

STATE OF CALIFORNIA
STANDARD AGREEMENT

STD 213 (Rev 05/18)

AGREEMENT NUMBER 18-C0042
REGISTRATION NUMBER

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

STATE AGENCY'S NAME	Department of Pesticide regulation, hereinafter referred to as "State"		
CONTRACTOR'S NAME	The Regents of the University of California, hereinafter referred to as "University"		
- The term of this Agreement is: 09/01/18 through 06/30/19
- The maximum amount of this Agreement is: \$ 88,000.00
- The Parties agree to comply with the terms and conditions of the following Exhibits, which by this reference are made a part of the Agreement.

Exhibit A – A7: A–Scope of Work; A1–Deliverables; A2–Key Personnel; A3–Authorized Representatives; A4–Use of Intellectual Property; A5–Resumes/Biosketch; A6–Current & Pending Support; A7–Third Party Confidential Information (if applicable)	14 page(s)
Exhibit B – B–Budget; B1–Budget Justification; B2– Subawardee Budgets (if applicable); B3– Invoice Elements	4 page(s)
Exhibit C* – University Terms and Conditions	UTC-518

Check mark additional Exhibits below, and attach applicable Exhibits or provide internet link:

- Exhibit D** – Additional Requirements Associated with Funding Sources 1 page(s)
- Exhibit E** – Special Conditions for Security of Confidential Information page(s)
- Exhibit F** – Access to State Facilities or Computing Resources page(s)
- Exhibit G** – Negotiated Alternate UTC Terms 1 page(s)

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.dgs.ca.gov/ols/Resources/ModelContractLanguageUniversities.aspx>.

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

CONTRACTOR		<i>California Department of General Services Use Only</i>
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) 9/26/2018	
PRINTED NAME AND TITLE OF PERSON SIGNING MTMS Grace I. Liu, JD, Associate Director, Sponsored Programs		
ADDRESS 1850 Research Park Drive, Ste. 300 Davis, CA. 95618-6153		
STATE OF CALIFORNIA		
AGENCY NAME Department of Pesticide Regulation		
BY (Authorized Signature) 	DATE SIGNED (Do not type) 10.11.18	
PRINTED NAME AND TITLE OF PERSON SIGNING Leslie Ford, Branch Chief		
ADDRESS 1001 I Street, Sacramento, CA 95814		

Exempt per:
 Delegation Letter 74.6

Exhibit A – Scope of Work

Project Summary & Scope of Work

Contract Grant

PI Name: Dr. Richard Connon

Project Title: High-throughput Biomonitoring of Aquatic Invertebrates

Project Summary/Abstract

Briefly describe the long-term objectives for achieving the stated goals of the project.

Ecological impacts of pesticide exposure can alter non-target biological diversity, particularly in sensitive “bioindicator” species. These bioindicator species can be used to highlight changes in water quality. Chemical sensitivities for many species are still undocumented. Laboratory toxicity tests generally focus on lab strains of model organisms, which may not represent the sensitivities of local biodiversity.

Biodiversity assessments traditionally require sampling and taxonomic identification of hundreds or thousands of individual organisms, requiring a high level of expertise. DNA-based species identification (e.g., metabarcoding) can overcome many of the limitations of taxonomic identification, resulting in high-resolution datasets. Targeted chemical analyses paired with metabarcoding will allow us to analyze species richness at sites with varying water quality.

The **objectives** are 1) to establish species richness indices for the Department of Pesticide Regulation’s (DPR) long-term monitoring sites, and 2) to causally link field water chemistry to organismal effects.

In order to achieve objective 1, University will first establish biodiversity indices (species richness, haplotype diversity) at selected sites associated with DPR’s monitoring projects using traditional and metabarcoding methods, then University will analyze the chemical profile (monitoring data and Pesticide Use Reporting site specific data) concurrently with species richness information, and identify sensitive field species via spatial site comparisons. Objective 2 will be realized by conducting acute exposures of three model invertebrate species (*Daphnia magna*, *Hyalella azteca*, *Chironomus dilutus*) to serial dilutions of field-collected water from selected DPR monitoring sites. From this, University will assess mortality, swimming behavior (*H. azteca*) and measure gene transcription of select target genes associated with motor function, metabolism, growth and development, and general stress response.

This project will provide a rapid assessment of species richness at key sites concurrently with DPR’s routine chemical analysis, and in doing so, support DPR goals to mitigate site-specific pesticide impacts through an increased understanding their ecological effects.

If Third-Party Confidential Information is to be provided by the State:

- Performance of the Scope of Work is anticipated to involve use of third-party Confidential Information and is subject to the terms of this Agreement; **OR**
- A separate CNDA between the University and third-party is required by the third-party and is incorporated in this Agreement as Exhibit A7, Third Party Confidential Information.

Scope of Work

Describe the goals and specific objectives of the proposed project and summarize the expected outcomes. If applicable, describe the overall strategy, methodology, and analyses to be used. Include how the data will be collected, analyzed, and interpreted as well as any resource sharing plans as appropriate. Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the goals and objectives.

1. Problem statement

A central goal of the DPR Surface Water Protection Program is to develop site-specific mitigation strategies, with the ultimate objective of reducing the impacts of pesticides on the environment. The ecological impacts of pesticide exposure can include changes in non-target biological diversity, particularly in sensitive "bioindicator" species^{1,2}. Bioindicator species act like the 'canary in the coal mine,' indicating changes in water quality. Chemical sensitivities for many species are still undocumented, however³. Laboratory toxicity tests generally focus on lab strains of model organisms, which may not represent the sensitivities of local biodiversity. To support DPR's mitigation goals and reduce potential ecological impacts, first University will need to know what organisms are present. Traditionally, assessments of biodiversity require sampling and taxonomic identification of hundreds or thousands of individual organisms, which is time-intensive and requires a high level of expertise. Taxonomy is commonly only resolved to the genus or Family-level, which limits the interpretation of statistical tests relying on taxonomic richness^{4,5}. DNA-based species identification (e.g., metabarcoding) can overcome many of the limitations of taxonomic identification, resulting in high-resolution datasets⁶. Targeted chemical analyses paired with metabarcoding will allow us to analyze species richness at sites with varying water quality. The richness indices can then be used to evaluate ecological impacts, and identify new, locally relevant bioindicators.

2. Research Goal, Objectives, & Tasks

The overall **goal** of this project is to understand effects of altered water quality on aquatic invertebrate communities. The **objectives** are to:

- 1) Establish species richness indices for DPR's long-term monitoring sites
 - a) Establish biodiversity indices (species richness, haplotype diversity) at selected sites associated with DPR's monitoring projects using traditional and metabarcoding methods
 - b) Analyze the chemical profile (monitoring data and Pesticide Use Reporting site specific data) concurrently with species richness information
 - c) Identify sensitive field species via spatial site comparisons
- 2) Causally link field water chemistry to organismal effects
 - a) Culture three model invertebrate species (*Daphnia magna*, *Hyalella azteca*, *Chironomus dilutus*)
 - b) Conduct 96h exposures on serial dilutions of field-collected water from selected DPR monitoring sites
 - c) Assess mortality, swimming behavior (*H. azteca*) and measure gene transcription of select target genes associated with motor function, metabolism, growth and development, and general stress response.

The **tasks** include sampling invertebrate species richness using both traditional and metabarcoding methods (Figure 1), at sites prioritized by the DPR surface water monitoring program. Sampling will occur during scheduled chemical sampling events. Toxicity of grab samples will be determined by standard lab 96h exposure tests (Figure 2).

3. Background & Rationale

Targeting invertebrates: Invertebrates are a key component of the aquatic food web, consuming phytoplankton and providing a vital food source for organisms at higher trophic levels⁷. In habitats that are periodically impacted by multiple stressors, such as poor water quality, effects on sensitive invertebrates can cause

changes in community structure and biodiversity across trophic levels⁸. The use of invertebrates as bioindicators has been reliably and routinely used in biomonitoring surveys for decades⁹.

Measuring biodiversity using metabarcoding: Biodiversity is the keystone of ecosystem stability, productivity and resilience, and is routinely measured as an indicator of water quality in freshwater systems. High-throughput techniques, such as metabarcoding, can greatly enhance traditional biodiversity monitoring^{6,10-13}. Metabarcoding can be used to identify a wide variety of taxa simultaneously from tissue or environmental samples. This is done by tagging and amplifying a particular target sequence that contains enough variation to differentiate between closely related species or haplotypes. This cost-effective method can reliably quantify patterns of diversity and community composition. Species identifications resulting from metabarcoding are comprehensive, efficient, and verifiable. This is particularly useful for the accurate identification of cryptic species, damaged specimens, specimens at all life stages, and taxa present at very low densities¹⁴. This increased taxonomic resolution could reveal site-specific taxonomic richness and intraspecific genetic diversity that go undetected with traditional methods. Extensive research has demonstrated the utility of metabarcoding for detecting the presence of a wide variety of taxonomic groups¹⁵⁻¹⁹. In natural populations of organisms routinely exposed to a chemical stressor, adaptation may allow enhanced tolerance²⁰. This tolerance may come with increased ecological fitness costs, however. Elimination of sensitive genotypes (along with other causes of mortality) will reduce genetic diversity within the population. Populations with reduced genetic diversity have lower adaptive capacity for coping with novel stressors²⁰. Haplotype diversity for specific sites on a DNA fragment can be measured using metabarcoding, without any additional sampling effort²¹.

4. Deliverables

The project will provide a rapid assessment of species richness at key sites concurrently with DPR's routine chemical analysis. This will maximize the cost-effectiveness and efficiency of monitoring efforts and enhance the value of the chemical dataset. The project will support DPR goals to mitigate site-specific pesticide impacts through an increased understanding their ecological effects. The sensitivities (EC50, LC50) of invertebrates to representative pesticides detected at field sites will provide indices relevant to local biodiversity (as species richness), providing data to inform long-term population-level monitoring (Figure 3). University anticipate that this work will produce a minimum of two publications (focusing on objectives 1 and 2, respectively), as well as a standard operating protocols for future monitoring efforts (Table 1).

5. Project Timeline:

		Proposed Project Timeline									
		2018				2019					
		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Field	DPR Water Sampling	x						x	x		
	Grab Samples for Tox Tests	x						x	x		
	Invertebrate Sampling, ID	x	x					x	x	x	
	DNA Sampling	x	x					x	x	x	
Lab	Establish Lab Culture	x					x	x	x		
	Grab Sample Testing	x						x	x		
	96h Exposures	x						x			
	qPCR/gene expression analysis		x	x	x	x				x	x
	Metabarcoding / Analysis		x	x	x	x				x	x
Deliverables	DNA biomonitoring SOP		x	x	x	x					
	Publications / Presentations							x	x	x	x

Table 1: Project Timeline. Field and lab work will occur over the year of funding, following the chemical sampling and analysis timeline of DPR's routine monitoring schedule. All sampling, analysis and deliverables will be completed within the 1-year funding period.

6. State Responsibilities:

DPR will participate, as needed, in Items 1-4 of the project.

Figures:

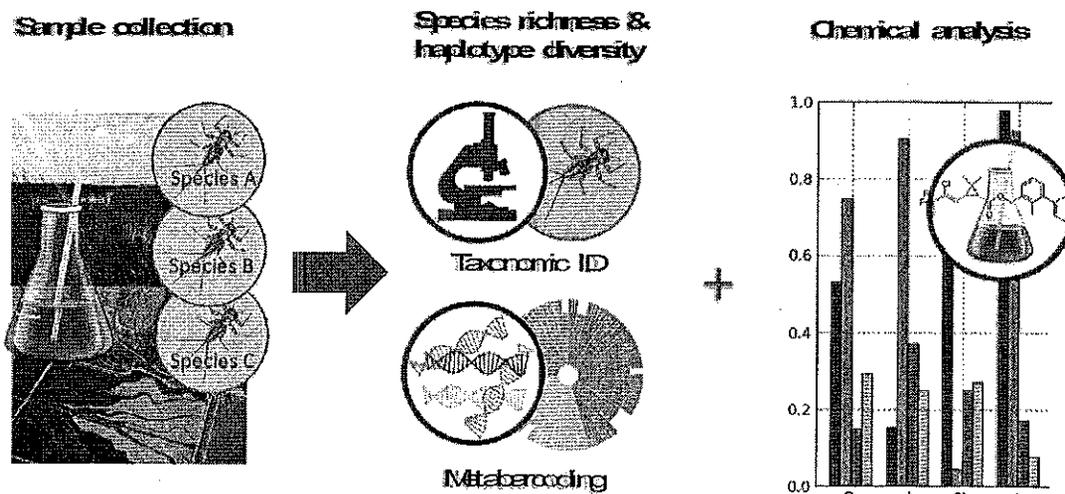


Figure 1: Conceptual model for Objective 1; To establish species richness indices for DPR's long-term monitoring sites. This will be accomplished by sampling invertebrate species richness using both traditional and metabarcoding methods, at sites prioritized by the DPR surface water monitoring program (e.g., study 310). Sampling will occur at regular intervals before, during and after scheduled chemical sampling events. Physicochemical measurements, invertebrates, and water samples will be collected at every sampling time point. Water samples will be collected for lab toxicity testing on lab cultured invertebrates.

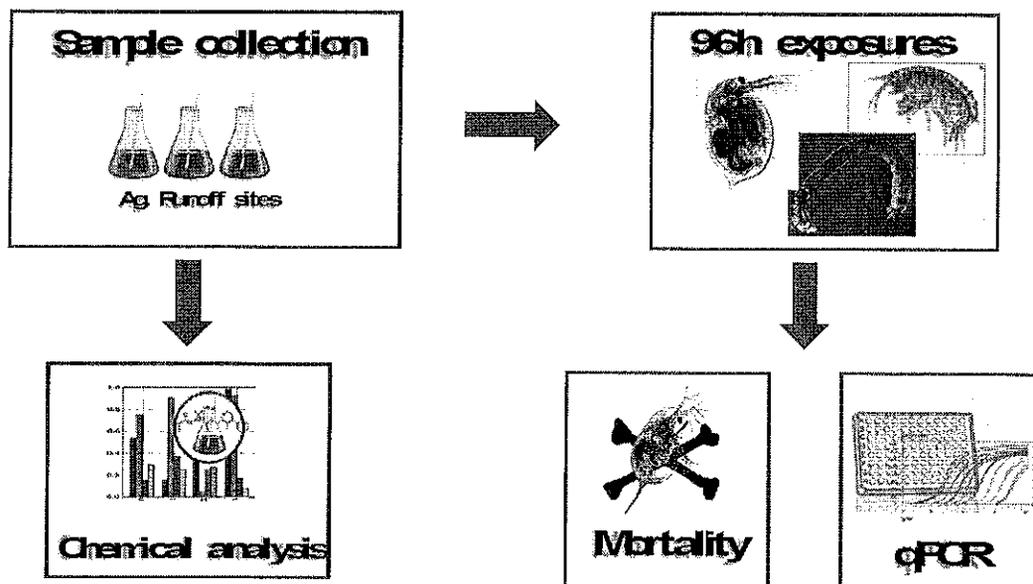


Figure 2: Conceptual model for Objective 2; To causally link field chemistry data to organismal effects. This will be accomplished by standard lab acute and chronic exposure tests. Lab cultures of invertebrate species (*Daphnia magna*, *Hyalella azteca*, *Chironomus dilutus*) will be used to measure effects of field water (endpoints: mortality, behavior, motility and gene expression).

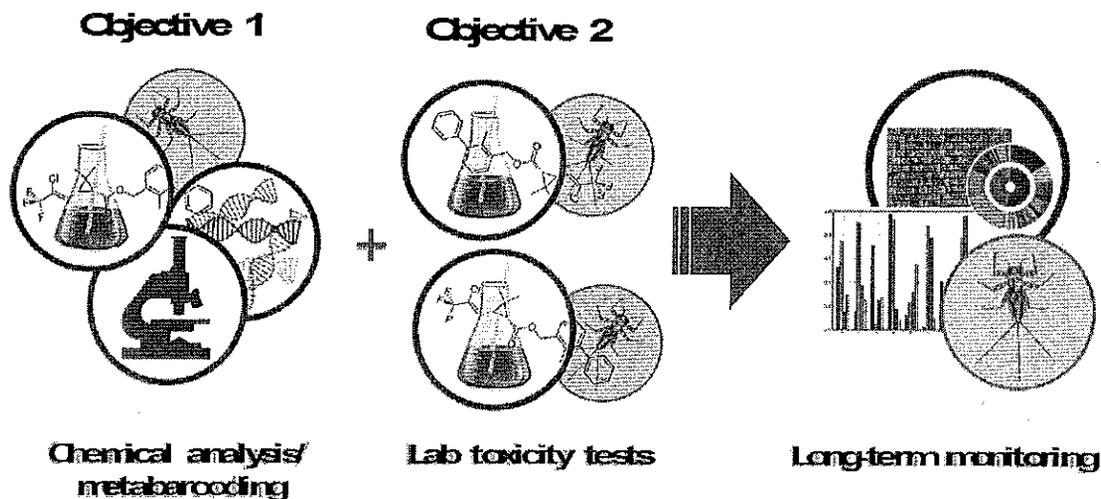


Figure 3: Conceptual model for high-throughput biomonitoring of aquatic invertebrates, including Objectives 1 and 2. The overall goals of the project are to understand effects of altered water quality on aquatic invertebrate communities and inform long-term monitoring efforts in order to support the goals of the DPR SWPP.

Exhibit A1 - Deliverables

SCHEDULE OF DELIVERABLES

List all items that will be delivered to the State under the proposed Scope of Work. Include all reports, including draft reports for State review, and any other Deliverables, if requested by the State and agreed to by the Parties.

If use of any Deliverable is restricted or is anticipated to contain preexisting Intellectual Property with any restricted use, it will be clearly identified in Exhibit A4, Use of Preexisting Intellectual Property.

Unless otherwise directed by the State, the University Principal Investigator shall submit all Deliverables to the State Contract Project Manager, identified in Exhibit A3, Authorized Representatives.

Deliverable	Description	Due Date
Report	Final report on results on species richness indices for DPR's long-term monitoring sites and field water chemistry effects on three model ecotoxicological species.	06/30/19
Final presentation to DPR	Final presentation to DPR	06/30/19
Manuscripts	A manuscript will be submitted to a peer-reviewed journal	06/30/19
The following Deliverables are subject to Section 19. Copyrights, paragraph B of Exhibit C		

Exhibit A2 – Key Personnel

KEY PERSONNEL

List Key Personnel as defined in the Agreement starting with the PI, by last name, first name followed by Co-PIs. Then list all other Key Personnel in alphabetical order by last name. For each individual listed include his/her name, institutional affiliation, and role on the proposed project. Use additional consecutively numbered pages as necessary.

Last Name, First Name	Institutional Affiliation	Role on Project
PI:		
<i>Connon, Richard E.</i>	<i>UC Davis</i>	<i>Principal Investigator</i>
Co-PI(s) – if applicable:		
<i>Lawler, Sharon P.</i>	<i>UC Davis</i>	<i>Co-Principal Investigator</i>
<i>Last name, First name</i>	<i>Institutional affiliation</i>	<i>Role on the project</i>
Other Key Personnel (if applicable):		
<i>Stinson, Sarah</i>	<i>UC Davis</i>	<i>Graduate Student researcher</i>
<i>Last name, First name</i>	<i>Institutional affiliation</i>	<i>Role on the project</i>

Exhibit A3 – Authorized Representatives

AUTHORIZED REPRESENTATIVES AND NOTICES

The following individuals are the authorized representatives for the State and the University under this Agreement. Any official Notices issued under the terms of this Agreement shall be addressed to the Authorized Official identified below, unless otherwise identified in the Agreement.

State Agency Contacts	University Contacts
Agency Name: Department of Pesticide Regulation	University Name: The Regents of the University of California Davis
<i>Contract Project Manager (Technical)</i>	<i>Principal Investigator</i>
Name: Xin Deng Sr. Environmental Scientist (Specialist) Address: Department of Pesticide Regulation 1001 I Street, MS 3-B Sacramento, CA. 95814 Telephone: 916-445-2506 Fax: 916-324-4088 Email: xin.deng@cdpr.ca.gov	Name: Richard Connon, PhD Associate Professor Address: VM:APC UC Davis Davis, CA 95616 Telephone: (530) 752-3141 Fax: <Fax#, if available> Email: reconnon@ucdavis.edu Designees to certify invoices under Section 14 of Exhibit C on behalf of PI: <ol style="list-style-type: none"> 1. <Name>, <Title>, <EmailAddress> 2. <Name>, <Title>, <EmailAddress> 3. <Name>, <Title>, <EmailAddress>
<i>Authorized Official (contract officer)</i>	<i>Authorized Official</i>
Name: Leslie Ford Branch Chief Address: Department of Pesticide Regulation 1001 I Street, 4 th Floor Sacramento, CA. 95814 <i>Send notices to (if different):</i> Name: Kim Bateman Contract Analyst Address: Department of Pesticide Regulation 1001 I Street, MS 4-A Sacramento, CA. 95814 Telephone: 916-445-2512 Email: kim.bateman@cdpr.ca.gov	Name: Grace Liu Associate Director Address: Office of Research, Sponsored Programs 1850 Research Park Drive, Ste. 300 Davis, CA. 95618-6153 Telephone: 530-754-7700 Fax: 530-752-0333 Email: awards@ucdavis.edu <i>Send notices to (if different):</i> Name: Maria Thomsen Contracts & Grants Analyst Address: Office of Research, Sponsored Programs 1850 Research Park Drive, Ste. 300

	<p>Davis, CA. 95618-6153 Telephone: 530-754-7700 Email: awards@ucdavis.edu</p>
<p>Administrative Contact</p> <p>Name: Kim Bateman Contract Analyst Address: Department of Pesticide Regulation 1001 I Street, MS 4-A Sacramento, CA. 95814 Telephone: 916-445-2512 Email: kim.bateman@cdpr.ca.gov</p>	<p>Administrative Contact</p> <p>Name: Maria Thomsen Contracts & Grants Analyst Address: Office of Research, Sponsored Programs 1850 Research Park Drive, Ste. 300 Davis, CA. 95618-6153 Telephone: 530-754-7700 Fax: 530-752-0333 Email: awards@ucdavis.edu</p>
<p>Financial Contact/Accounting</p> <p>Name: Department of Pesticide Regulation Accounts Payable Address: Department of Pesticide Regulation Accounts Payable P.O. Box 4015 Sacramento, CA 95812-4015 Telephone: (916) 445-4149 Email: Accounts_Payable@cdpr.ca.gov</p>	<p>Authorized Financial Contact/Invoicing</p> <p>Name: James Ringo Associate Accounting Officer Address: Contracts & Grants Accounting 1441 Research Park Drive Davis, CA. 95618 Telephone: 530-757-8523 Fax: 530-757-8721 Email: efa@ucdavis.edu</p> <p>Payment Address: Cashier's Office University of California Davis P.O. Box 989062 West Sacramento, CA. 95798-9062</p>

Exhibit A4 – Use of Intellectual Property

USE OF INTELLECTUAL PROPERTY

If either Party will be using any third-party or pre-existing intellectual property (including, but not limited to data, copyrighted works, known patents, trademarks, service marks and trade secrets) "IP" with restrictions on use, then list all such IP and the nature of the restriction below. If no third-party or pre-existing IP will be used, check "none" in this section.

A. State: Preexisting IP to be provided to the University from the State or a third party for use in the performance in the Scope of Work.

None or List:

Owner (Name of State Agency or 3 rd Party)	Description	Nature of restriction:

B. University: Restrictions in Preexisting IP included in Deliverables identified in Exhibit A1, Deliverables.

None or List:

Owner (Name of University or 3 rd Party)	Description	Nature of restriction:

C. Anticipated restrictions on use of Project Data.

If the University PI anticipates that any of the Project Data generated during the performance of the Scope of Work will have a restriction on use (such as subject identifying information in a data set) then list all such anticipated restrictions below. If there are no restrictions anticipated in the Project Data, then check "None" in this section.

None or List:

Owner (University or 3 rd Party)	Description	Nature of Restriction:

Exhibit A5 - RÉSUMÉ/BIOSKETCH

RÉSUMÉ/BIOSKETCH

Attach 2-3 page Resume/Biosketch for the PI and other Key Personnel listed in Exhibit A2, Key Personnel.

RICHARD E CONNON

Associate Adjunct Professor
School of Veterinary Medicine, Department of Anatomy, Physiology and Cell Biology
University of California, Davis
(916) 505-4925, reconnon@ucdavis.edu

EDUCATION AND TRAINING

University of California, Davis	Toxicogenomics	Post-Doc	2007-08
University of Reading, UK	Ecotoxicogenomics	Post-Doc	2003-06
University of Reading, UK	Ecotoxicology	PhD,	2003
Middlesex University, UK	Environmental Science	BSc (Hons)	1998

ACADEMIC APPOINTMENTS

07/16-present	Associate Professor (Adj.), School of Veterinary Medicine, UC Davis
06/13-06/16	Assistant Professor (Adj.), School of Veterinary Medicine, UC Davis
09/11-12/12	Assistant Researcher, School of Veterinary Medicine, UC Davis
11/08-08/11	Assistant Project Scientist, School of Veterinary Medicine, UC Davis
07/02-12/02	Research Assistant, University of Reading, UK, Biological Sciences
02/02-06/02	Research Assistant, University of Reading, UK, Psychology

5 SELECTED PEER-REVIEWED PUBLICATIONS (of over 60)¹.

Connon RE, Jeffries KM, Komoroske LM, Todgham AE, Fangué NA. 2018. The utility of transcriptomics in fish conservation. *Journal of Experimental Biology*, 221(2): jeb148833.

Hasenbein S, Poynton H, Connon RE. 2018. Contaminant exposure effects in a changing climate: How multiple stressors can multiply exposure effects in the amphipod *Hyalella azteca*. *Ecotoxicology*.
<https://doi.org/10.1007/s10646-018-1912-x>

Hobbs J, Moyle P, Fangué N, Connon RE. 2017. Is extinction inevitable for Delta Smelt and Longfin Smelt? An opinion and recommendations for recovery. *San Francisco Estuary and Watershed Science*, 15(2).

Fong S, Louie S, Werner I, Davis J, Connon RE. 2016 Contaminant effects on California Bay-Delta species and human health. *San Francisco Estuary and Watershed Science*, 14(4): 1-34.

¹ For further publications visit:

https://scholar.google.com/citations?hl=en&user=i8YaD6MAAAAJ&view_op=list_works&sortby=pubdate

Jeffries KM, **Connon RE**, Davis BE, Komoroske LM, Britton MT, Sommer T, Todgham AE, Fangué NA. **2016**. Effects of high temperatures on threatened estuarine fishes during periods of extreme drought. *J Exp Biol*, 219(Pt 11): 1705-16.

SHARON P. LAWLER

Professor of Entomology and Nematology
University of California, Davis, 1 Shields Avenue, Davis, CA 95616 USA
Phone: 530 754 8341; email splawler@ucdavis.edu

EDUCATION AND TRAINING

- 1978-1982 Lehigh University, Bethlehem, PA, B.A., Biology, philosophy minor
1984-1988 Rutgers University, New Brunswick, NJ, M.S., Ecology (w/P.J. Morin)
1988-1992 Rutgers University, New Brunswick, NJ, Ph.D., Ecology and Evolution (w/ Peter J. Morin)
1992-1994 Postdoctoral Researcher, Imperial College at Silwood Park, Ascot, England (w/John Lawton).
1994-1995 Postdoctoral Researcher, Biological Sciences, U. of Kentucky, Lexington (W/Philip Crowley)

ACADEMIC APPOINTMENT

1995-present Faculty, Entomology and Nematology, University of California, Davis. Current rank and step: Professor 3.5

5 SELECTED PEER-REVIEWED PUBLICATIONS

- 2008 Lawler, SP, Dritz, DA, Johnson, CS, Wolder, M. Does synergized pyrethrin applied over wetlands for mosquito control affect *Daphnia magna* zooplankton or *Callibaetis californicus* mayflies? *Pest Management Science*, 64(8): 843-7.
- 2013 **Lawler, Sharon P.** and D. A. Dritz. Efficacy of spinosad (Natular®) in control of larval *Culex tarsalis* and chironomid midges, and its non-target effects. *Journal of the American Mosquito Control Association*, 29(4): 352-357.
- 2015 Hasenbein, Simone, Sharon P. Lawler, Juergen Geist and Richard E. Connon. A long-term assessment of pesticide mixture effects on aquatic invertebrate communities. *Environmental Toxicology and Chemistry*, 35(1): 218-232.
- 2017 Lawler, Sharon P. Environmental safety review of methoprene and bacterially-derived pesticides commonly used for sustained mosquito Control. *Ecotoxicology and Environmental Safety*, 139: 336-343.
- 2017 Hasenbein, Simone, Sharon P. Lawler, and Richard Connon. An assessment of direct and indirect effects of two herbicides on aquatic communities. *Environmental Toxicology and Chemistry*, 36: 2234-2244.

SARAH STINSON, M.S.

Graduate group in Ecology, University of California at Davis
Phone 916.616.6812 email sastinson@ucdavis.edu

EDUCATION AND TRAINING

University of CA, Davis	Ecology	Ph.D. candidate	Current
University of CA, Davis	Ecology	M.S.	2017
University of CA, Davis	Ecology & Evolution	B.S.	2005

HONORS & AWARDS

- H.A. Jastro Shields Graduate Research Award (\$1,500)
- Marin Rod & Gun Club Student Fellowship (\$2,000)
- Ecology Student Endowment, UC Davis (\$3,000)
- Graduate Group in Ecology Student Fellowship, UC Davis (\$6,000)
- Yolo Basin Foundation Graduate Fellowship (\$7,500)
- Ecology Student Endowment, UC Davis (\$2,310)
- Best Poster, NorCal SETAC Annual Meeting
- Graduate Group in Ecology Student Fellowship, UC Davis (6,000.00)

PROFESSIONAL EXPERIENCE

- USV environmental sampling design consultant, seafloorsystems.com 2018 - present
- Laboratory Safety Officer. Connon Laboratory, UC Davis 2016 - present
- Board of Directors student member. NorCal SETAC 2014 - present
- Regional Student Representative. NASAC 2015 - present
- Teaching Assistant. UC Davis 2014 - 2018
- Laboratory Assistant III. CAHFS, UC Davis 2007 - 2014

RESEARCH INTERESTS

- Molecular Ecology; Ecotoxicology; Aquatic Invertebrate Ecology; Aquatic Biomonitoring; Community Ecology; Ecogenomics; Multiple environmental stressor.

PRESENTATIONS

- Stinson, S., Lawler, SP, Connon, RE. Development of a high-throughput biomonitoring system for invertebrates. Interagency Ecological Program Annual workshop. Folsom, CA. Poster Presentation. 2018
- Stinson, S., Connon, RE. Metabarcoding invertebrate populations: how genetic techniques can help determine community shifts due to contaminants. CA Dept. of Pesticide Regulation Symposium. Davis, CA. Presentation. 2017
- Stinson, S. Connon, RE. Freshwater invertebrate community structure and biodiversity in contaminant-impacted systems. UC Conservation Genomics Consortium eDNA Workshop. Los Angeles, CA. Presentation. 2017

• Exhibit A6 – Current & Pending Support

CURRENT & PENDING SUPPORT

University will provide current & pending support information for Key Personnel identified in Exhibit A2 at time of proposal and upon request from State agency. The "Proposed Project" is this application that is submitted to the State. Add pages as needed.

PI: Richard Connor					
Status (currently active or pending approval)	Award # (if available)	Source (name of the sponsor)	Project Title	Start Date	End Date
Proposed Project	18-C0042	Department of Pesticide Regulation	High-throughput biomonitoring of aquatic invertebrates	09/01/2018	06/30/2019
CURRENT	P1796002	California Department of Fish and Wildlife	Contaminant Effects on Two California Fish Species and the Food Web That Supports Them	07/01/2017	07/31/2020
CURRENT	P1696002	California Department of Fish and Wildlife	Drought-related high water temperature impacts the health of California salmonids through disease, enhancing predation risks	07/01/2016	06/30/2019
CURRENT	DSCPROP1	Delta Stewardship Council	Assessment of temperature- and nutritional-dependent physiological processes in larval green and white sturgeon for use in current and future habitat management of rearing grounds	07/01/2016	06/30/2019
CURRENT	EPA-G2014-STAR-E2	US EPA STAR	Linking biological scales across generations: An estuarine and marine model for measuring the ecological impact of endocrine disrupting compounds	06/01/2015	05/31/2020
CURRENT	16-C0084	Department of Pesticide Regulation	Developing molecular biomarkers to assess chlorantraniliprole and imidacloprid impacts in aquatic species	01/01/2017	12/31/2018
CURRENT	R15AC00043	Bureau of Reclamation	Genetic Signatures of Drought and Disease	07/01/2015	12/31/2018
PENDING		California Department of Fish and Wildlife	Defining the fundamental niche of Longfin Smelt (<i>Spirinchus thaleichthys</i>): Physiological mechanisms of environmental tolerance	08/01/2018	07/31/2021
Co-PI: Sharon Lawler					
Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project	18-C0042	Department of Pesticide Regulation	High-throughput biomonitoring of aquatic invertebrates	09/01/2018	06/30/2019
GSR: Sarah Stinson					
Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project	18-C0042	Department of Pesticide Regulation	High-throughput biomonitoring of aquatic invertebrates	09/01/2018	06/30/2019
CURRENT		H.A. Jastro Shields	Graduate Research Award (\$1,500)	07/01/2018	No end date
CURRENT		Marin Rod & Gun Club	Student Fellowship (\$2,000)	07/01/2018	No end date
CURRENT		Yolo Basin Foundation	Graduate Fellowship (\$7,500)	07/01/2016	No end date

Exhibit B - Budget
Budget for Project Period

Budget Line Item	From 08/01/2018 to 06/30/2019 FY 18-19	FY 19-20	TOTAL
<i>Direct Costs:</i>			
Personnel: Salary & Fringe Benefits	25,770	0	25,770
Travel	1,080	0	1,080
Materials & Supplies	20,654	0	20,654
Equipment	0	0	0
Consultant	0	0	0
Other – GSR Tuition/Fees (exempt from Indirect Costs)	13,419	0	13,419
Total Direct Costs	60,923	0	60,923
<i>Indirect Costs:</i>			
Indirect costs UCD @57%	27,077	0	27,077
TOTAL PER YEAR	88,000	0	88,000
TOTAL PROJECT COSTS			88,000

Note: Final invoice must be received within 60 days of the end of the grant period June 30, 2019.

Exhibit B1

Budget Justification

The Budget Justification will include the following items in this format.

Personnel

Name. Starting with the Principal Investigator list the names of all known personnel who will be involved on the project for each year of the proposed project period. Include all collaborating investigators, individuals in training, technical and support staff or include as "to be determined" (TBD).

Richard E. Connon (PI)

Sharon P. Lawler (Co-PI)

Sarah Stinson (Graduate Student Researcher)

Role on Project. For all personnel by name, position, function, and a percentage level of effort (as appropriate), including "to-be-determined" positions.

Dr. Connon will serve as the Principal Investigator of this project and will oversee project management activities including supervision of molecular and physiological assessments, bioinformatics, and subsequent analyses, data handling, and manuscript(s) preparation, report preparation and project oversight and outreach

Dr. Sharon Lawler will serve as the Co-Principal Investigator of this project and will assist with project management activities including experimental design and supervision of graduate student, as well as assist with analyses and manuscript preparation.

Ms. Sarah Stinson will develop initial study design, perform all aspects of proposed research, coordinate sampling with DPR, conduct invertebrate toxicity tests on field collected samples, collect and analyze field specimen as well as water samples for DNA analyses, data analyses, reporting and manuscript preparation.

Fringe Benefits.

In accordance with University policy, explain the costs included in the budgeted fringe benefit percentages used, which could include tuition/fee remission for qualifying personnel to the extent that such costs are provided for by University policy, to estimate the fringe benefit expenses on Exhibit B.

Composite benefit rates are developed in order to cover the costs of fringe benefits offered by the University. The rate is determined by creating a pool of benefit costs and dividing by the salary base per the requirements in OMB circular A-21. The federal rates are negotiated with the government in advance for a fiscal year and any over- or under-recovery is included as an adjustment in a subsequent rate proposal.

Costs in the Composite Benefit Rates include:

- UCRS (employer matching portion)
- Medical (employer contribution portion)
- Dental (employer contribution)
- Vision (employer contribution)
- OASDI (employer matching portion)
- Medicare (employer matching portion)
- OPEB (Other Post Employee Benefits)
- Unemployment Insurance
- Workers' Comp Insurance
- Employee Support Program
- UC Paid Disability
- UC Paid Life

Further information is available at http://afs.ucdavis.edu/our_services/costing-policy-e-analysis/composite-benefit-rates/

Travel

Itemize all travel requests separately by trip and justify in Exhibit B1, in accordance with University travel guidelines. Provide the purpose, destination, travelers (name or position/role), and duration of each trip. Include detail on airfare, lodging and mileage expenses, if applicable. Should the application include a request for travel outside of the state of California, justify the need for those out-of-state trips separately and completely.

A total of \$1,080 is budgeted over the study period to cover travel costs associated with implementing the study and presenting results. Travel to selected study sites, including sampling, and fish collection and transport (\$500.00). Travel costs associated with attending and presenting results conferences and workshops, by the graduate student researchers (\$580); including event registration, membership, accommodations, flights (as necessary), and out of pocket expenses.

Materials and Supplies

Itemize materials supplies in separate categories. Include a complete justification of the project's need for these items. Theft sensitive equipment (under \$5,000) must be justified and tracked separately in accordance with State Contracting Manual Section 7.29.

A total of \$20,654 is budgeted for materials and supplies needed to conduct exposures and experiments. Funds are requested to achieve the specific objectives listed in the project description: DNA Analyses (DNA extraction, Metabarcoding, sequencing); Invertebrate toxicological assessments and associated gene expression analyses; and general laboratory supplies.

Equipment

List each item of equipment (greater than or equal to \$5,000 with a useful life of more than one year) with amount requested separately and justify each.

University will not purchase equipment over \$5,000.

Consultant Costs

Consultants are individuals/organizations who provide expert advisory or other services for brief or limited periods and do not provide a percentage of effort to the project or program. Consultants are not involved in the scientific or technical direction of the project as a whole. Provide the names and organizational affiliations of all consultants. Describe the services to be performed, and include the number of days of anticipated consultation, the expected rate of compensation, travel, per diem, and other related costs.

N/A

Subawardee (Consortium/Subrecipient) Costs

Each participating consortium organization must submit a separate detailed budget for every year in the project period in Exhibit B2 Subcontracts. Include a complete justification for the need for any subawardee listed in the application.

N/A

Other Direct Costs

Itemize any other expenses by category and cost. Specifically justify costs that may typically be treated as indirect costs. For example, if insurance, telecommunication, or IT costs are charged as a direct expense, explain reason and methodology.

Graduate Student Tuition/Fees: \$13,419 towards tuition and fees for Ms. Sarah Stinson.

Rent

If the Scope of Work will be performed in an off-campus facility rented from a third party for a specific project or projects, then rent may be charged as a direct expense to the award.

N/A

Indirect (F&A) Costs

Indirect costs are calculated in accordance with the budgeted indirect cost rate in Exhibit B.

A total of \$27,077(57%) is budgeted for administrative overhead.

Exhibit B3 – Invoice Elements

Invoice and Detailed Transaction Ledger Elements

In accordance with Section 14 of Exhibit C – Payment and Invoicing, the invoice, summary report and/or transaction/payroll ledger shall be certified by the University's Financial Contact and the PI (or their respective designees).

Summary Invoice – includes either on the invoice or in a separate summary document – by approved budget category (Exhibit B) – expenditures for the invoice period, approved budget, cumulative expenditures and budget balance available²

- Personnel
- Equipment
- Travel
- Subawardee – Consultants
- Subawardee – Subcontract/Subrecipients
- Materials & Supplies
- Other Direct Costs
 - TOTAL DIRECT COSTS (if available from system)
- Indirect Costs
 - TOTAL

Detailed transaction ledger and/or payroll ledger for the invoice period³

- Univ Fund OR Agency Award # (to connect to invoice summary)
- Invoice/Report Period (matching invoice summary)
- GL Account/Object Code
- Doc Type (or subledger reference)
- Transaction Reference#
- Transaction Description, Vendor and/or Employee Name
- Transaction Posting Date
- Time Worked
- Transaction Amount

² If this information is not on the invoice or summary attachment, it may be included in a detailed transaction ledger.

³ For salaries and wages, these elements are anticipated to be included in the detailed transaction ledger. If all elements are not contained in the transaction ledger, then a separate payroll ledger may be provided with the required elements.

Exhibit D- Additional Requirements Associated with Funding Sources
(if applicable)

If the Agreement is subject to any additional requirements imposed on the funding State agency by applicable law (including, but not limited to, bond, proposition and federal funding), then these additional requirements will be set forth in Exhibit D. If the University is a subrecipient, as defined in 2 CFR 200 (Uniform Guidance on Administrative Requirements, Audit Requirements and Cost Principles for Federal Financial Assistance), and the external funding entity is the federal government, the name of the federal agency, the prime award number and date of prime award (if available), and the Catalog of Federal Domestic Assistance (CFDA) program number will be listed in Exhibit D. (Please see sections 10.A and 10.B of the Exhibit C.)

Agency (Required for federal funding source)	Prime Agreement Number/Date (if available)	If Federal, CFDA Number	Is prime award R&D? (yes/no)
United States Environmental Protection Agency	BG-00T11417-0		

Exhibit G – Negotiated Alternate UTC Terms (if applicable)

An alternate provision in Exhibit G must clearly identify whether it is replacing, deleting or modifying a provision of Exhibit C. The Order of Precedence incorporated in Exhibit C clearly identifies that the provisions on Exhibit G take precedence over those in Exhibit C.

While every effort has been made to keep the UTC as universal in its application as possible, there may be unique projects where a given term in the UTC may be inappropriate or inadequate. California Education Code §67327(b) allows for those terms to be changed, but only through the mutual agreement and negotiation of the State agency and the University campus. If a given term in the UTC is to be changed, the change should not be noted in Exhibit C, but rather noted separately in Exhibit G.

1. Harassment Free Workplace

The Department of Pesticide Regulation (DPR) is committed to providing a safe, secure environment, free from sexual misconduct. It is policy of the Department 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 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.

2. Rights in Data

The Parties agree that all data, plans, drawings, specifications, reports, computer programs, operating manuals, notes, and other written or graphic work submitted under Exhibit A in the performance of this Contract shall be in the public domain.

3. Indirect Costs

Overhead/Indirect Costs may not exceed 57% of the Modified Total Direct Cost.