations of Japanese barberry and other exotic plants. This information may shed light on whether exotic plants are being cultivated by homeowners in the neighborhoods surrounding the Park, and if so, whether the wind or birds are carrying the seeds onto Park lands.

27. In conclusion, the 2009 Hatfield and the 2011 Krafft & Hatfield studies do not provide any evidence that deer are having an effect on forest regeneration in Rock Creek Park. On the contrary, deer are having no effect on most plants within Rock Creek Park, including

exotic species. Therefore, in my professional opinion, to the extent that the National Park Service is relying on these studies to support its decision to kill deer in this Park in an effort to protect and promote forest regeneration or native plants, such reliance is probably misplaced.

28. Additionally, the National Park Service should not rely on research on deer at other locations – e.g., Catoctin Mountain Park and Gettysburg National Park – to justify its decision to kill deer at Rock Creek Park, because there simply are too many variables in any of these parks to make such reliance scientifically valid. In my opinion, it is irresponsible to extrapolate data from lands elsewhere, because the site-specific data here show that deer are not damaging the plant resources of Rock Creek Park.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief. Executed this 2nd day of July, 2013.



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Oswald Schmitz

Attachment A

Curriculum Vitae

Oswald Joseph Schmitz
Oastler Professor of Population and Community Ecology

WORK ADDRESS Yale University, School of Forestry and Environmental Studies, 370 Prospect St., New Haven, CT 06511 Ph (203) 432-5110,
Email: oswald.schmitz@yale.edu

URL http://environment.yale.edu/schmitz/

DEGREES

2003	MA Privatim, Yale University
1985-1989	Ph.D. University of Michigan, School of Natural Resources.
1983-1984	M,Sc. University of Guelph, Department of Zoology
1978-1982	B.Sc. University of Guelph, Department of Zoology

PROFESSIONAL POSITIONS

2011-2014	Director, Yale Institute for Biospheric Studies
2004-2009	Associate Dean for Academic Affairs, Yale University, School of Forestry and Environmental Studies
2000-present	Professor, Yale University, School of Forestry and Environmental Studies
2000-present	Joint Professor, Yale University, Department of Ecology and Evolutionary Biology (courtesy appointment subject to biannual re-approval)
1997-2000	Joint Associate Professor, Yale University, Department of Ecology and Evolutionary Biology
1996-2000	Associate Professor with term, Yale University, School of Forestry and Environmental Studies
1992-1996	Assistant Professor with term, Yale University, School of Forestry and Environmental Studies
1990-1992	N.S.E.R.C. (Canada) Postdoctoral Fellow, Department of Zoology, University of British Columbia
1988-1989	Rackham Predoctoral Fellow, School of Natural Resources, University of Michigan

FELLOWSHIPS/AWARDS/HONORS

2006	Named the Oastler Professor of Population and Community Ecology, Yale School of Forestry and Environmental Studies
2006	Elected Fellow of the AAAS (American Association for the Advancement of Science) for distinguished fundamental contributions towards understanding the emergence and maintenance of ecosystem structure and functioning and for relating ecosystem patterns to individual behaviors.
1999	Teaching Award, Yale School of Forestry and Environmental Studies
1994	Yale University Nominee, Packard Foundation Science Fellowship
1992	University Postdoctoral Fellowship, University of Calgary, (Declined to accept position at Yale)
1990-1992	N.S.E.R.C. Postdoctoral Fellowship, University of British Columbia
1988-1989	Rackham Predoctoral Dissertation Fellowship, University of Michigan
1987	Rackham Research Fellowship, University of Michigan

BIOGRAPHICAL SKETCH

Oswald Schmitz is the Oastler Professor of Population and Community Ecology, in the Yale University School of Forestry and Environmental Studies. He studies the linkage between two important components of natural systems: biodiversity and ecosystem services. These issues are examined using field experimentation guided by formal mathematical theory of species interactions. Both theory development and field research is aimed at identifying functionally unique groupings of predators and herbivores. These insights are used to explain how predator and herbivore species determine the species composition and productivity of plants in ecosystems, and ensuing ecosystem processes such as nutrient and carbon cycling. Research also focuses on elucidating how important environmental disturbances, such as global climate change and natural resource exploitation, alter the nature and strength of species interactions in ecosystems and ensuing ecosystem services. The scientific insights aid efforts to conserve vital services that species in ecosystems provide to humankind. His research evaluates how to rethink conservation strategies by considering species as part of a natural portfolio. This portfolio represents a wealth of potential alternatives to contemporary technologically intensive and expensive approaches in environmental management. His book "Ecology and Ecosystem Conservation" encapsulates much of his thinking about biodiversity and ecosystems and was heavily inspired by the writings of Aldo Leopold. More recently, his book "Resolving Ecosystem Complexity" lays out a blueprint for conducting empirical research to provide predictive understanding of how an ecosystem's complexity develops from the vast numbers of species interacting within it.

PROFESSIONAL AFFILIATIONS

Ecological Society of America; American Association for the Advancement of Science; Society of American Naturalists, Society for Conservation Biology

PROFESSIONAL SERVICE

To Conservation and Policy

2005-2009	Advisory Board Member, Center for Conservation Solutions, American Forest Foundation, Washington, DC.
2004	Member, US Environmental Protection Agency (EPA) Scientific Advisory Board ad hoc panel reviewing the EPA Report on the Environment.
2004	Presented "The effects of global climate change on species diversity and ecosystem functioning within the continental USA" to the spring meeting of the New England Governors and Eastern Canadian Premier's conference. This was a prelude to the fall meeting that led to significant New England wide agreements and subsequent legislation on controlling greenhouse gas emissions in New England.
1994 – 2000	Scientific Advisory Board, Mistik Forest Management Ltd., Saskatchewan, Canada
1999	Member, Scientific Advisory Panel on "Total Land Management", Mining Prospectors and Developers Association of Canada.

To Academics

2011-2012	Member, Steering Committee for Workshop: Climate change and species interactions: ways forward. Institute of Ecosystem Studies, Millbrook NY
2010-	Member, Editorial Advisory Board, Encyclopedia of Sustainability Volume 5: Ecosystem Management and Sustainability.
2010	Judge, Blavatnik Awards for Young Scientists, New York Academy of Sciences.

2010	Member, Millennium Conferences proposal review committee, Ecological Society of America.
2004-2010	Invited Faculty Member, Community Ecology and Biodiversity Group (1 of 9 original Internationally) Faculty of 1000 Biology—A next-generation literature awareness tool in which faculty members highlight the most interesting papers published in the biological sciences.
2006	Review Panel Member, US National Science Foundation (NSF) Ecological Biology Program.
2004	External Faculty Opponent, Ph.D. Dissertation, Umeå University
2002	External Faculty Opponent, Ph.D. Dissertation, University of Amsterdam
2002	Organized a Special Feature entitled “Linking Individual-scale trait plasticity to community dynamics” published in Ecology.
2002	Review Panel Member, US National Science Foundation (NSF) Biocomplexity in the Environment Program.
2000	Review Panel Member, United States Department of Agriculture (USDA) Ecosystem Science Grants Program
2000	Review Panel Member, US National Science Foundation (NSF) Doctoral Dissertation Improvement Grants Program
1996	Guest Editor, Special issue of Evolutionary Ecology (November 1997) on the theme "The population and community dynamical implications of optimal foraging theory" commemorating the 30th anniversary of optimal foraging theory.

To the Community

2005- 2008	Member, New Haven Science Fair Steering Committee
2005	Yale-New Haven Teacher’s Institute—Teaching Fellow: Ecology and Conservation for New Haven Public School teachers.
1995- present	Mentor, New Haven Science Fair

EDITORIAL SERVICE

2010-present	Associate Editor, ECOSPHERE
2009-present	Associate Editor, THE AMERICAN NATURALIST
2006-present	Associate Editor, ECOSCIENCE
2007-2009	Associate Editor, RESEARCH LETTERS IN ECOLOGY
2004-2008	Editor, ECOLOGY LETTERS
2001-2007	Associate Editor, OECOLOGIA
1999-2005	Associate Editor, ECOLOGY & ECOLOGICAL MONOGRAPHS

PEER REVIEW CONTRIBUTIONS

- Proposal Reviewer for USA National Science Foundation (NSF): Ecology, Population Biology, and Physiology and Behavior panels.
- Proposal Reviewer for Academy of Sciences of the Czech Republic
- Proposal Reviewer for Canada Natural Sciences Research Council (NSERC)
- Proposal Reviewer for Israeli National Science Foundation
- Proposal Reviewer for National Geographic Committee for Research and Exploration
- Proposal Reviewer for Netherlands Organization for Scientific Research
- Proposal Reviewer for Royal Society of New Zealand Marsden Fund
- Proposal Reviewer for South African Science Foundation
- Proposal Reviewer for US-Israel Binational Science Foundation
- Proposal Reviewer for UK Natural Environment Research Council (NERC)

Peer review contributions cont'd

Member of review panel, 1996 National Wildlife Federation Climate Change Fellowships

Book manuscript review for Johns-Hopkins University Press, Princeton University Press, University of Chicago Press, Island Press, Routledge Publishing, Blackwell Scientific, Oxford University Press, Yale University press..

Reviewer for Acta Oecologia, Acta Theriologica, American Midland Naturalist, American Naturalist, Basic and Applied Ecology, Biodiversity and Conservation, BioScience, Biotropica, Canadian Journal of Zoology, Conservation Biology, Ecology, Ecology Letters, Ecological Applications, Ecological Entomology, Ecological Modelling, Ecoscience, Ecosystems, Holarctic Ecology/Ecography, Global Change Biology, Journal of Animal Ecology, Journal of Ecology, Journal of Insect Behavior, Journal of Mammalogy, Journal of Sustainable Forestry, Journal of Theoretical Biology, Journal of the Torrey Botanical Society, Journal of Wildlife Management, Nature, Oecologia, Oikos, PLoS Biology, PLoS ONE, Proceedings of the National Academy of Science, Proceedings of the Royal Society of London, Science, Science, Theoretical Population Biology.

SERVICE TO YALE UNIVERSITY

Administrative service

2009-	Chair, Faculty Development and Appointments Committee, Yale Forestry and Environmental Studies
2003-2005	Member, Yale University International Education Committee
2001- 2009	Member, Yale College Environmental Studies Major Faculty Advisory Committee
2001-2008	Member, Yale University Technological Services Committee
2001-2006	Member, Yale University Press Publications Committee
2001-2004	Director of Doctoral Studies, Yale Forestry and Environmental Studies
2000-2001	Acting Chair, F&ES Curriculum Committee
1998-2002	Director, Yale University Center for Computational Biology

Committee service

Co-Chair, Ecological Economist search committee, Yale Forestry and Environmental Studies
Chair, Senior Aquatic Ecologist search committee, Yale Forestry and Environmental Studies
Chair, Junior Ecosystem Ecologist search committee, Yale Forestry and Environmental Studies
Chair, Undergraduate Education Committee, Yale Forestry and Environmental Studies
Member, Faculty Council, Yale Institute for Biospheric Studies
Member, Ecology Search Committee, Yale Department of Ecology and Evolutionary Biology
Member, Yale University Environmental Studies Major Steering Committee
Member, Tropical Ecology search committee, Yale Forestry and Environmental Studies
Member, Ecosystem Ecology search committee, Yale Forestry and Environmental Studies
Member, Yale Forest Forum
Member, Landscape Ecologist search committee Yale Forestry and Environmental Studies
Member, Junior Ecologist search committee, Yale Department of Ecology and Evolutionary Biology
Member, Senior Ecologist search committee, Yale Department of Ecology and Evolutionary Biology
Member, Joint Senior Ecologist search committee, Yale School of Forestry and Environmental Studies & Department of Ecology and Evolutionary Biology
Member, Doctoral Admissions committee, Yale Forestry and Environmental Studies
Member, Minority Recruitment committee, Yale Forestry and Environmental Studies
Member, Student Financial Aid committee, Yale Forestry and Environmental Studies
Member, Marsh Botanical Garden restoration committee

TEACHING

Courses taught

Population/Community Ecology	Conservation Biology	Experimental Design
Wildlife Conservation Ecology	Developing a Conservation Ethic	Biostatistics
Evolutionary Ecology	Bioreserve Design	Research Methods
Ecology & Environmental Problem Solving	Ecosystem Ecology	Ethics and Ecology of Biodiversity Conservation

Student Advising

Senior Undergraduate Theses Supervised

Studies in the Environment

Anne Guerry. 1995. The fusion of ecology and wildlife management: perspectives on wolf control in Alaska.
Leana Rosette 1998. The reintroduction of two Mantled Howler Monkeys in Manual Antonio, Costa Rica.
Anna Gross 2003-2004. Evaluating habitat conservation plans.
Dawn Lippert 2005-2006. Vieques' Vanishing Residents: An Analysis of Leatherback Sea Turtle Management on Vieques Island, Puerto Rico
Karen Stamieszkin 2005-2006. Assessing ecological viability of oyster farming in Maine.
Christa Anderson 2006-2007. Interactions between humans and lions in southern Tanzania.
Kathy Hughes 2009-2010. Empirical study of habitat complexity and predator-prey interactions as it informs ecosystem conservation. (*Winner of the 2010 Donnelley Prize for best senior thesis in the Environmental Studies Major)*

Ecology & Evolution

Joann Lo. 1996-1997. Associational defense hypothesis: the efficacy of trichomes as a defense against herbivory for associated defended and undefended plants.
Kenwyn Suttle. 1997. Agonistic interactions of prey between coexisting spiders: the effects of habitat structural complexity and food limitation.
Kara Rodgers. 1998. The effects of herbivory and plant competition on an oldfield plant community.
Lauge Sokol-Hessner. 2000. Understanding the effects of multiple spider predator combinations on grasshopper prey populations.
Megann Young. 2001. Effects of intermediate trophic complexity on top-down effects in food webs.
Farrin Anello. 2002. Effects of prey body size state on predation-risk avoidance behavior.
Charlie Liu. 2006. Grasshopper mouthpart plasticity and implications for population dynamics.

Applied Mathematics

Sacha Litman. 1995. Stability analysis of a plant-adaptive herbivore system.

Non-thesis Masters who did major project work in my lab

Andrew Beckerman 1992-1994	Maria Uriarte 1994-1996	Anne Axel 1997-1999
Erin Girdler 1992-1994	Jay West 1994-1996	Drue DeBerry 1998-1999
Scott Mathison 1992-1994	Heinrich zu Dohna 1996-1998	Jennifer Garrison 1998-1999
Theodore Wong 1993-1995	Kevin Drury 1996-1998	Tierney Kelly 2000-2001
Andrew Cooper 1993-1995	Andrei Podolsky 1996-1998	Elisabeth Jones 2000-2002
Brett Eldered 1993-1995	Benjamin Ruttenberg 1997-1998	Krithi Karanth 2001-2003
Kristina Rothley 1993-1995	Rebecca Young 1997-1999	Elizabeth Kalies 2002-2004
Kathleen O'Brien 1994-1996		

Jennifer Molnar 2003-2004
Tendro Ramaharitra 2004-2005
Radhika Dave 2005-2006
Rebecca Sanborn 2005-2006
Charlie Liu 2006-2007
Maya Cahn 2006-2007
Kelsey Kidd 2007-2008
Angela Rutherford 2007-2008
Sarah Fierce 2009-2010
Kathryn Freund 2009-2010
Alexandra Whitney 2009-2010
Jessica Price 2010-2011

Doctoral Students

Current

Jennifer Miller (2009-) *recipient of an NSF Graduate Research Fellowship*
Karin Burghardt (2010-) *recipient of an NSF Graduate Research Fellowship*
Kevin McLean (2010-)
Colin Donihue (2011-)

Past

Andrew Beckerman (1995-1999), *The distribution of the red-legged grasshopper*, Melanoplus femurrubrum, *among oldfields: resolving a counterintuitive pattern*. Currently Senior Lecturer (Associate Professor in US system), Department of Animal and Plant Sciences, University of Sheffield, Sheffield UK.

Susan Koenig, (1995-1999). *The reproductive biology of Jamaica's black-billed parrot (Amazona agilis) & conservation implications*. Currently the Executive Director, Windsor Research Station, Windsor Jamaica.

Kristina Rothley (1996-1999). *Trade-offs between conflicting demands and the management of habitat.* Currently teaching high school science in Cornwall, Ontario..

Jason Grear (1998-2003) *Mechanisms determining spatial dynamics of forest collembolans.* Currently Ecologist, EPA Atlantic Ecology Division National Health and Environmental Effects Research Laboratory, Narragansett, RI

Catherine Burns (1999-2004: recipient of an NSF Graduate Research Fellowship) *Investigating the response of white-footed mice to habitat loss: from individual behavior to landscape ecology*. Currently Director of Science, North Carolina Chapter of the Nature Conservancy

Michael Booth (1999-2005) *Effects of ectomicorhizal fungi on forest plant competition.* Currently, Professor and Chair, Department of Biology, Principia College.

Elizabeth Jones (2002-2007: co-advised with Lisa Curran) *The influence of mammalian seed predation on five Species in Papua New Guinea: differential effects of recruitment, distribution and implications for community composition*. Currently: teaching high school science in Palo Alto, CA.

Brandon Barton (2005-2010). *Species Interactions in a Warming Climate: Examining the Direct and Indirect Effects of Climate Change on New England Grassland Food Webs*. Currently Postdoctoral Associate, Department of Zoology, University of Wisconsin.

Holly Jones (2005-2010). *Evaluating island recovery following invasive species removal and seabird restoration.* Currently Postdoctoral Associate, Environmental Studies Department, University of California Santa Cruz.

Postdoctoral fellows

Current

Anne Trainor (2011-2013): PhD Department of Geography, North Carolina State University
Chia-Ying Ko (2010-2012): PhD University of Taiwan (co-advised with W. Jetz)

Past

Peter Hambäck (1997-1999): Currently Professor, Department of Botany, Stockholm University, Stockholm, Sweden
Dror Hawlena (2007-2011): Currently Senior Lecturer, Institute of Life Sciences, Hebrew University, Jerusalem, Israel
Barney Luttbeg (1997-1999): Currently Assistant Professor, Department of Zoology, Oklahoma State University
Ofer Ovadia, (1999-2003): Currently Associate Professor (Senior Lecturer in Israeli system), Department of Life Sciences, Ben Gurion University, Beer Sheva, Israel
Joohyoung Lee (2003-2005): Currently Research Scientist, Wayne State University.

PUBLICATIONS

Books

1) Ohgushi, T., O.J. Schmitz and R.D. Holt (Editors) 2011. Ecology and Evolution of Trait-Mediated Indirect Interactions: Linking Evolution, Community and Ecosystems. Cambridge University Press with the British Ecological Society Ecological Reviews Series. In Press.

2) Schmitz, O.J. 2010. Resolving Ecosystem Complexity. Princeton University Press Monographs in Population Biology.

3) Schmitz, O.J. 2007. Ecology and Ecosystem Conservation. Island Press—Foundations of Contemporary Environmental Studies Series.

Articles in Peer-reviewed Journals

4) Schmitz, O.J. 2012. Restoration of ailing wetlands (*invited contribution*). PLoS Biology 10(1): e1001248.

5) Cahn, M.L., M.M. Conner, O.J. Schmitz, T.R. Stephenson, J.D. Weihausen and H.E. Johnson. 2011. Disease, population viability, and recovery of endangered Sierra Nevada bighorn sheep. Journal of Wildlife Management 78:1753-1766.

6) Calcagno, V., C. Sun, O.J. Schmitz, and M. Loreau. 2011. Keystone predation and plant species coexistence: the role of carnivore hunting mode. American Naturalist 177: E1-E13 doi:10.1086/657436.

7) Hawlena, D., K.M. Hughes and O.J. Schmitz. 2011. Trophic trait plasticity in response to changes in resource availability and predation risk. Functional Ecology 25:1223-1231.

8) Hawlena, D., H. Kress, E. Dufresne, and O.J. Schmitz. 2011. Grasshoppers alter jumping biomechanics to enhance escape performance under chronic risk of spider predation. Functional Ecology 25:279-288. **Featured in Journal of Experimental Ecology**
http://jeb.biologists.org/cgi/content/full/214/5/vi?etoc

9) Milakovsky, B., B. Frey, M.S. Ashton, B.C. Larson, and O.J. Schmitz. 2011. Influences of gap position, vegetation management and herbivore control on survival and growth of white spruce (Picea glauca (Moench)Voss) seedlings. Forest Ecology and Management 261:440-446.

10) Schmitz, O.J. and J.R. Price. 2011. Convergence in trophic interaction strengths in grassland food webs through metabolic scaling of herbivore biomass. Journal of Animal Ecology 80:1330-1336. **(See In Focus article by M. Emmerson, Journal of Animal Ecology 80:1111-1114.)**

11) Warren, R.J., D.K. Skelly, O.J. Schmitz and M. Bradford. 2011. Universal ecological patterns in college basketball communities. PLoS ONE 6(3):e17342

12) Hawlena, D. and O.J. Schmitz. 2010. Herbivore physiological response to fear of predation and implications for ecosystem nutrient dynamics. Proceedings of the National Academy of Science USA 107:15503-15507. **Featured by *Nature*'s News and Comment http://www nature.com/news/2010/100921/full/news.2010.479 html**

13) Hawlena D. and O.J. Schmitz. 2010. Physiological stress as a fundamental mechanism linking predation to ecosystem processes. American Naturalist 176:537-556. **Featured by *Nature's* News and Comment http://www.nature.com/news/2010/100921/full/news.2010.479 html; Featured by Faculty of 1000 Biology http://f1000.com/5879962**

14) Rutherford, A.C. and O.J. Schmitz 2010. Regional-scale assessment of deer impacts on vegetation within western Connecticut USA. Journal of Wildlife Management 74:1257-1263.

15) Schmitz, O.J. 2010. Spatial dynamics and ecosystem functioning (*invited contribution*). PLoS Biology 8(5): e1000378. doi:10.1371/journal.pbio.1000378

16) Schmitz, O.J., D. Hawlena, and G.R. Trussell. 2010. Predator control of ecosystem nutrient dynamics. Ecology Letters 13:1199-1209.

17) Barton, B.T., A.P. Beckerman, and O.J. Schmitz. 2009. Climate change affects direct and indirect interactions in an old-field food web. Ecology 90:2346–2351. **Featured on F1000 Biology http://f1000biology.com/article/id/1955956/evaluation**

18) Barton, B.T. and O.J. Schmitz. 2009. Experimental warming transforms multiple predator effects in a grassland food web. Ecology Letters 12:1317-1325. **Featured on F1000 Biology http://f1000biology.com/article/id/1351956/evaluation**

19) Jones, H.P. and O.J. Schmitz. 2009. Rapid recovery of damaged ecosystems. PLoS One 4: e5653. doi:10.1371/journal.pone.0005653. **Featured on National Public Radio (NPR) News; Research Highlights in the journal Nature 459 (755 (11 June 2009) | doi:10.1038/459755a; F1000 Biology http://www.f1000biology.com/article/id/1161091/evaluation, The Economist and Conservation Magazine http://www.conservationmagazine.org/articles/v11n1/wounds-that-can-heal/.**

20) Schmitz, O.J. 2009. Effects of predator functional diversity on grassland ecosystem function. Ecology 90:2339–2345.

21) Filin, I, Schmitz, O.J. and O. Ovadia. 2008. Consequences of individual size variation on the survival of an insect herbivore: An analytical model and an experimental field testi using the Red-legged Grasshopper. Journal of Orthopteran Research 17:283-291.

22) Peckarsky, B.L., P.A. Abrams. D. Bolnick, J.H. Grabowski, B. Luttbeg, J.L. Orrock, S.D. Peacor, E.L. Preisser, O.J. Schmitz and G.C. Trussell. 2008. Revisiting the classics: Considering non-consumptive effects in textbook examples of predator-prey interactions. Ecology 89:2416-2425.

23) Schmitz, O.J. 2008. Effects of predator hunting mode on grassland ecosystem function. Science 319:952-954. **(see Perspective article by S. Naeem Science 319:913-914.) Featured on National Public Radio (NPR) Living on Earth program and Canadian Broadcasting Corporation (CBC) Quriks and Quarks program.**

24) Schmitz, O.J. 2008. Herbivory from individuals to ecosystems. Annual Review of Ecology, Evolution and Systematics 39:133-152.

25) Schmitz, O.J. 2008. Predators avoiding predation. (*invited contribution*). Proceedings of the National Academy of Science USA 105:14749-14750.

26) Schmitz, O.J., J.H. Grabowski, B.L. Peckarsky, E.L. Preisser, G.C. Trussell, and J.R. Vonesh. 2008. From individuals to ecosystems: toward an integration of evolutionary and ecosystem ecology. Ecology 89:2436-2445.

27) Ovadia, O., H. zu Dohna, G. Booth and O.J. Schmitz. 2007. Consequences of body size variation among herbivores on the strength of plant-herbivore interactions in a seasonal environment. Ecological Modelling 206:119-130.

28) Preisser, E.L., J.L. Orrock, and O.J. Schmitz. 2007. Predator hunting mode and habitat domain affect the strength of non-consumptive effects in predator–prey interactions. Ecology 88: 2744-2751.

29) Schmitz O.J. 2007. Predator diversity and trophic interactions. Ecology 88:2415-2426.

30) Koellner, T. and O.J. Schmitz. 2006. Biodiversity, ecosystem function and investment risk. BioScience 26:977-985.

31) Lee, J, Marshall, J.C., Schmitz O.J. and A. Caccone. 2006. Genetic divergence of Connecticut *Melanoplus femurrubrum* populations. Journal of Heredity 97:290-293.

32) Schmitz, O.J. 2006. Predators have large effects on ecosystem properties by changing plant diversity not plant biomass. Ecology 86:1432-1437. **Featured on F1000 Biology http://www.f1000biology.com/article/id/1033531/evaluation.**

33) Schmitz, O.J., E.L. Kalies and M.G. Booth. 2006. Alternative dynamic regimes and trophic control of plant succession. Ecosystems 9:659-672.

34) Grear, J. and O.J. Schmitz. 2005. Linking spatial distribution of a forest floor insect to grouping behavior and scattering effects of predators. Ecology 86:960-971.

35) Schmitz, O.J. 2005. Scaling from plot experiments to landscapes: studying grasshoppers to inform forest ecosystem management. Oecologia 145:225-234.

36) Krivan, V. and O.J. Schmitz. 2004. Trait and density mediated indirect interactions in simple food webs. Oikos 107:239-250.

37) Ovadia, O. and O.J. Schmitz. 2004. Scaling from individuals to food webs: the role of size-dependent predation risk. Israel Journal of Zoology 50:273-298.

38) Ovadia, O. and O.J. Schmitz. 2004. Weather variation and trophic interaction strength: sorting the signal from the noise. Oecologia 140:398-406.

39) Schmitz, O.J. 2004. Perturbation and abrupt shift in trophic control of biodiversity and productivity. Ecology Letters 7: 403-409.

40) Schmitz, O.J., V. Krivan and O. Ovadia. 2004. Trophic cascades: the primacy of trait-mediated indirect interactions. Ecology Letters 7:153-163.

41) Bolker, B., M. Holyoak, V. Krivan, L. Rowe and O.J. Schmitz. 2003. Connecting theoretical and empirical studies of trait-mediated interactions. Ecology 84:1101-1114.

42) Burns, C.E., K.M. Johnston and O.J. Schmitz. 2003. Global climate change and mammalian species diversity in US National Parks. Proceedings of the National Academy of Sciences USA 100: 11474-11477.

43) Krivan, V. and O.J. Schmitz. 2003. Adaptive foraging and flexible food web topology. Evolutionary Ecology Research 5:623-652.

44) Schmitz, O.J. 2003. Top predator control of plant biodiversity and productivity in an old field ecosystem. Ecology Letters 6:156-163.

45) Schmitz, O.J. E. Post, C.E. Burns and K.M. Johnston. 2003. Ecosystem responses to global climate change: moving beyond color-mapping. BioScience 53: 1199-1205.

46) Ovadia, O. and O.J. Schmitz. 2002. Linking individuals with ecosystems: experimentally identifying the relevant organizational scale for predicting trophic abundances. Proceedings of the National Academy of Sciences USA 99:12927-12931.

47) Schmitz, O.J. and L. Sokol-Hessner. 2002. Linearity in the aggregate effects of multiple predators on a food web. Ecology Letters 5:168-172.

48) Sokol-Hessner, L. and O.J. Schmitz. 2002. Aggregate effects of multiple predator species on a shared prey. Ecology 83:2367-2372.

49) Schmitz O.J 2001. From interesting details to dynamical relevance: on effective use of empirical insights in theory development. Oikos 94:39-50. (Invited contribution: Proceedings of the Nordic Oikos Seminar "Costs and Gains of Recent Progress in Ecology" Hällnäs, Sweden, October 1999)

50) Schmitz, O.J. and K.B. Suttle. 2001. Effects of top predator species on the nature of indirect effects in an old field food web. Ecology 82: 2072-2081

51) Luttbeg, B. and O.J. Schmitz. 2000. Predator and prey models with flexible individual behavior and imperfect information. American Naturalist 155:669-683.

52) Schmitz, O.J. 2000. Combining field experiments with individual-based modeling to identify the dynamically-relevant organizational scale in a field system. Oikos 89:471-484.

53) Schmitz, O.J., P. Hambäck and A.P. Beckerman. 2000. Trophic cascades in terrestrial systems: a review of the effect of top predator removals on plants. American Naturalist 155:141-153.

54) Abrams, P.A. and O.J. Schmitz. 1999. The effect of risk of mortality on the foraging behavior of animals faced with time- and gut-capacity constraints. Evolutionary Ecology Research 1:285-301.

55) Schmitz, O.J. 1998. Direct and indirect effects of predation and predation risk in old-field interaction webs. American Naturalist 151:327-342.

56) Schmitz, O.J., J.L. Cohon, K.D. Rothley and A.P. Beckerman. 1998. Reconciling variability and optimal behavior using multiple criteria in optimality models. Evolutionary Ecology 12: 73-94.

57) Uriarte, M. and O.J. Schmitz. 1998. Trophic control across a natural productivity gradient with sap-feeding herbivores. Oikos 82:552-560.

58) Beckerman, A.P., M. Uriarte and O.J. Schmitz. 1997. Experimental evidence for a behavior-mediated trophic cascade in a terrestrial food chain. Proceedings of the National Academy of Sciences USA 94: 10735-10738.

59) Johnston, K.M. and O.J. Schmitz. 1997. Influence of climate change on the distribution of selected wildlife species within the continental USA. Global Change Biology 3: 531-544.

60) Rothley, K.D., O.J. Schmitz and J.L. Cohon. 1997. Foraging to balance conflicting demands: novel insights from grasshoppers under predation risk. Behavioral Ecology 8: 551-559.

61) Schmitz, O.J. 1997. Press perturbations and the predictability of ecological interactions in a food web. Ecology 78: 55-69.

62) Schmitz, O.J., A.P. Beckerman and S.Litman. 1997. Functional responses of adaptive consumers and community stability with emphasis on the dynamics of plant-herbivore systems. Evolutionary Ecology 11:773-784.

63) Schmitz, O.J., A.P. Beckerman and K. O'Brien. 1997. Behaviorally-mediated trophic cascades: effects of predation risk on food web interactions. Ecology 78:1388-1399.

64) Schmitz, O.J. and G. Booth. 1997. Modeling food web complexity: the consequences of individual-based, spatially explicit behavioral ecology on trophic interactions. Evolutionary Ecology 11:379-398.

65) Johnson, K.H., K.A. Vogt, H.J. Clark, O.J. Schmitz and D.J. Vogt. 1996 Biodiversity and the productivity and stability of ecosystems. Trends in Ecology and Evolution 11:372-377.

66) Schmitz, O.J. 1995. Functional responses of optimal consumers and the potential for regulation of resource populations. Wildlife Research 22:101-113.

67) Sinclair, A.R.E., D.S. Hik, O.J. Schmitz, G.G.E. Scudder, D.H. Turpin and N.C. Larter. 1995 Biodiversity and the need for habitat renewal. Ecological Applications 5:579-587.

68) Schmitz, O.J. 1994. Resource edibility and trophic exploitation in an old-field food web. Proceedings of the National Academy of Sciences USA 91:5364-5367.

69) Schmitz, O.J. and T.D. Nudds. 1994. Parasite-mediated competition in deer and moose: how strong is the effect of meningeal worm on moose? Ecological Applications 4:91-103.

70) Belovsky, G.E. and O.J. Schmitz. 1994. Plant defenses and optimal foraging by mammalian herbivores. Journal of Mammalogy 75:816-832.

71) Schmitz, O.J. 1993. Trophic exploitation in grassland food chains: simple models and a field experiment. Oecologia 93:327-335

72) Belovsky, G.E. and O.J. Schmitz 1993. Owen-Smith's evaluation of herbivore foraging models: what is constraining? Evolutionary Ecology 7: 525-529.

73) Schmitz, O.J. 1992. Exploitation in model food chains with mechanistic consumer-resource dynamics. Theoretical Population Biology 41:161-183.

74) Schmitz, O.J. 1992. Optimal diet selection by white-tailed deer: balancing reproduction with starvation risk. Evolutionary Ecology 6:125-141.

75) Schmitz, O.J., D.S. Hik and A.R.E. Sinclair. 1992. Plant chemical defense and twig selection by snowshoe hare: an optimal foraging perspective. Oikos 65:295-300.

76) Schmitz, O.J. 1991. Thermal constraints and optimization of winter feeding and habitat choice by white-tailed deer. Holarctic Ecology 14:104-111.

77) Schmitz, O.J. and M.E. Ritchie. 1991. Optimal diet selection with variable nutrient intake:balancing reproduction with starvation risk. Theoretical Population Biology 39:100-114.

78) Belovsky, G.E., O.J. Schmitz, J.B. Slade and T.J. Dawson. 1991. Effects of thorns and spines on Australian herbivores of different body sizes. Oecologia 88:520-528

79) Schmitz, O.J. 1990. Wildlife management implications of foraging theory:evaluating deer supplemental feeding. Journal of Wildlife Management 54:522-532.

80) Lavigne, D.M. and O.J. Schmitz. 1990. Global warming and increasing population density: a prescription for seal plagues. Marine Pollution Bulletin 21:280-284.

81) Schmitz, O.J. and D.M. Lavigne. 1987. Factors affecting body size in sympatric Ontario Canis. Journal of Mammalogy 68:92-99.

82) Lavigne, D.M., S. Innes, G.W. Worthy, K.M. Kovacs,O.J. Schmitz and J.P. Hickie. 1986. Metabolic rates of seals and whales. Canadian Journal of Zoology 64:279-284

83) Schmitz, O.J. and G.B. Kolenosky. 1985. Wolves and coyotes in Ontario: morphological relationships and origins. Canadian Journal of Zoology 63:1130-1137.

84) Schmitz, O.J. and G.B. Kolenosky. 1985. Hybridization between wolf and coyote in captivity. Journal of Mammalogy 66:402-405.

85) Schmitz, O.J. and D.M. Lavigne. 1984. Intrinsic rate of increase, body size and specific metabolic rate in marine mammals. Oecologia 62:305-309.

Peer-Reviewed Book Chapters

86) Trussell, G.R. and O.J. Schmitz. Species functional traits, trophic control, and the ecosystem consequences of adaptive foraging in the middle of food chains In: Ohgushi, T., O.J. Schmitz and R.D. Holt (Eds.) Ecology and Evolution of Trait-Mediated Indirect Interactions: Linking Evolution, Community and Ecosystems. Cambridge University Press)

87) Seto, K., S. Bringezu, R. deGroot, K. Erb, T. Graedel, N. Ramankutty, A. Reenberg, O. Schmitz and D. Skole. 2009. Land: stocks, flows and prospects. In: T. Graedel and E. van der Voet (eds.) Linkages of Sustainability. Strüngman Forum Report, volume 4: Cambridge, MIT Press (due out November 2009).

88) Schmitz O.J. 2009. Perspectives on sustainability of ecosystem services and functions. In: T. Graedel and E. van der Voet (eds.) Linkages of Sustainability. Strüngman Forum Report, volume 4: Cambridge, MIT Press (due out November 2009).

89) Schmitz O,J, 2005. Behavior of predators and prey and links with population level processes. Pages 256-278 In: P. Barbosa and I. Castellanos (eds.) Ecology of Predator-Prey Interactions: Oxford University Press.

90) Schmitz O.J., 2004. From mesocosms to the field: the role and value of cage experiments in understanding top-down effects in ecosystems. Pages 277-302 In: W.W. Weisser and E. Siemann (eds.) Insects and Ecosystem Function, Springer Series in Ecological Studies. Springer-Verlag, Berlin

91) Belovsky, G.E., J.M. Fryxell and O.J. Schmitz. 1999. Natural selection and herbivore nutrition: optimal foraging theory and what it tells us about the structure of ecological communities. 5th International Symposium on the Nutrition of Herbivores. American Society of Animal Science.

92) Schmitz, O.J. and A.R.E. Sinclair 1997. Rethinking the role of deer in forest ecosystem dynamics. In: W.J. McShea, J. Rappole and B. Underwood (eds.) The Science of Overabundance: Deer Ecology and Population Management. Smithsonian Press.

93) Belovsky, G.E. and O.J. Schmitz. 1991. Mammalian herbivore optimal foraging and the role of plant defenses. In R.T. Palo and C.T. Robbins (eds.) Plant chemical defenses and mammalian herbivory. CRC Press, Boca Raton.

Peer Reviewed Invited Encyclopedia Contributions

94) Miller, J.R. and O.J. Schmitz. 2012. Food Webs. In: R. Craig, J. Nagle, B. Pardy, O. Schmitz and W. Smith (Eds.) Encyclopedia of Sustainability Vol. 5: Ecosystem Management and Sustainability, Berkshire Publishing.

95) Schmitz, O.J. 2012. Terrestrial food webs and the changing structure and functioning of ecosystems under climate change. In: R. Pilelke (ed.) Climate Vulnerability, Elsevier Publications.

96) Schmitz, O.J., H.P. Jones and B.T. Barton. 2008. Scavengers. In: S.E. Jorgensen (ed.) Encyclopedia of Ecology.

97) Schmitz O.J. 2007. Indirect effects in communities and ecosystems. In: S. Levin (ed.) The Princeton Guide to Ecology.

98) Schmitz, O.J. and A.P. Beckerman. 2007. Food webs. In: Encyclopedia of Life Sciences. John Wiley & Sons, Ltd: Chichester http://www.els.net/ [DOI: 10.1002/9780470015902.a0003740]

99) Vogt, K.A., O.J. Schmitz, K.H. Beard, J.L. O'Hara and M. Booth. 2000. Conservation biology — contemporary issues. In: S Levin (ed.) Encyclopedia of Biodiversity, Academic Pres

Scientific Essays

100) Schmitz, O.J. and T. Graedel. 2010. The consumption conundrum: driving destruction abroad. Yale E360 http://e360.yale.edu/content/feature.msp?id=2266.

101) Schmitz, O.J., F.R. Adler and A.A. Agrawal. 2003. Linking Individual-scale trait plasticity to community dynamics (Introduction to a Special Feature) Ecology 84: 1081-1082.

102) Schmitz, O.J. 1997. Commemorating 30 years of optimal foraging theory. Evolutionary Ecology 11:631-632.

Book Reviews

103) Schmitz, O.J. 2005. Pushing the boundaries of ecosystems. *Essay review* of: Food Webs at the Landscape Level by G.A. Polis, M.E. Power and G.R. Huxel. Perspectives on Science and Medicine 48:301-306.

104) Schmitz, O.J. 2001. Review of Partnerships for Protection: New Strategies for Planning and Management of Protected Areas edited by S. Stolton and N. Dudley. Natural Resources Forum.

105) Schmitz, O.J. 1993. Review of Mammoths Mastodonts and Elephants: biology, behavior and the fossil record by G. Haynes. Journal of Evolutionary Biology 6:147-148.

Articles in Review

Miller, J.B. and O.J. Schmitz. Fear on the move: predator hunting mode and habitat domain predict variation in prey mortality and plasticity in prey spatial response.

Trussell, G.R. and O.J. Schmitz. Overcoming the ecology of this and that.

Hawlena, D., M.S. Strickland, M.A. Bradford, and O.J. Schmitz. Fear of predation slows litter decomposition.

Additional publications supported by funding to my lab

Booth, G. 1997. Gecko: a continuous 2-D world for ecological modeling. Artificial Life 3:147-163.

*Rothley, K.D. 1999. Designing bioreserve networks to satisfy multiple conflicting demands. Ecological Applications 9:741-750.

*Beckerman, A.P. 2000. Counterintuitive outcomes of interspecific competition between two grasshopper species along a resource gradient. Ecology 81:948-957.

Hambäck, P. 2001. Direct and indirect effects of herbivory: Feeding by spittlebugs affects pollinator visitation rates and seed set of *Rudbekia hirta*. Ecoscience 8: 45-50.

*Koenig, S.E. 2001**.** The breeding biology of Black-billed Parrot *Amazona agilis* and Yellow-billed Parrot *Amazona collaria* in Cockpit Country, Jamaica. Bird Conservation International 11: 205-225.

*Rothley, K.D. 2001. Manipulative, multi-standard test of a white-tailed deer habitat suitability model. Journal of Wildlife Management 65:953-963.

*Beckerman, A.P. 2002. The distribution of *Melanoplus femurrubrum*,: fear and freezing in Connecticut Oikos 99:131-140.

*Rothley, K.D. 2002. Use of multiobjective optimization models to examine behavioural trade-offs of white-tailed deer habitat use in forest harvesting experiments. Canadian Journal of Forest Research 32:1275-1284.

Ovadia, O. and H. zu Dohna. 2003. The effect of intra- and inter-specific aggression on patch residence time in Negev Desert gerbils: a competing risk analysis. Behavioral Ecology 14:583-591.

Ovadia, O. 2003. Ranking hotspots of varying sizes: a lesson from the nonlinearity of the species-area relationship. Conservation Biology 17:1-3.

*Booth, M.G. 2004. Micorrhizal networks mediate overstorey-understorey competition in a temperate forest. Ecology Letters 7: 538-546.

*Burns, C.E., B.J. Goodwin and R.S. Ostfeld 2005. A prescription for longer life? Bot fly parasitism of the white-footed mouse. Ecology 86:753–761.

*Burns, C.E. 2005. Behavioral ecology of disturbed landscapes: The response of territorial animals to relocation. Behavioral Ecology 16:898-905.

*Grear, J. and C.E. Burns. 2007. Evaluating effects of low quality habitats on regional population growth in *Peromyscus leucopus*: Insights from field-parameterized spatial matrix models. Landscape Ecology 22: 45-60.

*Burns, C.E. and J. Grear. 2008. Effects of habitat loss on white-footed mice: Testing matrix model predictions with landscape-scale perturbation experiments. Landscape Ecology 17:817-831.

Stamieszkin, K., J. Wielgus and L.R. Gerber. 2009. Management of a marine protected area for sustainability and conflict resolution: lessons from Loreto Bay National Park (Baja California Sur, Mexico). Ocean and Coastal Management 52:449-458. Based in part on Masters of Environmental Science research conducted under my supervision.

*Barton B.T. 2010. Climate warming and predation risk during herbivore ontogeny. Ecology 91:2811-2818.

*Jones, H.P. 2010. Prognosis for ecosystem recovery following rodent eradication and seabird restoration in an island archipelago. Ecological Applications 20:1204-1216. ***Recommended by Faculty 1000 Biology***

*Jones, H.P. 2010. Seabird islands take mere decades to recover following rat eradication. Ecological Applications. 20:2075-2080

*Barton, B.T. 2011. Local adaptation to temperature conserved top-down control in a grassland food web. Proceedings of the Royal Society London B 278: 3102-3107.

**Articles arising from my students' doctoral dissertation work. I do not require that doctoral students list me as a coauthor on publications arising from their dissertation work.*

RESEARCH GRANTS & CONTRACTS

2011-2012	Yale Mapping Framework for Wildlife Conservation and Climate Adaptation. Co-Funded by Doris Duke Charitable Foundation, Kresge Foundation & Wilburforce Foundation. $1,400,000
2010-2011	Climate warming, species interactions and transformation of ecosystem carbon cycling. Yale Climate and Energy Institute $94,675 (Co-PI with M. Bradford)
2009-2010	Vertebrates on the Move: Managing Cascadia Wildlife in the Face of Climate Change. US National Park Service 1 H9471091063 $6800.
2009-2010	Dissertation Improvement Grant of Holly Jones: Quantifying a chronosequence of seabirds and island ecosystem recovery after rat eradication. NSF OISE 0853846 $15,000.
2009-2010	Dissertation Improvement Grant of Brandon Barton: How will climate change affect trophic interactions? NSF DEB 0910047 $13,000.
2008-2012	Complexity and stability in an old-field ecosystem: the role of asymmetrical interaction strengths and food web topology. NSF DEB-0816504 $474,346.
2007	REU Supplement to DEB 0515014 Predator identity and trophic control of biodiversity and ecosystem function. $4,500
2006-2009	OARE: Online Access to Research in the Environment--provides developing world free or greatly discounted access to the scholarly environmental record of the world's leading scientific publishers through a secure internet portal. Co-funded: William and Flora Hewlett Foundation and John D. and Catherine T. MacArthur Foundation $500,000.
2005-2009	Predator identity and trophic control of biodiversity and ecosystem function. NSF DEB 0515014 $475,017
2003-2004	Dissertation Improvement Grant of Michael Booth: Do common mycorrhizal networks limit plant competition and species exclusion in temperate forests? NSF DEB 0309225 $10,080
2002	REU Supplement to NSF DEB 0107780 $5938
2001-2005	Perturbation and recovery of an old-field food web. NSF DEB 0107780 $212,833
2001-2002	Assessing sensitivity of wildlife species to anticipated climate change in parks and protected areas in the continental United States. Edward John Noble Foundation $100,000.

2000	Computational Ecology: teaching implementation phase. Yale University Library and Information Technology Services Faculty Support Grant $10,000
1999	Understanding the role of individual-scale processes in community-level dynamics. NSF-National Center for Ecological Analysis and Synthesis (NCEAS): $34,560.
1998-1999	A computer-based learning environment for teaching community ecology. Yale University Library and Information Technology Services Faculty Support Grant $10,000
1998-1999	Dissertation Improvement Grant of Andrew Beckerman: The distribution of a grasshopper species among New England Fields: population ecology along an environmental gradient. NSF DEB-9801665 $5672
1997-1999	Modelling the industrial ecosystem CoPI with T. Graedel and L. Bennett NSF BES-9729295 $100,000
1996-1999	Adaptive management of boreal ecosystems for productivity and diversity: Applying exploitation ecosystems concepts to forestry and forest management MISTIK Forest Management Ltd., Saskatchewn, Canada $240,000
1996	REU Supplement to NSF DEB-9508604 $4,688
1995-1997	Organizational complexity in ecological food webs: experimental analysis of interaction strength in an old-field system NSF DEB-9508604 $50,000
1994-1997	Multiscale models in computational biology. CoPI with G. Wagner and L. Buss, Yale Center for Computational Ecology NSF BIR-9400642 $165,230
1993-1995	Influence of global climate change on the distribution and population dynamics of selected wildlife species. Electric Power Research Institute $104,651
1986-1987	Development of cost effective management of wintering deer. Ontario Ministry of Natural Resources Renewable Resources Research Grants. $20,000

INVITED LECTURESHIPS

2011 Distinguished Ecologist Lecture Series—Michigan Tech University

2010 Biodiversity, Ecology and Global Change Lecture—Harvard University Center for the Environment

2009 Ledermann Lecture in Natural History and Conservation Biology—College of the Environment and Life Sciences, University of Rhode Island

2005 The Walton Lecture Series—Mountain Lake Biological Station, Virginia, USA

1999 The Nordic Oikos Society--Advanced course on the role of empiricism and computational and analytical modeling in generating scientific hypotheses., Umeå, Sweden

CONFERENCE SYMPOSIA ORGANIZED

A.P. Beckerman and O.J. Schmitz. Food webs and climate change. Ecological Society of America, Pittsburgh, August 1-6, 2010.

T. Oghushi, O.J. Schmitz and R. Holt. Trait-mediated indirect effects in insect communities. International Congress of Entomology, Durban, South Africa (6-12 July 2008)

CONFERENCE PRESENTATIONS

Schmitz, O.J. Climate change, food web reorganization and implications for carbon and nitrogen cycling. **Invited presentation** Biodiversity, Global Change and Insect-Mediated Ecosystem Services Session, Entomological Society of America Annual meeting November 2011.

Schmitz, O.J. Climate change and the potential for transformation of food web connectedness. Ecological Society of America, Pittsburgh, August 2010.

Schmitz, O.J. Predator identity and the nature of trait-mediated indirect effects. International Congress on Entomology, Durban South Africa, July 2008.

Schmitz, O.J. Predator diversity and trophic interactions. **Invited Presentation** Trophic cascades across ecosystems session. Annual Meeting of the Ecological Society of America, San Jose CA, August 2007.

Schmitz, O.J. Stoichiometry and Food web interactions: what are the questions and how do we answer them? **Invited Presentation** Stoichiometry of terrestrial systems contributed session, Annual Meeting of the Ecological Society of America, Memphis, TN, August 2006.

Schmitz, O.J. Looking at biodiversity and ecosystem functioning vertically as well as horizontally. **Invited presentation,** International Symposium on Biodiversity and Dynamics of Communities and Ecosystems: Structures, Processes and Mechanisms Osaka, Japan, March 2006.

Schmitz, O.J. Perturbation and alternate states of trophic control of biodiversity and productivity. Annual Meeting of the Ecological Society of America, Portland OR, August 2004.

Schmitz, O.J. Evolutionary ecology: the theater and the play. **Invited Presentation:** A Day of Commemoration honoring G. Evelyn Hutchinson on the occasion of his 100th birthday. Yale University, October 2003.

Schmitz, O.J. Biodiversity cascades: effects of top predators on plant diversity mediated by herbivore antipredator behavior. **Invited Presentation:** Trophic Cascades in Terrestrial Systems Symposium, Annual Meeting of the Ecological Society of America, Tucson, AZ, August 2002.

Schmitz, O.J. Trait variation and direct and indirect effects in an old-field system. **Invited Presentation**: Mini Symposium on structured population dynamics. University of Amsterdam, Amsterdam, The Nertherlands, May 2002.

Schmitz, O.J. Climate change effects on wildlife species distribution and life-history: synthesis and future steps. **Invited Presentation**: Mini-conference on "The big unknowns in global change". Athens, GA, April 2001.

Schmitz, O.J. Herbivore state-dependence and behavior-mediated trophic interactions: toward generalizable theory for the dynamics of plant-herbivore systems. **Invited presentation**: Gordon Research Conference on Plant-Herbivore Interactions. Ventura, CA, February 2001

Schmitz, O.J. and K.B. Suttle. Predator hunting mode and emergent indirect effects in old-field interaction webs. Annual Meeting of the Ecological Society of America, Spokane WA, August 1999.

Luttbeg, B. and O.J. Schmitz. Predator and prey models with flexible individual behavior and imperfect information. International Society for Behavioral Ecology, Monterey, CA, August 1998.

Schmitz, O.J. Combining mathematical modeling with field experimentation to unravel the nature and strength of species interactions. **Invited Presentation**, Symposium on Theoretical, Empirical and Statistical Approaches to Measuring Interactions Strengths. Annual Meeting of the Ecological Society of America, Albequerque, NM. August 1997

Schmitz, O.J. Organizational complexity of old-field food webs. Annual Meeting of the Ecological Society of America, Providence, RI, August 1996.

Schmitz, O.J. Multiple ecosystem states: rethinking the role of deer in forest ecosystem dynamics. **Invited Presentation** in a symposium entitled "The Science of Overabundance: the ecology of unmanaged deer populations" Smithsonian Institution, Conservation and Research Center, National Zoological Park, November 1994.

Schmitz, O.J. Optimal foraging and consumer-resource dynamics. **Invited Presentation**, Predation Symposium, 6th International Theriological Congress, Sydney, Australia, August 1993.

Belovsky, G.E. and O.J. Schmitz. Herbivore optimal foraging and plant defenses. **Invited Presentation**, Plant-herbivore interactions symposium, 6th International Theriological Congress, Sydney, Australia, July 1993.

Schmitz, O.J. Risk-sensitivity and diet selection by mammals. **Invited Presentation**, Optimal foraging Symposium, 5th International Theriological Congress, Rome, Italy, August 1989.

Schmitz,O.J. Optimal activity and habitat choice of wintering deer. Annual Meeting of the Ecological Society of America, Toronto Ontario, August 1989.

Schmitz, O.J. Optimal diet selection by white-tailed deer: balancing reproduction with starvation risk. 2nd International Behavioral Ecology Conference, Vancouver, B.C. October 1989.

Schmitz,O.J. Risk-sensitive foraging by wintering deer. Annual Meeting of the Ecological Society of America, Columbus, Ohio, August 1988.

INVITED SEMINARS

2011	Department of Zoology, Miami University of Ohio Department of Biology, Case Western Reserve University School of Forest Resources and Environmental Science, Michigan Technological University Department of Ecology, Evolution and Conservation Biology, University of Nevada-Reno
2010	Department of Organismal and Evolutionary Biology, Harvard University Department of Biology, Duke University School of Biology, Georgia Institute of Technology

	Division of Biology, University of California—San Diego
	Department of Animal and Plant Sciences, University of Sheffield
	Ecology and Evolution Section, Imperial College—Silwood Park
2009	Department of Biological Sciences, Florida International University
	College of the Environment and Life Sciences, University of Rhode Island
	Department of Entomology, University of Maryland
	Department of Biology, Wesleyan University
	Department of Biology, North Carolina State University
2008	Department of Biological Sciences, Stanford University
	Department of Biology, University of Houston
	Department of Ecology, Evolution and Natural resources, Rutgers University
	Department of Biological Science, Florida State University
2007	Department of Zoology and Physiology, University of Wyoming
	School of Forestry, Northern Arizona University
	Department of Ecology, Evolution, and Environmental Biology, Columbia University
	Department of Biology, University of Montana
	Department of Biology, University of Pennsylvania
	Department of Biology, Syracuse University
	Department of Ecology and Evolutionary Biology, University of Michigan
2006	Department of Ecology and Evolution, University of Tennessee
	Department of Integrative Biology, University of Guelph
	Department of Biology, McGill University
2005	Department of Biology, Laval University
	Department of Integrative Biology, University of California Berkeley
	Department of Entomology, Cornell University
	Department of Entomology, and Organismal and Evolutionary Biology, University of Massachusetts—Amherst
2004	Department of Ecology and Environmental Science, Umeå University
	Department of Biological Sciences, University of Pittsburgh
	Department of Biology, Fordham University
	Department of Zoology, University of New Hampshire
	Institute for Biospheric Studies, Yale University
2003	Department of Biological Science, Simon Fraser University
2002	Department of Zoology, Miami University of Ohio
	Institute of Biodiversity and Ecosystem Dynamics, University of Amsterdam
	Department of Ecology and Evolutionary Biology, Yale University
	Interdisciplinary Bioethics Project, Yale University
2000	Department of Entomology, University of Maryland
1998	Department of Ecology and Evolution, University of California, Davis
	Department of Zoology, University of Toronto

1997	Department of Ecology and Evolution, University of Chicago Department of Ecology and Evolution, SUNY Stony Brook Department of Biology, Brown University Department of Biological Sciences, Dartmouth College
1996	Institute of Ecosystem Studies, Millbrook New York
1995	Department of Computer Science, University of Michigan Department of Biology, Boston University Ecosystem Group, Woods Hole Oceanographic Institute
1994	Department of Computer Science, University of Michigan Department of Zoology, University of Guelph Department of Animal Ecology, Swedish University of Agricultural Science
1992	Department of Fisheries and Wildlife, Utah State University