

STATE OF CALIFORNIA
STANDARD AGREEMENT
 STD 213 (Rev 06/03)

AGREEMENT NUMBER 13-C0022
REGISTRATION NUMBER

1. This Agreement is entered into between the State Agency and the Contractor named below:

STATE AGENCY'S NAME

Department of Pesticide Regulation

CONTRACTOR'S NAME

The Regents of the University of California

2. The term of this Agreement is: July 1, 2013 or upon final approval by the State, whichever occurs later, through June 30, 2014

3. The maximum amount of this Agreement is: **\$ 21,974.00**
Twenty-one thousand nine hundred seventy-four dollars and no cents

4. The parties agree to comply with the terms and conditions of the following exhibits which are by this reference made a part of the Agreement.

Exhibit A – Scope of Work	6 Pages
Exhibit B – Budget Detail and Payment Provisions	3 Pages
Exhibit C* – General Terms and Conditions (GIA 610)	
Exhibit D - Special Terms and Conditions	2 Pages
Exhibit E – Additional Terms and Conditions	1 Page
Exhibit F – Curriculum Vitae	7 Pages

Items shown with an Asterisk (*), are hereby incorporated by reference and made part of this agreement as if attached hereto. These documents can be viewed at <http://www.ols.dgs.ca.gov/Standard+Language/default.htm>

IN WITNESS WHEREOF, this Agreement has been executed by the parties hereto.

CONTRACTOR		California Department of General Services Use Only
CONTRACTOR'S NAME (if other than an individual, state whether a corporation, partnership, etc.) The Regents of the University of California		
BY (Authorized Signature) 	DATE SIGNED (Do not type) 6/4/2013	
PRINTED NAME AND TITLE OF PERSON SIGNING Ahmad Hakim-Elahi, Ph.D., J.D.; Executive Director, Research Administration 602		
ADDRESS 1850 Research Park Drive, Suite 300 Davis, CA 95618-8153		
STATE OF CALIFORNIA		
AGENCY NAME Department of Pesticide Regulation		
BY (Authorized Signature) 	DATE SIGNED (Do not type) 6.12.13	
PRINTED NAME AND TITLE OF PERSON SIGNING Samantha Lewis, Business Services Office Manager		
ADDRESS 1001 I Street, 4 th Floor, Sacramento, CA 95814		

Exempt per: Delegation Letter 74.5

EXHIBIT A
STANDARD AGREEMENT

SCOPE OF WORK

1. This Agreement is between The Regents of the University of California, hereinafter referred to as Contractor, and the Department of Pesticide Regulation, hereinafter referred to as DPR.
2. This Agreement will commence on the start date July 1, 2013 as presented herein or upon final approval by the State, whichever is later and no work shall begin before that time. This Agreement is of no effect unless approved by the State. Contractor shall not receive payment for work performed prior to approval of the Agreement and before receipt of notice to proceed by the Contract Manager. This Agreement shall expire on June 30, 2014. The services shall be provided during normal working hours, Monday through Friday, except state holidays.
3. The Project Representatives during the term of this Agreement will be:

- A. All official communications, except invoices, from the Contractor to DPR shall be directed to the attention of the DPR Contract Manager, **Xin Deng**, Ph.D., or designee, at:

Department of Pesticide Regulation
Environmental Monitoring Branch
1001 I Street
P.O. Box 4015
Sacramento, CA 95812-4015
Phone (916) 445-2506; Fax (916) 324-4405
Email address: xdeng@cdpr.ca.gov

- B. All invoices from the Contractor to DPR shall be directed to:

Department of Pesticide Regulation
Attn: Accounts Payable
P.O. Box 4015, MS 4A
Sacramento, CA 95812-4015

- C. All programmatic communications from DPR to the Contractor shall be directed to the attention of **Dr. Sharon Lawler** or designee at:

Dr. Sharon Lawler
UC Davis, Department of Entomology
One Shields Avenue
Davis, CA 95616-8584
Phone: (530) 754-8341; Fax: (530) 752-1537
Email: splawler@ucdavis.edu

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- D. All administrative communications, except payments, from DPR to Contractor shall be directed to:

Brian Russ
Office of Research, Sponsored Programs
1850 Research Park Drive, Suite 300
Davis, CA 95618-6153
Phone: (530) 754-7700; FAX: (530) 752-0333
Email: awards@ucdavis.edu

- E. All payments from DPR to the Contractor shall be directed to:

The Regents of the University of California
Cashier's Office
University of California Davis
P.O. Box 989062
West Sacramento, CA 95798-9062

- F. The Project Representatives during the term of this Agreement may be changed by mutual written agreement without the necessity of formal amendment to this Agreement.

4. Contractor agrees to provide the following services:

A. Goals and Objectives

The goals are to conduct a detailed assessment of the impact of two pyrethroids, lambda-cyhalothrin and permethrin, and the organophosphate, chlorpyrifos, on invertebrate communities, both macroinvertebrates and zooplankton, including monitoring the chemical fate of the three chemicals in both the water column and sediment.

Specific objectives are:

- 1) To determine long-term contaminant mixture effects on the community structure, function, and biomass available to fishes, encompassing different life stages of aquatic invertebrates and their seasonal development; and,
- 2) To monitor the fate of contaminants, both in the water column and sediment, and how this passage affects the species living in the different habitats.

Contractor hypothesizes that contaminant mixtures will significantly affect the biomass, structure and function of the invertebrate community. Contractor's work

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will quantify the degree of impact to invertebrate resources plus the timeline and trajectory of recovery.

The proposed study will address and answer numerous significant questions, including:

- 1) How will pesticide mixture exposures affect the biomass and composition of invertebrate communities; and,
- 2) Will systems recover and, if so, what is the timeline?

B. Approach and Methods

Pesticide mixture effects on community structure:

The mesocosm-system used for this study is an outdoor-system at the UC Davis Putah Creek Riparian Reserve consisting of 17 solitary PVC tanks. Each tank was filled with a layer of a clean sand-sediment mixture. The mixture mostly consists of 50% sand and 50% natural sediment. The sediment was tested for toxicity prior to use by conducting a 96-hour sediment toxicity test with the sensitive amphipod *Hyalella azteca*. Tanks were filled with approximately 350 gallons of a mixture of clean well water and uncontaminated pond water from a pond in close vicinity to the study site. No pesticides are in use near this pond, so contamination can be eliminated. This was also confirmed by conducting a 96h toxicity test using the sensitive amphipod *Hyalella azteca*. Aquatic flora was obtained from Putah Creek at the Riparian Reserve and consists of the two submerged plant species *Elodea* sp. and *Myriophyllum* sp..

When the mesocosms were set up, functional groups of invertebrates relevant to the fish species in the Delta were added and/or colonized. These include, but are not limited to copepods, cladocerans, amphipods, and chironomids. Immigration of flying aquatic insects from Putah Creek and adjacent ponds will promote the development of an intact community, and support recovery by recolonization following pesticide application, thus strengthening the ecological relevance of this study. Flightless taxa with slow reproduction such as amphipods will be added to respective tanks if loss is prolonged.

Pesticide treatments and controls will be randomly assigned to the tanks. To model realistic application scenarios pesticide formulations will be used for this study. Formulations can be more toxic than pure compounds (Beggel *et al.* 2010). Pesticide concentrations will be based on known environmental concentrations and low-level concentrations known to result in sublethal effects. Sampling of invertebrates will take place weekly from 4 weeks before pesticide application and 6 to 10 months past application. Each sample will be processed as follows. For zooplankton identification Contractor will collect one sample consisting

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of 4 sub-samples per mesocosm tank. By using a PVC tube (4cm in diameter and 1m in length) sub-samples will be taken from the close vicinity of plants and from the open water. By noting the depth of the sampled water column the total water volume taken can be calculated. Water will be poured through a stainless steel sieve (pore size = 63 μ m) to remove metazoans and zooplankton will be collected from four sub-samples. Remaining water of the sample will be poured back to the corresponding tank. Animals in the sieve will be transferred to Polyethylene-bottles and fixed with the staining solution Rose Bengal. For macroinvertebrate identification Contractor will use the following sampling: 1) Using a sampling mesh samples will be taken in form of 3 sweeps (2 along the sides of the tank walls and 1 through the free water). 2) Benthic invertebrates will be sampled using purpose-built habitat sampler and periodic sweep samples. 3) To collect emerging invertebrates floating emergence traps will be positioned in each tank and sampled every 4-5 days. All organisms will be counted and identified to the lowest practical taxonomic level. Descriptive and multivariate methods of statistical analyses will be utilized (e.g., Biomass, Shannon's index, species abundances and Principle Response Curves) to assess both indirect and direct effects on the aquatic food-web. To illustrate the effects on important prey groups Contractor will analyze the community based on functional groups such as infauna, benthos, herbivores/collectors, and predators.

Transport and fate of the pesticide mixtures:

Samples of both water and sediment will be taken and analyzed to trace the presence of the pesticides and common breakdown products in each mesocosm. Sampling will be performed weekly for 5 weeks (or longer if pesticides will be detected) after pesticide application (34 samples per week, 170 samples in total for both water and sediment analysis). 2 control samples will be taken before pesticide analysis. Water subsamples will be collected using amber pre-labeled, kilned and acid-washed glass bottles (950 mL). Sediment subsamples will be collected from the top 2 cm using pre-cleaned stainless steel spoons and carefully transferred to 950-ml amber pre-labeled, kilned and acid-washed glass bottles (Puckett 2002). Samples will be transported on wet ice to the laboratory, stored in the dark at 4°C and analyzed within two days of collection.

Sediment samples will be dried and ground. An aliquot of 10g of each sample will be used for further analysis. After adding 20 ml of a solution of hexane:ethyl acetate (1:1, v/v) dried sediment will be sonicated for 30 min and centrifugated for 5 min. The solvent layer will be transferred into another centrifuge tube, and the sediment extraction will be repeated 2 times. All 3 solvent layers will be collected and combined. The combined extracts will be concentrated to 0.4 ml under a gentle stream of nitrogen and then extracted at a slow drip under vacuum using a GCB/PSA cartridge (Supelclean™ ENVI-Carb™ II), which was preconditioned using 3.0 ml hexane. The GCB/PSA cartridge will be used to effectively remove plant

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pigments such as chlorophyll, and plant sterols from the final extracts without the loss of planar compounds.

Water samples will be extracted using conditioned 6-ml solid phase-extraction C₁₈ cartridge (Supelclean™ 500 mg, Sigma-Aldrich) at a slow drip under vacuum.

For sediment and water samples cartridges will be vacuum-dried for 2 hours to remove any excess water and frozen before further use. To elute pesticides columns will be rinsed twice with a 5-ml volume of a solution of hexane:ethyl acetate (1:1, v/v). Solvent elution (10 ml) will be collected and concentrated to 0.4 ml under a gentle stream of nitrogen. The internal standard Dibromooctafluorobiphenyl (Chem Service, West Chester, PA) will be added to the concentrated extracts prior to GC analysis.

All final extracts will be analyzed using gas chromatography negative chemical ionization mass spectrometry (GC-NCI-MS) on Agilent 5973 series gas chromatograph (Agilent Technologies, Palo Alto, CA), equipped with a split-splitless injector (280°C, splitless, 1.5-minute purge time). The column will be a Supelco DB-5MS column (30 m x 0.25 mm with a 0.3 µm film thickness). Instrumental calibration will be performed using nine sets of calibration standard solutions with each pesticide (Chem Service, West Chester, PA), the surrogate Trans-Permethrin D6 (EQ Laboratories, Atlanta, GA), and the internal standard Dibromooctafluorobiphenyl in hexane. Quantification will be based on peak area using the standards.

Funding for supplies is required towards:

- Habitat samplers, emergence traps and photo dishes for macroinvertebrate sampling
- PVC tubes for zooplankton sampling
- Staining chemicals and preservation for zooplankton identification
- Specific pesticide extraction supplies such as solvents, chemicals and columns
- Pesticide formulations
- Hazardous waste disposal
- General supplies for laboratory use such as gloves, pipet tips and glassware
- Page Charges

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C. Project Timeline

2013:

Task	Jul	Aug	Sep	Oct	Nov	Dec
Sampling and identification of zooplankton and macroinvertebrate communities	x	X	x	x	x	---
Analysis of water and sediment samples	(x)					
Statistical Analysis of biological and abiotic effects	x	X	x	x	x	X

(x)=sampling depending on pesticide and community effects, --- = sampling break due to dormant season

2014:

Task	Jan	Feb	Mar	Apr	May	Jun
Sampling and identification of zooplankton and macroinvertebrate communities	---	---	x	(x)	(x)	
Analysis of biological and abiotic effects	x	x				
Statistical data analysis and evaluation of the results			x	x	x	
Final report						X

(x)=sampling depending on pesticide and community effects, --- = sampling break due to dormant season

5. DPR's Responsibility:

Provide acknowledgement of receipt of study protocol and report within 30 days of submission.

EXHIBIT B
Standard Agreement

BUDGET DETAIL AND PAYMENT PROVISIONS

1. Invoicing

- A. For services performed according to the scope of work in Exhibit A of this Agreement and upon receipt and approval of the invoices by DPR's Contract Manager, DPR agrees to compensate Contractor, in arrears, for actual allowable costs incurred as specified herein and in accordance with the rates specified herein or attached hereto. Incomplete or disputed invoices shall be returned to Contractor, unpaid, for correction.
- B. Invoices shall include the Agreement Number, shall be itemized in accordance with the Rates detailed in Item 4 of this Exhibit, and submitted in triplicate, not more frequently than monthly or less than quarterly in arrears, to:

Department of Pesticide Regulation
Attn: Accounts Payable
P.O. Box 4015, MS-4A
Sacramento, CA 95812-4015

2. Budget Contingency Clause

- A. It is mutually agreed that if the Budget Act of the current year and/or any subsequent years covered under this Agreement does not appropriate sufficient funds for the program, this Agreement shall be of no further force and effect. In this event, DPR shall have no liability to pay any funds whatsoever to Contractor or to furnish any other considerations under this Agreement and Contractor shall not be obligated to perform any provisions of this Agreement.
- B. If funding for any fiscal year is reduced or deleted by the Budget Act for purposes of this program, DPR shall have the option to either cancel this Agreement with no liability occurring to DPR, or offer an Agreement Amendment to Contractor to reflect the reduced amount.

3. Payment

- A. Costs for this Agreement shall be computed in accordance with State Administrative Manual (SAM) Sections 8752 and 8752.1.
- B. Nothing herein contained shall preclude advance payments pursuant to Article 1, Chapter 3, Part 1, Division 3, Title 2 of the California Government Code, Sections 11256 and 11257.

EXHIBIT B
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- C. Transportation and subsistence costs shall not exceed rates authorized to be paid UC system non-represented employees traveling within California.
- D. Contractor will be reimbursed for direct costs, other than salary costs, that are identified in the Contractor's rates.
- E. Contractor will bill in arrears for costs incurred during the billing period. If applicable, salary costs will be itemized and billed by position. Documentation supporting specific salary costs will be presented if requested by DPR. Non-wage costs will be billed, in summary, according to general expense categories. A detailed report of transactions will support the billing. Individual expenditures exceeding \$500.00 will be supported by a photocopy of the original documentation. Documentation in support of expenditures less than \$500.00 will be presented if requested by DPR.
- F. Contractor shall not commence performance of work or services until this contract has been approved by the State. No payment will be made prior to approval nor for any work performed prior to approval of this Agreement.
- G. Ten percent (10%) of each invoice amount shall be withheld by DPR until the completion of this Agreement in accordance with the Scope of Work in Exhibit A of this Agreement.

4. Rates

Rates for these services are as follows:

Table I – Cost Totals

	Total Amount
1. Salaries & Wages	\$8,160.00
2. Benefits ① 3%	\$245.00
3. Travel ②	\$1,000.00
4. Supplies③	\$8,174.00
5. Contractual	\$0
6. Minor Equipment④ or Equipment	\$0
7. Indirect Cost⑤ 25%	\$4,395.00
Total Amount	\$21,974.00

①Benefits include: Worker's Compensation and other benefits appropriate for title

(NOTE: Student Interns are non-personnel employees with no benefits and shall be excluded from the percentage calculation of this line item.)

②Travel includes: Invoice for payments on travel shall be based on current University of California rates and guidelines

③Supplies include: Copying services, field sampling supplies, lab supplies, reagents, etc.

④Minor Equipment: line item does not include any equipment with a unit acquisition of \$5,000 or more. If over 5,000 then line item must be identified as "Equipment" line item and Exhibit E will require special language.

⑤Indirect Cost: 25% indirect cost rate includes: depreciation of buildings and equipment, utility consumption, operations and maintenance costs, administrative services provided at the departmental and central level, and library costs.

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Table II – Personnel Service Costs

Personnel	Monthly Salary	Number of Months	Percentage Of Time	Total Amount
Dr. Lawler – Principal Investigator (1% in kind contribution fully funded and not paid by DPR)				\$0.00
Student Assistant	\$1360	12	50%	\$8,160.00
Total Personnel				
Benefits				
Student Benefits @ 3%				\$245.00
Total Benefits				
Total Personnel and Benefits				\$8405.00

Note: The principal investigator is fully funded. This is for the student assistant only.

5. Cost Limitation

- A. The total amount of this Agreement shall not exceed \$21,974.00.
- B. It is understood and agreed that this total is an estimate and that DPR will pay for only those services actually rendered as authorized by the DPR Contract Manager or his/her designee.

EXHIBIT D
Standard Agreement

SPECIAL TERMS AND CONDITIONS

1. Termination

- A. Either Party reserves the right to terminate this agreement without cause upon thirty (30) days written notice to the other Party, or immediately in the event of a material breach. In the event of termination, Contractor shall be paid for all allowable costs incurred up to the date of termination, including any non-cancelable obligations.
- B. In the event that the total Agreement amount is expended prior to the expiration date, DPR may, at its sole discretion, terminate this Agreement with 30 days notice to contractor.

2. Subcontracting

Contractor shall perform the work contemplated with resources available within its own organization and no portion of the work shall be subcontracted.

3. Dispute Resolution

- A. DPR reserves the right to issue an order to stop work in the event that a dispute should arise, or in the event that DPR gives the performing agency a notice that this Agreement will be terminated. If DPR exercises this right, the stop-work order will be in effect until the dispute has been resolved or this Agreement has been terminated.
- B. Any dispute concerning a question of fact arising under the terms of this Agreement which is not disposed of within a reasonable period of time by agency employees normally responsible for the administration of this agreement, shall be brought to the attention of the Executive Officer or designated representative of each agency for joint resolution.
- C. The Contractor shall continue to perform all its responsibilities under this agreement during any dispute until notified to stop work or expiration of this Agreement.

4. Harassment Free Workplace

DPR is committed to providing a safe, secure environment, free from sexual misconduct. It is the policy of DPR that employees have the right to work in an environment that is free from all forms of discrimination, including sexual harassment. This policy specifically speaks to freedom from a sexually harassing act that results in the creation of an intimidating, hostile or offensive work environment or that otherwise

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interferes with an individual's employment or work performance. As a Contractor with DPR, you and your staff are expected to comply with a standard of conduct that is respectful and courteous to DPR employees and all other persons contacted during the performance of this Agreement. Sexual harassment is unacceptable, will not be tolerated; and may be cause for prohibiting some or all of the Contractor's staff from performing work under this Agreement.

EXHIBIT E
Standard Agreement

ADDITIONAL PROVISIONS

1. Disposition of Work Product

DPR retains use and non-commercial governmental distribution rights to all deliverables identified in Exhibit A of this Agreement.

2. Contractor Evaluation

The Contractor is hereby notified that its performance under this Agreement shall be evaluated within thirty (30) calendar days following the Expiration of this Agreement. The evaluation may include statements on the adequacy of the service or the product, whether the service was satisfactory, whether the service or the product was provided or completed within the time limitations, reasons for time or cost overruns, whether the product is operational or being utilized by the State, and/or the State plans for implementation, and the State's general impression as to the competency of the Contractor and its staff. The evaluation shall be filed in the State's official Contractor Evaluation File.

3. Consulting Services

- A. The Contractor is hereby advised of its duties, obligations and rights under Public Contract Code § 10335.5.
- B. The Contractor's key personnel assigned to perform work under this Agreement and their level of responsibility shall be mutually acceptable to the State and the Contractor.

EXHIBIT F
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Curriculum Vitae: Sharon P. Lawler

Department of Entomology, One Shields Ave, University of California, Davis, CA 95616
Email: splawler@ucdavis.edu, phone: 530 754-8341

Educational Degrees:

1988-1992 Doctor of Philosophy in Ecology and Evolution, Rutgers, New Brunswick, NJ
1984-1988 Master of Science in Ecology, Rutgers University, New Brunswick, NJ,
1978-1982 Bachelor of Arts in Biology, philosophy minor. Lehigh U. Bethlehem, PA

Employment

1995-present Professor of Entomology, University of California at Davis
1994-1995 Postdoctoral Researcher, Center for Ecology, Evolution and Behavior.
University of Kentucky, Lexington, KY.
1992-1994 Postdoctoral Researcher, NERC Centre for Population Biology, Imperial College
at Silwood Park, Ascot, Berks, U.K.

Grants

Department of the Interior, United States Fish and Wildlife Service Region 1. Impacts of a fungal pathogen, pesticides, and temperature on the Cascades frog in the mountains of northern California." PIs: Jonah Piovia-Scott and Catherine Johnson; Co-PIs Sharon Lawler, Janet Foley, Carlos Davidson, and Karen Pope. \$395,122. 2010-2013.

University of California Academic Senate. Investigating the role of amphibian skin bacteria in combating a deadly disease of frogs. With J. Foley, Co-PI. \$23,598. 2009-10.

CA Dept of Fish and Game

Survey for chytridiomycosis in amphibians of the Klamath-Siskiyou mountains: A study of biotic and abiotic factors. 2008-10: Co-PIs J. Piovia-Scott and K.L. Pope.

National Science Foundation-DEB

Effects of an introduced predator on ecosystem subsidy and amphibian decline. 2004-2008: \$386,000 (plus 1 REU supplement)

Department of the Interior, U.S. Fish and Wildlife Service Region 1

CA-Environmental Fate of Mosquito Adulticides and Effects on Non-Target Invertebrates in Wetlands of the Sacramento Valley, California.
2004-2008 \$188,946

California Department of Fish and Game

Responses of a declining amphibian and other wildlife to changes in fisheries management in California wilderness. 2003-2006: \$325,509

University of California Division of Agriculture and Natural Resources Integrated Pest Management Program and University of California Mosquito Research Program

Duration of lambda-cyhalothrin effects on mosquitoes and beneficials: assessing biological control disruption and resistance risk. 2003-4: \$50,000

University of California Mosquito Research Program

Do repeated applications of ULV pyrethroids affect zooplankton or aquatic insects? 2006-2007: \$20,186

Effects of Rice Straw Management on the dynamics of mosquito populations: a food web study. 1999-2001: \$119,232

Non-Target Effects of Mosquito Larvicides Used on National Wildlife Refuges

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1997-1998: \$31,298

Non-Target Effects of U.L.V. Mosquito Adulticides on Aquatic Insects and Fish

1996-1997: \$32,254

Direct and Indirect Effects of Mosquitofish on a Declining Species of Amphibian,

The Red-legged Frog. 1995 -1996: \$44,678

Department of the Interior, U.S. Fish and Wildlife Service

Mosquito Control on National Wildlife Refuges: Ecosystem Effect Studies

1995-1999: \$290,188

NSF DEB 94-19660

Evolution, Coevolution and Predator-Prey Dynamics: An Experimental Approach.

1995-1997: \$30,000

Teaching:

Metacommunity Ecology: Spring 2008, 1-week intensive graduate course in Uppsala, Sweden, funded by the European Science Foundation (20 students from all over the EU).

Biology of Aquatic Insects, now Freshwater Invertebrates (undergraduate, offered annually)

Community Ecology (graduate, offered annually)

Biological Sciences 1B: Zoology. Winter 2007.

Graduate Seminars. Topics vary; approximately 1 annually. Topics have included: Insects as Vectors of Ecosystem Subsidy, Insect Conservation, Microbiology of Enology, Rapid Evolution in Insects, Biology of Hydrothermal Vents.

Publications:

Joseph, M., J. Piovia-Scott, **S. Lawler** and K. Pope. In press. Indirect effects of introduced trout on Cascades frogs (*Rana cascadae*) via shared aquatic prey. *Freshwater Biology*.

Epanchin, P., R. Knapp and **S. Lawler**. 2010. Nonnative trout impact an alpine-nesting bird by altering aquatic insect subsidies. *Ecology* 91: 2406-2415.

Pope, K.L., J. Piovia-Scott and **S. P. Lawler**. 2009. Changes in aquatic insect emergence in response to whole-lake experimental manipulations of introduced trout. *Freshwater Biology* 54:982-993.

Pope, K. L., J.M. Garwood, H. H. Welsh and **S.P. Lawler**. 2008. Evidence of indirect impacts of introduced trout on native amphibians via facilitation of a shared predator. *Biological Conservation* 141:1321-1331.

Lawler, S.P., D.A. Dritz, C. S. Johnson and M. Wolder. 2008. Does synergized pyrethrin applied over wetlands for mosquito control affect *Daphnia magna* zooplankton or *Callibaetis californicus* mayflies? *Pest Management Science* 64:843-847.

Piechnik, D.A., **S.P. Lawler** and N.D. Martinez. 2008. Food-web assembly during a classic biogeographic study: species' trophic breadth corresponds to colonization order. *Oikos* 117:665-674.

Boyce, W.M., **S.P. Lawler**, J.M. Schultz, S.J. McCauley, L.S. Kimsey, M.K. Niemala, C.F. Nielson and W. K. Reisen. 2007. Non-target Effects of the Mosquito Adulticide Pyrethrin Applied Aerially During a West Nile Virus Outbreak in an Urban California Environment. *Journal of the American Mosquito Control Association* 23: 335-339.

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- Lawler, S. P.**, L. Reimer, T. Thiemann, J. Fritz, K. Parise, D. Feliz and D. Elnaiem. 2007. Effects of vegetation control on mosquitoes in seasonal freshwater wetlands. *Journal of the American Mosquito Control Association* 23:66-70.
- Lawler, S. P.**, D. A. Dritz., J.A. Christiansen and A. Cornel. 2007. Effects of lambda-cyhalothrin on mosquito larvae and predatory aquatic insects. *Pest Management Science* 63:234-240.
- Lawler, S. P.** and D. A. Dritz. 2006. Effects of rice straw and water management on riceland mosquitoes. *Journal of Medical Entomology* 43:828-832.
- Lawler, S. P.** and D. A. Dritz. 2005. Straw and winter flooding benefit mosquitoes and other insects in a rice agroecosystem. *Ecological Applications* 15:2052-2059.
- Lawler, S. P.** and G. C. Lanzaro. 2005. Managing mosquitoes on the farm. University of California Division of Agriculture and Natural Resources Publication 8158. 19 pp. Online at <http://anrcatalog.ucdavis.edu/pdf/8158.pdf>
- Holyoak, M. H. and **S. P. Lawler**. 2005. The contribution of laboratory experiments on protists to understanding population and metapopulation dynamics. *Advances in Ecological Research* 37: 245-271.
- Srivastava, D. S., J. Kolasa, J. Bengtsson, A. Gonzalez, **S.P. Lawler**, T. E. Miller, P. Mungia, T. Romanuk, D. C. Schneider and M. K. Trzcinski. 2004. Are natural microcosms useful model systems for ecology? *Trends in Ecology & Evolution* 19: 379-384.
- Leyse, K., **S. P. Lawler** and T. Strange. 2004. Effects of an alien fish, *Gambusia affinis*, on an endemic California fairy shrimp, *Linderiella occidentalis*: implications for conservation of diversity in fishless waters. *Biological Conservation* 118:57-65.
- Orland, M.C. and **S. P. Lawler**. 2004. Resonance inflates carrying capacity in protist populations with periodic resource pulses. *Ecology* 85: 150-157.
- Lawler, S. P.**, D. A. Dritz and L. D. Godfrey. 2003. Effects of the agricultural insecticide lambda-cyhalothrin (Warrior™) on mosquitofish (*Gambusia affinis*). *J. American Mosquito Control Assoc.* 19:430-432.
- Miles, A. K., **S. P. Lawler**, D. A. Dritz and S. Spring. 2002. Effects of mosquito larvicide on mallard ducklings and prey. *Wildlife Society Bulletin* 30:675-682.
- Dritz, D.A., **S.P. Lawler**, J. Albertson, W. Hamersky and J. R. Rusmisl. 2001. The impact of Bti on the survival of the endangered tadpole shrimp *Lepidurus packardii*. *Proceedings and Papers of the 69th Annual Conference of the Mosquito and Vector Control Assoc. of California*. Pp. 88-91.
- Lawler, S. P.**, J. Armesto and P. Kareiva. 2001. How relevant are studies of biodiversity and ecosystem functioning to conservation? In A. Kinzig, D. Tilman and S. Pacala, Eds. *Biodiversity and Ecosystem Function: Empirical and Theoretical Analysis of the Relationship*. Monographs in Population Biology 33: 294-313. Princeton University Press.
- Lawler, S. P.** Rice fields as temporary wetlands: a review. 2001. *Israel Journal of Zoology* 47:513-528. (Special feature edition: Ecology of Temporary Pools)
- Hector, A., J. Joshi, **S.P. Lawler** and E. M. Spehn. 2001. Conservation implications of the link between biodiversity and ecosystem functioning. *Oecologia* 129:624-628.
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Invited Book Reviews:

- Lawler, S. P. 2009. Ecology. Authors M.L. Cain, W. D. Bowman and S. D. Hacker. Quarterly Review of Biology.
- Lawler, S. P. 2007. Structure and diversity in food web research. Ecology 88:1335-1336.
- Lawler, S. P. 2006. The farmer and the conservationist should be friends: finding common ground for invertebrates. Conservation Biology 20:923-925.

Webpage text:

- Lawler, S.P. 2004. Rice: managing mosquitoes in an agricultural situation.
<http://www.ipm.ucdavis.edu/PMG/r682000411.html>

*Invited Symposium Talks**

- Lawler, S.P. 2008. Insects linking ecosystems and ecosystem services. Entomological Society of America Annual Meeting 2008, Reno, NV.
- Lawler, S.P. 2008. Mosquito larvicides' impacts on non-target organisms. American Mosquito Control Association Annual Meeting, Sparks, NV.
- Lawler, S. P. 2002. Should ecologists throw away their aquaria and petri dishes? 'Minature Worlds' Symposium, Ecological Society of America, Savannah, GA.
- Lawler, S. P. and P. J. Morin 1998. Food web structure and population dynamics in laboratory microcosms of protists. INTECOL, Florence, Italy.
- Lawler, S.P., D. Dritz, T. Strange and M. Holyoak. 1996. Vector control and an endangered species: are mosquitofish the most likely cause of red-legged frog decline? 28th Annual Conference of the Society for Vector Ecology, Berkeley, CA, USA.
- Lawler, S.P. 1995. Experimental analysis of microcosm food webs. Experimental Ecology Symposium, American Society of Zoologists, St. Louis, MO, USA.
- Lawler, S.P. 1995. Population dynamics of protists in microcosms. The Gordon Research Conference in Microbial Population Biology, Plymouth State College, Plymouth, NH, USA.
- Lawler, S.P. 1993. Community complexity and population dynamics in laboratory microcosms of protists. Biodiversity and Conservation Meetings, Paris, France.

Selected Contributed Papers

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- Piovia-Scott, J., K. Pope, E. Cole, J. Foley and S. Lawler. 2009. Incidence of a fungal pathogen in *Rana cascadae* and other amphibian species in the mountains of Northern California. 2009 CA-NV Declining Amphibian Task Force Meeting, Bodega Bay CA.
- Lawler, S. P. and D. A. Dritz. 2000. Effects of straw management and winter flooding on aquatic food web structure in a rice agroecosystem. 85th Annual Meeting of the Ecological Society of America, Snowbird, UT.
- Lawler, S.P. 1998. Are terrestrial ULV applications of pyrethrin, permethrin and malathion safe for nearby aquatic non-target organisms? 64th Annual Meeting of the American Mosquito Control Association, Sparks, Nevada.
- Lawler, S.P., D. Dritz, M. Holyoak and T. Strange. 1997. Effects of bullfrogs and mosquitofish on California red-legged frogs. Ecological Society of America, Albuquerque, NM. *Suppl. Bull. Ecol. Soc. Amer.* 78: 128.
- Lawler, S.P. and D. Balciunas. 1994. Effects of alternate prey and basal resource level in simple microcosm communities of protists. British Ecological Society Winter Meeting, University of Stirling, UK.
- Lawler, S.P. 1992. Direct and indirect trophic interactions in laboratory microcosms of protists. British Ecological Society Winter Meeting, University of Lancaster, UK.
- Lawler, S.P. and P.J. Morin. 1991. Food web architecture and population dynamics in laboratory microcosms of protists. Ecological Society of America. San Antonio, Tx. USA. *Bull. Ecol. Soc. Amer.* 72:170-171.
- Lawler, S.P. 1990. Competitive priority effects in larval *Bufo woodhousei fowleri* and *Hyla crucifer*. American Society of Ichthyologists and Herpetologists. Charleston, SC. USA.
- Lawler, S.P. 1986. Differential behavioral responses of larval anuran prey to predators. Ecological Society of America, Columbus Ohio. *Bull. Ecol. Soc. Amer.* 68:347.

* In addition to the talks listed above, I give talks to Mosquito and Vector Abatement Districts annually. I have given invited seminars at the NSF Food Web Conference, Pingree Park, CO; The University of Oregon, Eugene, OR; The University of Texas, Austin, TX; The University of Georgia, Athens, GA; The University of Miami, Oxford OH; the University of Chicago, IL; The University of California at Davis; the Bodega Marine Laboratory, CA; Dartmouth College, NH; the University of Pittsburgh, PA; U. California Irvine, the University of British Columbia, and the University of Colorado at Boulder.

Current Professional Activities

Subject Editor, Ecology
Faculty of 1000, Ecology, Marine and Freshwater Ecology section
Member, Ecological Society of America
Society for Conservation Biology
Sigma Xi
Mosquito Control Association of California

Current and Recent University Service (past 4 years)

Department of Entomology: Undergraduate Master Advisor; Curriculum, Courses and Majors Committee, Admissions and Fellowships Committee, various ad-hoc committees.
Graduate Group in Ecology: Chair. Admissions Committee.
Center for Population Biology: Admissions Committee

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College of Agriculture and Environmental Sciences: Chair, Search Committee: Quantitative Animal Conservation Ecologist; Member, Search Committee: Conservation Valuation Analyst; Member, Search Committee, Aquatic Physiological Ecologist. Chair, Equity and Diversity Committee.