

# Western IPM Center Grant Application Form

## Section A – Organization information

Name: Salt Lake City Mosquito Abatement District  
Address: 2215 N 2200 W  
Salt Lake City, UT 84116  
  
EIN: 87-6000451  
UEI: JA98SGHTFZN3

## Section B – Project Director Contact Information

Name: Michele Rehbein  
Job Title: Education Specialist  
email: michele@slcmad.org  
Phone Number: 801-355-9221

## Section C – Project information

Title: Adopting Integrated Pest Management for Mosquito Suppression at a Newly Operational State Correctional Facility within Wetland Habitats Surrounding the Great Salt Lake  
Requested Amount: \$26,515  
Performance Period: Begin Date: 03/01/23 End Date: 02/29/2024

## Section D – Certifications

### 1. Facilities and administrative rates (also known as indirect costs) included in this proposal have been calculated based on the following:

- ☐ Organization's federally negotiated F&A rate. A copy of the F&A Rate agreement will be requested if awarded funding.  
☐ The 30% of Total Costs (TC) F&A rate allowed under USDA NIFA.  
☐ de minimus rate of 10%. Please specify the rate basis: TC, TDC, MTDC, or other.  
☒ Other rate. Please specify the basis on which the rate has been calculated. Our organization does not charge facilities and administrative costs.

### 2. Human subjects ☒ Yes ☐ No

Subaward recipient certifies that if human subjects are involved in *this project*, subrecipient shall conduct the activities in accordance with the Department of Health and Human Services regulations codified at 45 CFR 46 - Protection of Human Subjects and obtain institutional review board approval of the planned involvement of human subjects in the project.

### 3. Animal subjects ☐ Yes ☒ No

Subaward recipient certifies that if animal subjects are involved in *this project*, subrecipient shall conduct the activities in accordance with the National Institutes of Health (NIH) "Principles for Use of Animals", the [Animal Welfare Act \(7 U.S.C. 2131 et. seq.\)](#) and all other applicable Federal laws, guidelines, and policies.

### 4. Does the project have potential impact – positive or negative – on the environment? ☐ Yes ☒ No

### 5. If project has a potential environmental impact, has an authorization or an environmental assessment (EA) or environmental impact statement (EIA) been performed? ☐ Yes ☒ No

### 6. Responsible and Ethical Conduct of Research ☒ Subaward recipient Certifies it is in Compliance

In accordance with sections 2, 3, and 8 of 2 CFR Part 422, institutions that conduct USDA-funded extramural research must foster an atmosphere conducive to research integrity, bear primary responsibility for prevention and detection of research misconduct, and maintain and effectively communicate and train their staff regarding policies and procedures. See <http://nifa.usda.gov/responsible-and-ethical-conduct-research> for further information.

### 7. Fraud, Waste, and Abuse ☒ Subaward recipient certifies it is in compliance

Subaward recipient may not require its employees, contractors, or subaward recipients seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting them from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

## Western IPM Center Grant Application Form

### 8. Debarment and Suspension

Is the project director or any other employee or student participating in *this project* debarred, suspended or otherwise excluded from or ineligible for participation in federal assistance programs or activities?

☐ Yes ☒ No If yes, please attach further explanation.

The subaward recipient certifies that they: (please answer all questions below)

- ☐ are ☒ are not presently debarred, suspended, proposed for debarment, or declared ineligible for award of federal contracts
- ☐ are ☒ are not presently being indicted, or otherwise criminally or civilly charged by a government entity
- ☐ have ☒ have not been convicted of or had a civil judgment rendered against them for commission of fraud or criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) contract of subcontract; violation of Federal or State antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property within three (3) years preceding this offer
- ☐ have ☒ have not had one or more contracts terminated for default by any federal agency within three (3) years preceding this offer

### Section E – Federal Funding Accountability and Transparency Act (FFATA)

#### 1. Primary place of performance (City, State, Nine Digit Zip code, Congressional District):

Salt Lake City, Utah 84116-1108, Congressional District 2

#### 2. Officers: **Check this box if the below does not apply** ☒

If selected for funding, recipient must provide the names and total compensation of each of the five most highly compensated officers for the calendar year in which the subaward will be awarded if both A and B apply.

- A. In the fiscal year proceeding the subaward, the subaward recipient received—
- 80 percent or more of its annual gross revenues in Federal Contracts (and subcontracts), loans, grants (and subgrants) and cooperative agreements; AND
  - \$25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and subgrants) and cooperative agreements.
- B. The public does not have any access to information about the compensation of the senior executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986.

### Section F – Audit and Financial Certification

#### 1. Audit Certification (Check one):

- ☐ **Subrecipient receives an annual audit in accordance with 2 CFR 200 Subpart F**

If awarded, the most recent audit results will be requested

- ☒ **Subrecipient does NOT receive an annual audit in accordance with 2 CFR 200 Subpart F and is Not a Federal Entity**

Subrecipient certifies that its financial system is in accordance with generally accepted accounting principles and:

- ☒ has the capability to identify, in its accounts, all Federal awards received and expended and the Federal programs under which they were received;
- ☒ maintains internal controls to assure that it is managing Federal awards in compliance with applicable laws, regulations and the provision of contracts or grants;
- ☒ complies with applicable laws and regulations;
- ☒ can prepare appropriate financial statements, including the schedule of expenditures of federal awards;
- ☒ there are no outstanding audit findings which would impact contract costs. If there are findings, submit a copy of the most recent report that describes the finding and steps to be taken to correct the finding.

What books of account are maintained?

General Ledger	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Cash Receipts Journal	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Project Cost Ledger	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Payroll Journal	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Cash Disbursements Journal	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			

UC ANR may require a limited-scope audit before a subaward can be issued.

- ☐ **Subrecipient is a Federal entity and does NOT receive an annual audit in accordance with A-133**

## Western IPM Center Grant Application Form

---

Section G – W-9 Form will be requested if the subaward recipient is funded

---

Section H – Organization Authorized Representative Signature

---

Signed and certified on behalf of the organization listed above:

A handwritten signature in blue ink, appearing to read 'Ary Faraji', is written over a large, empty oval space.

12/9/22

---

Authorized Organizational Representative

---

Date

Name: Ary Faraji, PhD  
Title: Executive Director  
Phone: 801-355-9221  
E-Mail: ary@slcmad.org



## Grants to support Integrated Pest Management

## Adopting Integrated Pest Management for Mosquito Suppression at a Newly Operational State Correctional Facility within Wetland Habitats Surrounding the Great Salt Lake

### 2023 Western Annual Grant Program

#### Adopting Integrated Pest Management for Mosquito Suppression at a Newly Operational State Correctional Facility within Wetland Habitats Surrounding the Great Salt Lake

**ID:** 409483

[Instructions for saving to PDF](#)

**Grant Type:** IPM Centers Grant

**Region:** Western

**Application Year:** 2023

**Status:** Submitted

**Applicant:** [Dr. Michele Rehbein](#)

Other

Education Specialist

Salt Lake City Mosquito Abatement District

[michele@slcmad.org](mailto:michele@slcmad.org)

2215 N 200 W

Salt Lake City, UT 84116

(w) (801) 355-9221

## Project Information

### Project Title

Adopting Integrated Pest Management for Mosquito Suppression at a Newly Operational State Correctional Facility within Wetland Habitats Surrounding the Great Salt Lake

### Center Priority Areas from the RFA

- Biological Control of Pests
- IPM for Indigenous, Insular and Isolated People
- IPM in New Places

### Project Start Date

March 1, 2023

### Project end date

February 29, 2024

### Project Type

Outreach and Implementation

### Total Dollar Amount Requested

\$26515

## **Proposal Form Uploads**

### **Grant Application Form**

[SLCMAD\\_23\\_applicationForm-1](#)

### **Current and Pending Support**

[WIPMC 2022\\_current\\_pending](#)

### **Conflict of Interest List**

[WIPMC 2022\\_conflict\\_of\\_interest](#)

## **Project Director Information**

### **Project Director Contact Information**

**Dr. Michele Rehbein**

### **Project Director State**

Utah

## Co Project Director List

Please select cooperating states

- Utah

Please provide a list of co Project Directors

**Dr. Ary Faraji**

**Dr. Greg White**

**Dr. Christopher Bibbs**



## Project Narrative

### Project Summary

This is an Outreach and Implementation project that will focus on an underserved community (an incarcerated population) located at the newly built Utah State Correctional Facility (USCF) surrounded by rural, remote, wetland habitats near the Great Salt Lake in Salt Lake City (SLC), Utah. The new USCF became operational in July 2022 and with the opening of the facility issues and concerns regarding mosquitoes became apparent. The local mosquito populations are a nuisance and health concern to inmates and correctional staff, who lack the proper preventive and protection measures at that location.

Through this project, the Salt Lake City Mosquito Abatement District (SLCMAD) aims to increase the adoption of Integrated Pest Management (IPM), primarily targeting mosquitoes, yet also aiding in reduction of other biting insects, in the prison facility by educating inmates and correctional staff in IPM. An educational program within the USCF will be created to educate inmates and staff about mosquitoes, mosquito-borne pathogens, IPM, and the wetland habitats surrounding the prison. As part of the education and implementation of IPM practices, a fish rearing program for the biological control of mosquitoes around the USCF will be implemented using the least chub, *Iotichthys phlegethontis*, a small, native fish species, endemic only to Utah. Vocational skills and supplemental training will be given to inmates through this education project to attempt to increase future career opportunities post-release.

Additionally, the final objective of this project is to share the outcomes and resources developed at this facility so other institutions have the opportunity to improve on, refine, and apply the lessons learned to their agencies. Our ultimate plan is to develop an IPM Best Management Practices (BMP) that can be used nationally at other locations with similar problems.

### Problem and Justification

The new USCF was built within SLC, Utah and completed in late spring 2022. The facility sits on 300 acres, has 32 buildings with a capacity to house approximately 3,600 inmates, plus a large number of staff who work at the prison each day (Kilpatrick 2022, UDC 2022). The USCF was constructed in the middle of remote, rural wetland habitats where six new miles of road were constructed in order to reach it.

The USCF is within the SLCMAD's jurisdictional boundary. Historically, SLCMAD has not conducted mosquito control applications in this location due to its remote distance from the city and because no housing nor human activity was prevalent at that location. However, now with 4,000+ people located there daily, there is a greater need for mosquito control to protect the health and well-being of inmates and correctional staff (Carlisle 2022). Not long after opening, phone calls, emails, and service requests to SLCMAD were received from staff and inmates (Harkins 2022a, Harkins 2022c). Members of Utah Prisoner Advocate Network (UPAN) also began to inquire about immediate plans to alleviate mosquito issues.

West Nile virus (WNV) is an arbovirus carried by mosquito species that are common in the SLC region (CDC 2022). A single adult mosquito trap located in the wetland habitats can collect upwards of 26,000 mosquitoes in a single night. In the 2022 season, 1,800,027 adult mosquitoes were collected and 98 WNV positive mosquito pools were detected within the SLCMAD boundary. There are now also residences, facilities, and businesses in places there never were before, like USCF, and are appearing in other rural and natural areas across the West and the country. In this case, concern of changing landscape and flooding around the USCF due to its location in a wetland is possible, not to mention that it has

also been observed in the past (Harkins 2022b). There is no protective corridor of other buildings; lands around USCF are owned by the National Audubon Society, private duck clubs, and agricultural farmlands, and mosquitoes now have 4,000+ human hosts to feed on.

This is a proposed Outreach and Implementation project that will educate inmates and USCF staff about IPM. Inmates will learn applicable IPM methods for the prison and community while gaining a sense of fulfillment and purpose. Vocational skills from this project will be learned to transfer to jobs once released; this has been demonstrated to lead to higher employment rates upon release in other studies (Cho and Tyler 2013, Nadkarni et al. 2022).

Mosquito fish, *Gambusia affinis*, are typically used as a biological control agent against mosquito larvae and often reared in mosquito abatement agencies and supplied to residents at no cost (Cassiano et al. 2021, Walton 2007). The mosquito fish is a non-native species that cannot be released into natural waterways or be situated at the USCF due to its location in the 100-year flood zone. However, the least chub, *Notichthys phlegethontis*, a native and state sensitive fish, is similar in size to mosquito fish and also eats mosquito larvae. Because the least chub is native, it would be possible to house it at the USCF. SLCMAD has a successful mosquito fish rearing program with a 2,000 ft<sup>2</sup> fish hatchery on site and dedicated staff that oversee the program. The experience and history of SLCMAD's fish program ensures the USCF's least chub program will be successful too. A project at the Salt Lake County jail showed success with a least chub rearing program in the past (Nadkarni et al. 2022).

This project will integrate into the regional overall IPM program and goals through the adoption of IPM in new places such as the USCF. However, this isn't limited to prisons, this applies to other large-scale operations housing and/or employing large quantities of people located in pest habitats or with pest issues. This benefits the incarcerated but also benefits others lacking accessibility to the outdoors, nature, and the environment. Examples include senior centers, military barracks, youth centers, and rehabilitation centers (Nadkarni et al. 2017). Other studies have observed that contact with nature is often identified as a positive health benefit and reduces stress and tension (Moran and Turner 2019). Inmates will be the primary learners of rearing fish for a mosquito biological control and USCF staff will also be involved, giving inmates and staff regular contact with a source of nature as correctional staff are equally likely to experience stress too, and give inmates responsibility to care for a living organism. Other organisms can be substituted for mosquitoes and fish and follow a similar structure to this project, examples include invasive plant species or working to conserve a threatened species, so, many facets of this project can be applicable in different ways.

The prison has a diverse population, with individuals coming from varying backgrounds and education levels. This project will provide inmates, which are a severely underserved population, opportunities to learn more about IPM, the environment, gain long lasting skills, and have opportunities to contribute to the community beyond prison walls (Little 2015). This project integrates into SLCMAD's overall IPM program through learning best practices that benefit a large-scale operation and improve on educating and engaging large groups of individuals affected by mosquitoes in a safe, effective way. This will ultimately add to SLCMAD's overall plan to develop an IPM BMP to be used on a national level with other institutions with similar issues.

Additionally, this project addresses the Western IPM Center priorities including IPM for insular and isolated people, IPM in changing landscapes, IPM culture and capacity, IPM in new places, biological control of pests, and urban pest management. This project will reach inmates and correctional staff, and the friends, relatives, neighbors, colleagues, and more of those directly involved. The Western IPM Center states it engages a broad diversity of stakeholders for IPM research, education, and extension for pest management in all settings, and this proposed project will most certainly reach those in a more underserved and neglected setting when it comes to pest and mosquito management.

## Project Objectives

1. The primary objective of the proposed project is to increase awareness and adoption of IPM among the newly operational USCF with USCF inmates and staff.
  1. This objective will include educating and training USCF inmates and staff on IPM.
  2. SLCMAD has had discussions with USCF staff about recommendations to manage mosquito populations previously. Through this proposed project, the USCF and SLCMAD will put into action many of these recommendations while also refining them.
  3. Additionally, this objective will include introducing inmates and staff to rearing the least chub, a native fish species to Utah. The least chub will be used as a biological control agent against mosquitoes and begin the initial stages of a fish rearing program at the new USCF.
  4. Conservation of a sensitive fish species, endemic only to Utah, will also be completed through the use of the least chub in this project instead of an invasive fish species (mosquito fish) which is a better IPM practice.
2. The second objective is to develop vocational skills of inmates through this project.
  1. The project will attempt to supplement and provide experience and knowledge to inmates with vocational and technical skills that will transfer to future career opportunities once released.
  2. This will increase individuals with capabilities to conduct and provide IPM, with opportunities to obtain their own pesticide licenses.
  3. Using the least chub as a biological control agent also exposes inmates to science and IPM, therefore training and educating them on other science-based fields, fostering a further opportunity for success in placement of a job or continued education.
3. The third objective of the proposed project is to share the outcomes and resources developed from this project with others.
  1. This will allow those within and outside of SLC, Utah, and the Western region to apply, build on, and improve what was designed and learned throughout this project to add to or better fit with their own organization.
  2. The IPM, biological, and environmental component of this project is applicable to many other facilities that house individuals and can provide a stronger sense of connection to nature, while encouraging increased awareness and adoption of IPM practices.

## Procedures

*Objective 1:* Increase awareness and adoption of IPM among the new USCF including inmates and correctional staff.

The project procedures will be reviewed and approved either internally or by the Utah Department of Corrections Institutional Review Board. Under the guidance of USCF, SLCMAD will work with correctional staff to implement educational presentations to USCF inmates and staff on mosquitoes, IPM, and prevention and protection against mosquitoes. Before any education or training is conducted, an anonymous survey will be asked to be completed by inmates participating in this project to get baseline information and initial characterization of demographics, general

education levels, knowledge of mosquitoes, and protection/prevention methods of mosquitoes. This initial information will later be compared with a post evaluation distributed to participants after IPM and educational training. Surveys of UPAN members may also be collected to compare responses of individuals outside the prison facility to those inside.

Through survey software (i.e., SurveyMonkey) the anonymous surveys pre and post provided education and training will be analyzed to determine what impacts the program had on inmates and staff. Survey questions will be randomly ordered and will include questions that have been used in previous studies and will also be expanded to include those specifically related to this proposed project. Below are examples of survey questions (Nadkarni et al 2022) that will be included, but are not limited to:

1. Only highly trained scientists can understand science. 1 = strongly disagree...5 = strongly agree.
2. Only highly trained scientists can conduct scientific work. 1 = strongly disagree...5 = strongly agree.
3. When I leave prison, I would prefer a job that helps to protect the natural environment. 1 = strongly disagree...5 = strongly agree.
4. Even though I am in prison, it is important to me to contribute to the outside community if I can. 1 = strongly disagree...5 = strongly agree.
5. Science helps me in my daily life. 1 = strongly disagree...5 = strongly agree.
6. I can contribute to science. 1 = strongly disagree...5 = strongly agree.
7. I know how to protect myself against mosquitoes. 1 = strongly disagree...5 = strongly agree.

*Objective 2:* Develop inmate's vocational skills through this project.

SLCMAD will require assistance from USCF staff to recruit inmates who want to participate in this project. Inmates in general population and those who qualify for work, programming, and education opportunities will have the opportunity to participate. Educational presentations will include basic mosquito biology, mosquito life cycle, mosquito-borne diseases, IPM methods, personal protective measures against mosquito bites, and more. Correctional staff and inmates will learn how to appropriately protect themselves against mosquitoes such as provision of clothing to cover up exposed skin, how to properly apply insect repellent, and check for standing water, among other simple yet effective actions to take. For interested inmates, study materials and resources can be made available to obtain their pesticide license.

Additional training will be given for those inmates and staff participating in the fish rearing program. This will include husbandry and rearing information of the least chub and an overview of the fish program through presentations and hands-on training. Inmates will participate in the setup, maintenance, and routine care of the fish. Least chub fry will be reared in hard shell pond liners and transferred to larger plastic livestock troughs when mature; these will be sheltered in a structure on USCF property. The old USCF property had education program facilities already constructed (i.e., a greenhouse), however, with the recent prison move, no structures exist yet related to education and inmate involvement. The fish rearing program will supply biological control agents against mosquitoes at the USCF. The fish will be placed in the moat surrounding the prison's property and can be used in their catch basins to reduce mosquito larvae. In the long term, the fish rearing program will additionally be used to supply fish to residents within the SLCMAD jurisdictional boundary.

Mosquito surveillance traps will be placed on USCF property to routinely track mosquito species and numbers throughout the mosquito season. Mosquito collection data from the surveillance traps will be shared with inmates and staff involved in the project. Mosquito traps may not be available for direct use by inmates to avoid various trap parts being used

inappropriately and for safety purposes. However, sharing these data will encourage staff and inmates to continue learning about mosquito control and IPM and applying the information.

*Objective 3:* Share the outcomes and resources developed from this project with others inside and outside the Western region.

Among procedures of this project, educational materials and resources will be developed. These resources, such as presentations, will be made public for others to adopt to their programs or use as a basis to develop a new program.

Through survey software used, such as SurveyMonkey, surveys collected will be evaluated to compare pre and post education and determine any trends among inmates and staff. This information will be used to improve the education program at the USCF and for other institutions to use.

## Outputs

This project will benefit more than the USCF and SLCMAD; it will provide information and resources for other organizations across the Western region with pest management concerns and those seeking to adopt IPM methods such as other rehabilitation centers, military bases, youth centers, and senior centers. The skeleton of this project is also applicable to those mentioned above and many other institutions that could benefit from a more robust connection with nature and the environment.

This project will contribute to publication in peer reviewed journals, future grant proposals, attending conferences and professional presentations, and sharing the fish program and what was learned with peers as well as the creation of specific education presentations for non-scientists. Training materials will be created for this project that will be shared, an addition to the scientific community will be made through adopting IPM, and sharing IPM with other members of the community through relatives of inmates and correctional staff, and information about this project will also be shared through local media outlets to the public.

## Outcomes

Overall, this project will contribute to the goals of the Western IPM Center through adopting IPM in new places, strengthening networks and institutions promoting IPM, promoting IPM for underserved communities, using a biological control, and promoting the safe use of IPM methods. This project will also have an economic benefit on tax payers of SLC; the source of revenue for SLCMAD. Funds from this grant and implementation of this project will reduce the amount of tax payers' money going towards mosquito control at the USCF (a state not local facility) if an effective and robust IPM program is developed within USCF, reducing SLCMAD's time and money in this location. This will allow SLCMAD to focus its work and personnel to serve other regions within its jurisdictional boundary that are also in need of IPM.

Concurrently, this project will develop a stronger working relationship between the SLCMAD, the USCF, UPAN, the community, scientists, and other advocacy groups (both human and environmental).

An underserved population (the incarcerated) will be the primary beneficiaries from this project, including the community that is connected to this population (i.e., UPAN, family, friends). This project will provide needed relief from mosquitoes and other biting insects while providing technical skills to inmates that can be applied to jobs once released. This project will offer inmates an opportunity to give back to the community through a fish rearing program while providing inmates responsibility and boosting morale, leading to lower rates of recidivism.

The correctional staff will also positively benefit from the proposed project through learning IPM to obtain long lasting skills to assist with mosquito and biting insect issues at the USCF. These skills and strategies can be improved over time to determine what works best for the USCF, the population there, and other pests of major concern. The least chub

rearing program will also be a long-term biological control agent for the prison to use on their facility property. Working with the least chub also supplements the important conservation work of a native and sensitive fish species found only in Utah.

The collection of mosquitoes and recording mosquito surveillance and WNV detection data will also be an outcome. Through understanding the species composition near and surrounding the USCF allows all parties involved to determine the best course of IPM action. The initial stages, progress, and other outcomes of this project will be shared with the public through SLCMAD's networking (presentations at community councils and professional meetings) and local media outlets. Sharing the progress of this project will not only encourage others in the scientific and non-scientific community to adopt IPM strategies, but also encourage their curiosity to learn more about IPM and protection measures they can effectively take against mosquitoes and other biting insects.

## **Cooperation of Key Personnel and Institutional Units Involved**

### Institutional Units Involved

*Salt Lake City Mosquito Abatement District* is the lead organization for this project. It is a special service district with the goal of protecting human and animal health through reduction of mosquitoes and mosquito-borne diseases using Integrated Mosquito Management methods.

*Utah State Correctional Facility* will be the primary institution this project will be located. Inmates and correctional staff will be educated and trained on IPM.

*Utah Prisoner Advocate Network* is a nonprofit outreach organization that advocates for better conditions inside Utah prisons and jails. They will help connect and support inmates, USCF, and SLCMAD.

### Key Personnel

*Michele Rehbein, PhD – Principal Investigator/Project Director:* Responsible for overseeing the day-to-day activities of the project, producing and executing outreach and education, and preparing final reports.

*Ary Faraji, PhD – Co-Project Director:* Assist with coordination and communication between institutions involved and editing final reports.

*Greg White, PhD – Co-Project Director:* Assist with coordination and communication between institutions involved, assist with final reports and evaluating outcomes.

*Christopher Bibbs, PhD – Co-Project Director:* Assist with education and outreach development and/or presentations, assist with final reports and evaluating outcomes.

*Brad Sorensen – Collaborator:* Assist with the setup of the fish program at the USCF.

*Shawn Anderson – Collaborator:* Assist with security clearance and communication of staff and inmates at USCF for the IPM/education programs.

*Karen Thompson – Collaborator:* Liaison of UPAN with SLCMAD, USCF, and inmates.

## **Literature Cited**

1. Beehler A, Bennett, Brown D, DeChant P, Faraji A, Fredregill C, Gordon J, Irwin, Greiner Safi P, Markowski D, Qualls W. 2021. Best Practices for Integrated Mosquito Management. American Mosquito Control Association. Sacramento, CA.  
[https://cdn.ymaws.com/www.mosquito.org/resource/resmgr/docs/publications/hr\\_november\\_2021\\_amca\\_bmp\\_ma.pdf](https://cdn.ymaws.com/www.mosquito.org/resource/resmgr/docs/publications/hr_november_2021_amca_bmp_ma.pdf)

2. Cassiano EJ, Hill J, Tuckett Q, Watson C. 2021. Eastern mosquitofish, *Gambusia holbrooki*, for control of mosquito larvae. University of Florida, IFAS Extension. Available from: <https://edis.ifas.ufl.edu/publication/FA202>.
3. Carlisle N. 2022. Workers worry Utah's new billion dollar prison isn't safe. Available from: <https://www.fox13now.com/news/fox-13-investigates/workers-worry-utahs-new-billion-dollar-prison-isnt-safe>.
4. Centers for Disease Control and Prevention (CDC). 2022. West Nile Virus. Available from: <https://www.cdc.gov/westnile/index.html>.
5. Cho RM, Tyler JH. 2013. Does prison-based adult basic education improve post release outcomes for male prisoners in Florida? *Crime Delinq* 59:915-1005. <https://doi.org/10.1177/0011128710389588>.
6. Harkins P. 2022a. Inmates 'getting eaten alive' by insects at new Utah prison. Officials knew it could happen, records show. Available from: <https://www.sltrib.com/news/2022/11/22/inmates-getting-eaten-alive-by/>.
7. Harkins P. 2022b. Location of new state prison pits safety of inmates against the future of Great Salt Lake wildlife. Available from: <https://www.sltrib.com/news/2022/11/29/new-utah-prison-clash-between/>.
8. Harkins P. 2022c. 3 things to know about the mosquito problem at the new Utah prison. Available from: <https://www.sltrib.com/news/2022/12/08/3-things-know-about-mosquito/>.
9. Kilpatrick C. 2022. New Utah state prison set for a spring completion. Available from: <https://www.enr.com/articles/53846-new-utah-state-prison-set-for-a-spring-completion>.
10. Little PC. 2015. Sustainability science and education in the neoliberal ecoprison. *Environ Educ Res* 21:365-377. <http://dx.doi.org/10.1080/13504622.2014.994169>.
11. Moran D, Turner J. 2019. Turning over a new leaf: The health-enabling capacities of nature contact in prison. *Soc Sci Med* 231:62-69. <https://doi.org/10.1016/j.socscimed.2018.05.032>.
12. Nadkarni NM, Chen JM, Morris JS, Carrierio AE, Kaye TN, Bush K, Young M, George L. 2022. Impacts of conservation activities on people who are incarcerated: A case study based on qualitative and quantitative analyses. *Ecol Soc* 44:<https://doi.org/10.5751/ES-13423-270344>.
13. Nadkarni NM, Hasbach PH, Thys T, Crockett EM, Schnacker L. 2017. Impacts of nature imagery on people in severely nature-deprived environments. *Front Ecol Environ* 15:395-403. <https://doi.org/10.1002/fee.1518>.
14. Utah Department of Corrections (UDC). 2022. Utah state correctional facility. Available from: <https://corrections.utah.gov/utah-state-correctional-facility/>.
15. Walton WE. 2007. Larvivorous fish including *Gambusia*. *J Am Mosq Control Assoc* 23:184-220. [https://doi.org/10.2987/8756-971X\(2007\)23\[184:LFIG\]2.0.CO;2](https://doi.org/10.2987/8756-971X(2007)23[184:LFIG]2.0.CO;2).

## Biosketches

### Project Director

**Name:** Michele Rehbein, Ph.D., C.A.E.

**Position Title:** Education Specialist

**Organizational Affiliation:** Salt Lake City Mosquito Abatement District

**Email:** michele@slcmad.org

**Work phone:** 801-355-9221, **Cell phone:** 630-272-2103

### EDUCATION AND TRAINING

2010	A.A.	College of DuPage	Liberal Arts and Sciences
2013	B.S.	Western Illinois University	Biology, Zoology Option
2016	M.S.	Western Illinois University	Biology, Microbiology Option
2020	Ph.D.	WIU, Institute for Environmental Sciences	Environmental Science

### EXPERIENCE

2022—Present	Education Specialist, SLC Mosquito Abatement District, SLC, UT
2021—2022	District Manager, Moab Mosquito Abatement District, Moab, UT
2016—2020	Ph.D. Candidate/Research Assistant, Institute for Environmental Studies, WIU, Moline, IL and Franklin Grove, IL
2019	Director of Ruth Edwards Nature Center and Museum, Dixon Park District, Dixon, IL
2017	Microbiology Tutor, Adventure Works, DeKalb, IL
2015—2016	Teaching Assistant, Dept. of Biological Sciences, WIU, Macomb, IL
2014—2016	Graduate Researcher/Graduate Assistant, Department of Biological Sciences, WIU, Macomb, IL
May—June 2015	Environmental Health Intern, McDonough County Health Department, Macomb, IL
2013	Wildlife Rehabilitator, Willowbrook Wildlife Center, Glen Ellyn, IL
May—June 2012	Wildlife Rehabilitator Intern, Willowbrook Wildlife Center, Glen Ellyn, IL
May—Aug. 2012,	Student Department of Safety and Environmental Affairs Team Member,
2011	S&C Electric Company, Chicago, IL

### HONORS AND AWARDS

2020—2025	Certified Associate Ecologist (CAE), Ecological Society of America
Summer, 2020	River Action Eddy Scholarship
2020	River Action Eddy Award Nominee
Fall, 2019	Quad Cities Conservation Alliance Scholarship
2019	Graduate Student Research and Professional Development Fund Recipient



Spring, 2019	Quad Cities Conservation Alliance Scholarship
2016	Graduate Student Research and Professional Development Fund Recipient
2016	3rd Place Best Poster Presentation, Graduate Research Conference, WIU
2015	2nd Place Best Oral Presentation, Illinois Mosquito and Vector Control Association (IMVCA)
2015—2016	University Women's Scholarship Recipient
2015—2016	Women in Science, Technology, Engineering, and Mathematics Research and Scholarly Activities Scholarship Recipient
2015—2016	Women in Science, Technology, Engineering, and Mathematics Research and Scholarly Activities Travel Award Recipient
2015	Student Sustainability Research and Project Development Fund Recipient
2015	2nd Place Best Oral Presentation, Emerging Infectious Diseases Conference
2015	National Environmental Justice Conference Youth/Emerging Leaders Award Recipient
2010	College of DuPage Honors Graduate

## GRANTS AWARDED

1. "Management of the Invasive *Aedes aegypti* Mosquito in Moab, Utah through an Integrated Pest Management Approach Highlighting Educational Campaigns and Citizen Science Involvement." Western IPM Center Outreach and Implementation Grant 2022, Western IPM Center, M. Rehbein (PI), \$49,990.
2. "Identification of *Culex* and *Aedes* Mosquito Microbiomes from Wetland and Lower Order Stream Habitats." Nachusa Grasslands Scientific Research Grant 2019, the Nature Conservancy, M. Rehbein (PI), R. Viadero (CoPI), \$5,561.
3. "Identification of *Culex* and *Aedes* Mosquito Microbiomes from Wetland and Lower Order Stream Habitats." Nachusa Grasslands Scientific Research Grant 2018, the Nature Conservancy, M. Rehbein (PI), R. Viadero (CoPI), \$3,170.

## SYNERGISTIC ACTIVITIES

Since 2014 I have been studying and conducting research involving mosquitoes. I have collaborated with local health departments across rural west-central IL on mosquito surveillance projects and conducted my dissertation research in north-central IL on The Nature Conservancy property called Nachusa Grasslands Preserve. This was the first of its kind mosquito research on the property and contributed to the Preserve's overall scientific research and insect inventory. I received funding for my dissertation research from the Friends of Nachusa Grasslands for that research. Previously I was the manager at the Moab Mosquito Abatement District and received funds through the Western IPM Center for a citizen science project and educational outreach campaign focusing on the invasive *Aedes aegypti* mosquito in Moab, UT. I have participated in the Moab Festival of Science and was invited to present at Science Moab's Science on Tap program in 2022. I am still involved with Science Moab, a non-profit science organization, and am a scientist mentor with their

School to Science program. In the past I served as Director of the Dixon Park District Nature Center and conducted multiple environmental outreach programs for all ages and have mentored and tutored undergraduate students. I am a member of the Utah Mosquito Abatement Association, American Mosquito Control Association, 500 Women Scientists, Grassroots Leaders Network of Southern Utah Wilderness Alliance, Ecological Society of America, and Soil and Water Conservation Society. I have served on the Moab Festival of Science Planning Committee in 2021 and the Upper Mississippi River Conference and Hydropower Potential on the Mississippi River Conference organizing and planning committees in 2017. I have participated in both verbal and poster presentations at various conferences on the local and national level to discuss and share my research.

## PUBLICATIONS

1. Hunt, J.R., Rehbein, M.M, Viadero, R.C., Miller, CL. 2022. Distribution of *Aedes* mosquitoes in western Illinois, 2014-2018: First Records for *Aedes japonicus* and *Aedes albopictus*. *J Am Mosq Control Assoc*, (under review).
2. Rehbein, M.M. and R. Viadero. 2021. A new record of *Uranotaenia sapphirina* and *Aedes japonicus* in Lee and Ogle Counties, Illinois. *J Am Mosq Control Assoc*, 37(4): 280-282. <https://doi.org/10.2987/21-6994>.

## TECHNICAL PUBLICATIONS

1. Rehbein, M. 2019. Identification of mosquito microbiomes in wetland and low order streams. Friends of Nachusa Grasslands Annual Report. Nachusa Grasslands Preserve, Franklin Grove, IL. Project dates: May—December 2018.
2. Rehbein, M. 2020. Mosquitoes of wetland and low order streams: Identification of mosquito hosts through genetic sequencing and influential abiotic factors of north-central Illinois. Friends of Nachusa Grasslands Annual Report. Nachusa Grasslands Preserve, Franklin Grove, IL. Project dates: May—December 2019.

## Co Project Director (1)

**Name:** Ary Faraji, Ph.D.

**Position Title:** Executive Director

**Organizational Affiliation:** Salt Lake City Mosquito Abatement District

**Role:** Co-PI

**Email:** ary@slcmad.org

**Work phone:** 801-355-9221

## EDUCATION AND TRAINING

2000	BS	University of La Verne	Double major in Biology and Theology
2005	MSc	Rutgers University	Entomology
2014	PhD	Rutgers University	Entomology

### 1. Personal Statement

I have been passionate about entomology since a very young age and have collected insects from all over the globe during the past 30 years. My passion for entomology culminated in my first applied position as a Seasonal Vector Ecologist during 1998, working directly with mosquito surveillance and control techniques. I have pursued these interests

in my academic and professional careers and have tried to combine applied research into real-world scenarios to better understand the biology and ecology of disease vectors, and to determine improved techniques for surveillance and control of mosquitoes and mosquito-borne diseases. I have been fortunate to have recently worked on the first USDA-funded area-wide project for the invasive Asian tiger mosquito (*Aedes albopictus*), where I could further utilize my interests and expertise to enhance new control and surveillance tools.

## 1. Positions and Honors

1998-1999 Assistant Vector Ecologist, San Gabriel Valley Mosquito Control District, San Gabriel, CA

2000-2003 Vector Surveillance Coordinator, Mosquito Research & Control, Rutgers University, New Brunswick, NJ

2003-2014 Superintendent/Entomologist, Mercer County Mosquito Control, Trenton, NJ

2014-present Executive Director/Entomologist, Salt Lake City Mosquito Abatement District, Salt Lake City, UT

2014-present Adjunct Asst. Professor, School of Biological Sciences, University of Utah, Salt Lake City, UT

2016-present Contractor, Intergovernmental Personnel Act, US Department of Health and Human Services, Centers for Disease Control and Prevention, Division of Vector Borne Diseases, Arbovirus Diseases Branch, Ft. Collins, CO

## 1. Contributions to Science (Selected Publications)

1. Su, T; Theime, J; White, GS; Lura, T; Mayerle, N; Faraji, A; Cheng, ML; Brown, MQ. 2018. High resistance to *Bacillus sphaericus* and susceptibility to other common pesticides in *Culex pipiens* (Diptera: Culicidae) from Salt Lake City, UT. *Journal of Medical Entomology*. Published online: 1 November 2018.
2. Unlu, I; Faraji, A; Williams, GM; Marcombe, S; Fonseca, DM; Gaugler, R. 2018. Truck-mounted area[1]wide applications of larvicides and adulticides for extended suppression of adult *Aedes albopictus*. *Pest Management Science*. Published online: 2 October 2018.
3. Egizi, A; Martinsen, ES; Vuong, H; Zimmerman, KI; Faraji, A; Fonseca, DM. 2018. Using bloodmeal analysis to assess disease risk to wildlife at the new northern limit of a mosquito species. *EcoHealth*. 15(3): 543-554.
4. Egizi, A; Roegner, V; Faraji, A; Healy, SP; Schulze, TL; Jordan, RA. 2017. A historical snapshot of *Ixodes scapularis*-borne pathogens in New Jersey ticks reflects a changing disease landscape. *Ticks and Tick-Borne Diseases*. 9(2): 418-426.
5. Krow-Lucal, ER; Novosad, SA; Dunn, AC; Brent, CR; Savage, HM ; Faraji, A ; Peterson, D ; Dibbs, A ; Vietor, B ; Christensen, K ; Laven, JJ; Godsey, MS; Christensen, B; Beyer, B; Cortese, MM; Johnson, NC, Panella, AJ; Biggerstaff, BJ; Rubin, M; Fridkin, SK; Staples, JE; Nakashima, AL. 2017. Zika virus infection in patient with no known risk factors, Utah, USA, 2016. *Emerging Infectious Diseases*. 23(8): 1260-1267.
6. Unlu, I; Suman, DS; Wang, Y; Klinger, K; Faraji, A; Gaugler, R. 2017. Effectiveness of autodissemination stations containing pyriproxyfen in reducing immature *Aedes albopictus* populations. *Parasites and Vectors*. 10(139).

7. Unlu, I; Faraji, A; Morganti, M; Vaeth, R; Akaratovic, K; Kiser, J; Abadam, C; Kline, D. 2017. Reduced performance of a PVC-coated Biogents Sentinel prototype in comparison to the original Biogents Sentinel for monitoring the Asian tiger mosquito, *Aedes albopictus*, in temperate North America. *PLoS One*. 12(3): e0172963.
8. Barker, CM; Collins, CE; Conlon, JM; Connelly, CR ; Debboun, M ; Dormuth, E ; Faraji, A ; Fujioka, KK ; Lesser, CR ; Michaels, SR ; Schankel, B; Smith, K; Unlu, I; White, BW. 2017. Best Practices for Integrated Mosquito Management: A Focused Update. American Mosquito Control Association. Technical Report. Pages 1-58.
9. Rochlin, I., Faraji, A., Ninivaggi, D., Barker, C.M., and Kilpatrick, A.M. 2016. Anthropogenic impacts on mosquito populations in North America over the past century. *Nature Communications*. 7:13604.
10. Brent, C., Dunn, A., Savage, H., Faraji, A., Rubin, M., Risk, I., Garcia, W., Cortese, M., Novosad, S., Krow-Lucal, E.R., Crain, J., Hill, M., Atkinson, A., Peterson, D., Christensen, K., Dimond, M., Staples, J.R., and Nakashima, A. 2016. Preliminary findings from an investigation of Zika virus infection in a patient with no known risk factors – Utah, 2016. *Morbidity and Mortality Weekly Report*. 65(36): 981-982.
11. Faraji, A. and Unlu, I. 2016. The eye of the tiger, the thrill of the fight: effective larval and adult control measures against the Asian tiger mosquito, *Aedes albopictus*, in North America. *Journal of Medical Entomology*. 53(5): 1029-1047.
12. Faraji, A., Healy, S., Unlu, I., Crans, S., Wang, Y., and Gaugler, R. 2016. Droplet characterization and penetration of an ultra-low volume mosquito adulticide spray used targeting the Asian tiger mosquito, *Aedes albopictus*, within urban and suburban environments of northeastern USA. *PLoS One*. 11(4): e0152069.
13. Faraji, A. and Gaugler, R. 2015. Experimental host preference of diapause and non-diapause induced *Culex pipiens pipiens* (Diptera: Culicidae). *Parasites and Vectors*. 8:389.

## Co Project Director (2)

**Name:** Greg White, Ph.D.

**Position Title:** Assistant Director

**Organizational Affiliation:** Salt Lake City Mosquito Abatement District

**Role:** Co-PI

**Email:** greg@slcmad.org

**Work phone:** 801-355-9221

## EDUCATION AND TRAINING

2005	B.S.	Utah State University	Biology with a Cellular & Molecular Emphasis
2010	Ph.D.	University of Alabama	Microbiology

## 1. Personal Statement

I have expertise in conducting mosquito control research and helping carry out the day to day operations of successful mosquito control work. I have a broad background in the study of virus transmission by mosquitoes and pesticide efficacy and resistance. I have worked in the mosquito control field in three different states and have had exposure to many different research methods and control methods.

## 1. Positions and Honors

2008 – 2010 Senior Scientist; Divisions of Global Health, University of South Florida, Tampa, FL

2010 – 2016 Vector Ecologist; Coachella Valley Mosquito and Vector Control District, Indio, CA

2016 – present Assistant Director; Salt Lake City Mosquito Abatement District, Salt Lake City, UT

2022 – present Adjunct Assistant Professor, College of Biology, Utah State University, Logan, UT

## 1. Contributions to Science (Selected Publications)

1. Rochlin I., **White G.**, Reissen N, Martheswaran, T, Faraji A. Effects of aerial adulticiding for mosquito management on nontarget insects: A Bayesian and community ecology approach. *Ecosphere*. 2022 Jan; *13*(1)
2. Kim D, DeBriere TJ, Cherukumalli S, **White GS**, Burkett-Cadena ND. Infrared light sensors permit rapid recording of wingbeat frequency and bioacoustic species identification of mosquitoes. *Scientific Reports*. 2021 May 11; *11*(1):1-9.
3. Yee DA, Dean C, Webb C, Henke JA, Perezchica-Harvey G, **White GS**, Faraji A, Macaluso JD, Christofferson R. No Evidence That Salt Water Ingestion Kills Adult Mosquitoes (Diptera: Culicidae). *J Med Entomol*. 2020 Oct 20
4. Aldridge RL, Britch SC, Linthicum KJ, Golden FV, Dao TT, Rush MJE, Holt K, **White G**, Gutierrez A, Snelling M. Pesticide Misting System Enhances Residual Pesticide Treatment of HESCO Geotextile. *J Am Mosq Control Assoc*. 2020 Mar; *36*(1):43-46
5. Chaves LF, Reissen N, **White GS**, Gordon S, Faraji A. Trap Comparison for Surveillance of the Western Tree Hole Mosquito (Diptera: Culicidae). *J Insect Sci*. 2020 Jan 1; *20*(1):3. doi: 10.1093/jisesa/iez131. Erratum in: *J Insect Sci*. 2020 Jan 1; *20*(1)
6. Su T, Thieme J, **White GS**, Lura T, Mayerle N, Faraji A, Cheng ML, Brown MQ. High Resistance to *Bacillus sphaericus* and Susceptibility to Other Common Pesticides in *Culex pipiens* (Diptera: Culicidae) from Salt Lake City, UT. *J Med Entomol*. 2019 Feb 25; *56*(2):506-513.
7. **White GS**, Symmes K, Sun P, Fang Y, Garcia S, Steiner C, Smith K, Reisen WK, Coffey LL. Reemergence of St. Louis Encephalitis Virus, CA 2015. *Emerg Infect Dis*. 2016 Dec; *22*(12):2185-2188.
8. Aldridge RL, Britch SC, Snelling M, Gutierrez A, **White G**, Linthicum KJ. Passive baited sequential filth fly trap. *J Am Mosq Control Assoc*. 2015. Sep; *31*(3):278-82.
9. Healy JM, Reisen WK, Kramer VL, Fischer M, Lindsey NP, Nasci RS, Macedo PA, **White G**, Takahashi R, Khang L, Barker CM. Comparison of the efficiency and cost of West Nile virus surveillance methods in California. *Vector Borne Zoonotic Dis*. 2015 Feb; *15*(2):147-55.
10. Bingham AM, Graham SP, Burkett-Cadena ND, **White GS**, Hassan HK, Unnasch TR. Detection of eastern equine encephalomyelitis virus RNA in North American snakes. *Am J Trop Med Hyg*. 2012 Dec; *87*(6):1140-4. doi: 10.4269/ajtmh.2012.12-0257.
11. Graham SP, Hassan HK, Chapman T, **White G**, Guyer C, Unnasch TR. Serosurveillance of eastern equine encephalitis virus in amphibians and reptiles from Alabama, USA. *Am J Trop Med Hyg*. 2012 Mar; *86*(3):540-4.

12. Britch SC, Linthicum KJ, Wynn WW, Aldridge RL, Walker TW, Farooq M, Dunford JC, Smith VL, Robinson CA, Lothrop BB, Snelling M, Gutierrez A, Wittie J, **White G**. Longevity and efficacy of bifenthrin treatment on desert-pattern US military camouflage netting against mosquitoes in a hot-arid environment. *J Am Mosq Control Assoc*. 2011 Sep;27(3):272-9.
13. Burkett-Cadena ND, **White GS**, Eubanks MD, Unnasch TR. Winter biology of wetland mosquitoes at a focus of eastern equine encephalomyelitis virus transmission in Alabama, USA. *J Med Entomol*. 2011 Sep;48(5):967-73.
14. **White G**, Ottendorfer C, Graham S, Unnasch TR. Competency of reptiles and amphibians for eastern equine encephalitis virus. *Am J Trop Med Hyg*. 2011 Sep;85(3):421-5.
15. **White GS**, Pickett BE, Lefkowitz EJ, Johnson AG, Ottendorfer C, Stark LM, Unnasch TR. Phylogenetic analysis of eastern equine encephalitis virus isolates from Florida. *Am J Trop Med Hyg*. 2011 May;84(5):709-17.
16. Ottendorfer CL, Ambrose JH, **White GS**, Unnasch TR, and Stark LM. 2009. Isolation of genotype V St. Louis encephalitis virus in Florida. *Emerg Infect Dis*. 15(4): 604-6.

### Co Project Director (3)

**Name:** Christopher S. Bibbs, Ph.D.

**Position Title:** Laboratory Director

**Organizational Affiliation:** Salt Lake City Mosquito Abatement District

**Role:** Co-PI

**Email:** chris@slcmad.org

**Work phone:** 801-355-9221

### EDUCATION AND TRAINING

2010	A.A.	Gulf Coast State College	Pre-Entomology
2012	B.S.	University of Florida	Entomology
2014	M.S.	University of Arizona	Entomology
2019	Ph.D.	University of Florida	Entomology; Public Health and Toxicology

### EXPERIENCE

2022—Present	Laboratory Director, SLC Mosquito Abatement District, SLC, UT
2019—2022	Product Development Specialist/Entomologist, Central Life Sciences, Dallas, TX
2014—2019	Biologist, Anastasia Mosquito Control District, St. Augustine, FL
2014—2016	Education Specialist, Anastasia Mosquito Control District, St. Augustine, FL
2012—2014	Specialist, Entomology/Parasitology, University of Arizona, Tucson, AZ
2010—2012	Departmental Outreach Assistance, University of Florida, Gainesville, FL
2006—2010	Pharmacy Technician, Bay Medical Center, Panama City, FL

### HONORS AND AWARDS

2019	Hollandsworth Prize, 85 <sup>th</sup> Annual AMCA Student Paper Competition
------	-----------------------------------------------------------------------------

2018	Invited Plenary Speaker at 13 <sup>th</sup> Mosquito Control Association of Australia
2018	Hollandsworth Prize 2 <sup>nd</sup> place, 84 <sup>th</sup> Annual AMCA Student Paper Competition
2018	T. Wainwright Miller Memorial Scholarship, FL Mosquito Control Foundation
2018	First place MUVE student competition talk
2018	ESA: MUVE travel grant to attend and present research, 2018 Annual ESA meeting
2018	Grinter Fellowship, University of Florida Graduate College
2017	Cyrus R. Lesser Memorial Scholarship, FL Mosquito Control Foundation
2017	Grinter Fellowship, University of Florida Graduate College
2016	Grinter Fellowship, University of Florida Graduate College
2015	Young Professional travel and research grant, AMCA

### GRANTS AWARDED

1. April 16<sup>th</sup>, 2018 – Florida Department of Agriculture and Consumer Services Coordinating Council on Mosquito Control grant submitted for "Evaluation of a Vapor-Active pyrethroid as a Barrier Treatment against Wild Mosquitoes," 1-year project. ~\$34,100
2. April 16<sup>th</sup>, 2018 – (Co-writer) Florida Department of Agriculture and Consumer Services Coordinating Council on Mosquito Control grant submitted for "Non-target Impact Validation with Operational Mosquito Adulticides" 1-year project. ~\$96,067
3. April 13<sup>th</sup>, 2016 – Florida Department of Agriculture and Consumer Services Coordinating Council on Mosquito Control contract 23583 / UF project P0010729 awarded for "Toxicity of vapor active insecticides for multi-vector control," 1-year project. ~\$96,000
4. August, 19<sup>th</sup>, 2012 – Public Health industry Support grant for research on "Refuge use trends and activity patterns of *Centruroides sculpturatus*" from Rare Disease Therapeutics, Inc. 1-year project - \$10,000

### SELECTED PUBLICATIONS

1. **Dixon, D., C. S. Bibbs, D. L. Autry, M. Banfield, and R. D. Xue. 2022.** Evaluation of autocidal gravid ovitraps for the control of *Aedes aegypti* and *Aedes albopictus* in Saint Augustine, FL. International Journal of the Florida Mosquito Control Association, *accepted pending issue*.
2. **Davis, J., C. S. Bibbs, G. C. Müller, and R. D. Xue. 2021.** Evaluation of *Bacillus thuringiensis israelensis* as a toxic sugar bait against adult mosquitoes of *Aedes aegypti*, *Aedes albopictus*, and *Culex quinquefasciatus*. Journal of Vector Ecology, 46(1): 30-33. DOI: <https://doi.org/10.52707/1081-1710-46.1.30>
3. **Autry, D., D. Dixon, C. S. Bibbs, E. I. M. Khater, and R. D. Xue. 2021.** Field comparison of utocidal gravid ovitraps and In2Care traps against *Aedes aegypti* in downtown Saint Augustine, northeastern Florida. Journal of the Florida Mosquito Control Association, 68: 89-93. DOI: <https://doi.org/10.32473/jfmca.v68i1.129105>.
4. **Khater, E. I. M., Z. Ding, C. S. Bibbs, and R. D. Xue. 2021.** Insecticide efficacy of spatial repellent compound-metofluthrin against susceptible and resistant strains of *Aedes aegypti*. Journal of the Florida Mosquito Control Association, 68: 83-88. DOI: <https://doi.org/10.32473/jfmca.v68i1.129104>.

5. **Bibbs, C. S., P. E. Kaufman, and R. D. Xue. 2021.** Adulticidal efficacy and sub-lethal effects of metofluthrin in residual insecticide blends against wild *Aedes albopictus* (Diptera: Culicidae). *Journal of Economic Entomology*, 114(2):928-936. DOI: <https://doi.org/10.1093/jee/toaa321>.
6. **Luo, L., R. D. Xue, and C. S. Bibbs. 2019.** Efficacy evaluation of the mixture of permethrin and (s)-methoprene applied by a backpack sprayer against larval and adult *Culex quinquefasciatus*. *Acta Parasitology et Medica Entomologica Sinica*, 26(2): 92-98.
7. **Bibbs, C. S., J. R. Bloomquist, D. A. Hahn, P. E. Kaufman, and R. D. Xue. 2019.** Gone in 60 seconds: sub-lethal effects of metofluthrin vapors on behavior and fitness of resistant and field strains of *Aedes aegypti* (Diptera: Culicidae). *Journal of Medical Entomology*, 56(4): 1087-1094. DOI: <https://doi.org/10.1093/jme/tjz040>
8. **Liu, H., D. Dixon, C. S. Bibbs, and R. D. Xue. 2019.** Autocidal Gravid Ovitrap (AGO) incorporation with attractants for control of gravid and host-seeking *Aedes aegypti* (Diptera: Culicidae). *J Med Entomol*, 56(2): 576-578. DOI: <https://doi.org/10.1093/jme/tjy207>.



## Budget

### Budget Form

**Budget Total: \$26,515**

Category	Description	Amount
Materials and supplies	Pond hard shell liners	\$1,200
Materials and supplies	Plastic horse troughs	\$1,500
Materials and supplies	Fish habitat salt	\$60
Materials and supplies	Algae control	\$150
Materials and supplies	Dechlorinator crystal	\$120
Materials and supplies	LED light strips	\$200
Materials and supplies	Pond pumps	\$200
Materials and supplies	Pond filters	\$500
Materials and supplies	Greenhouse/hoop house kit	\$5,000
Materials and supplies	Starter Crumble, fish food	\$110
Materials and supplies	Fish nets	\$50
Materials and supplies	Cleaning equipment for fish tanks	\$150
Materials and supplies	API Freshwater Master Kit	\$50
Materials and supplies	Fish fry grow out box	\$100
Materials and supplies	Insect repellent/spray for clothing	\$2,600
Materials and supplies	Curtis Dyna insect traps	\$400
Materials and supplies	Bug Ball starter kit	\$70
Materials and supplies	Pesticide license fee	\$40
Materials and supplies	Pesticide	\$1,000
Materials and supplies	Mosquito larval inspection equipment	\$315
Materials and supplies	Adult mosquito education	\$50
Materials and supplies	Survey software	\$900
Personnel - Salaries/Wages	Seasonal employee/intern	\$7,000
Printing and Publication Costs	Publication costs	\$3,000
Travel	Fuel costs	\$1,000
<b>Total Direct costs: (includes subawards)</b>		<b>\$25765</b>
Indirect costs	Utilities (water and electric)	\$750
<i>Indirect costs: 2.83%</i>		
<b>Salt Lake City Mosquito Abatement District Total: \$26,515</b>		<b>\$26,515</b>

Description	Details/Justification
Pond hard shell liners	The pond hard shell liners will be used to house the immature stages of the least chub (fish fry). This will allow the fish fry to successfully develop to adult to ensure the population stays healthy and consistent. This will be a significant part of this proposed project since this will relate to the rearing of the fish needed for the IPM program.
Plastic horse troughs	The plastic horse troughs will be larger in size than the pond hard shell liners used for the least chub fish fry; the plastic horse troughs will be used to house the mature/adult fish that will be used in the fish rearing program. The fish will be used as a biological control agent against mosquitoes, which are a huge pest and nuisance for inmates and correctional staff at the USCF.
Utilities (water and electric)	This amount will help cover water and electricity used for a successful fish rearing program. The fish will need their habitats filled with water and refreshed throughout the year to keep their habitats clean, and also need electricity to run various pond equipment such as filters and aeration pumps.
Fish habitat salt	Some fish need salt in their water to keep them healthy, this will help coat their bodies with the protective slime and help protect against diseases.
Algae control	This item will help keep a healthy fish population through ensuring the fish habitats are kept clean through algae growth control.
Dechlorinator crystal	Another item that will be needed for a healthy fish habitat is dechlorinator. This aids in the removal of heavy and toxic metals in the water that can be detrimental to fish.
LED light strips	Grow lights are needed to place over the fish habitats, especially during winter time/colder months, to encourage a reproduction.
Pond pumps	Pond pumps are necessary to aerate fish tanks and will help keep a steady supply of oxygenated water for a healthy fish population.
Pond filters	Pond filters are needed to keep the water in the fish tanks clean.
Greenhouse/hoop house kit	A structure, such as a greenhouse or a hoop house, will be constructed on the USCF property to house the least chub fish. This will help shelter and protect the fish during the rearing program.
Starter Crumble, fish food	This is needed to feed the fish.
Fish nets	Various sized fish nets will be used for transferring of fish, during cleaning, and separating fish.
Cleaning equipment for fish tanks	Cleaning equipment such as brushes and algae scrapers of various sizes will be used to keep the fish habitats cleaned and prevent build up of algae or dirty water that could lead to sick or ill fish.
API Freshwater Master Kit	This kit tests the condition of the fish water to prevent unsafe water conditions, such as nitrates, ammonia, pH, phosphates, and nitrite.
Fish fry grow out box	A grow out box for fish fry is needed to protect the least chub fry from adults or else adult fish will eat the immature fish. This can be made out of PVC piping and filter media.
Insect repellent/spray for clothing	Insect repellent and spray to treat clothing for the USCF staff and inmates are needed. So far, the USCF has not supplied to this inmates, leaving them vulnerable to mosquitoes and other biting insects. This will help supply them with an effective and easy way to prevent mosquito bites as a supplement to the overall education program that will be started. These will also help reduce bites when inmates and staff are outside during recreation time and walking to/from the dining building.
Curtis Dyna insect traps	These traps will be placed inside the USCF building, such as the foyer areas, to help catch mosquitoes that enter the building from outside. This is one more protection measure that can be taken to help prevent mosquito bites.
Bug Ball starter kit	These will help trap other biting insects the USCF has expressed as a pest, such as the tabanid flies (deer fly and horse fly), that have shown to be quite effective. This can be placed around the facility to help prevent bites from other insects.
Pesticide license fee	This will encourage the USCF to have staff or even inmates obtain their pesticide license so they can conduct IPM on the property themselves.

Pesticide	This will help cover pesticide, like Bti for mosquito larvae, that the USCF can use around the property as an IPM strategy once some of the correctional staff obtain their pesticide licenses. This will help get the USCF started, and as the education program develops, they can purchase whatever else may be best for their facility to reduce mosquitoes and biting insects.
Mosquito larval inspection equipment	These supplies will equip the USCF to conduct their own mosquito larvae inspections, such as dippers, plastic pipettes, and plastic collection tubes, that they otherwise would not have.
Adult mosquito education	This includes funds for emergence chambers that can be made to house adult mosquitoes used for education purposes (like viewing the mosquito life cycle and different mosquito species).
Survey software	Survey software, such as SurveyMonkey, will be used to create and evaluate surveys that will be taken pre and post education of inmates and correctional staff. Software survey will also be of use to statistically analyze answers further to be used in report, publications, presentations, and shared with others. This will also help evaluate the education program and determine what improvements may be needed for the future. This amount includes a one-year subscription.
Fuel costs	This amount will cover travel to and from the USCF. SLCMAD will travel to the USCF often to help with the least chub fish rearing program and with the education program.
Publication costs	This amount will cover costs for publication in a peer reviewed journal once this project has progressed and/or completed. Through a publication, this project will be shared even further with the science and non-science community to encourage others to adopt IPM and similar projects.
Seasonal employee/intern	This amount will help cover costs for a seasonal employee or intern. The USCF has expressed concern for their below normal staff numbers, so extra help will be beneficial to both USCF and SLCMAD to conduct education, the fish rearing program, and other activities required for this project.

## Supporting Documents

### Letters of Support from Project Partners

2023 WIPMC RFA Combined LOS 12.9.22



This site is produced and managed by the Regional IPM Centers and is based on code developed by [SARE](#). The Regional IPM Centers are supported by the USDA National Institute of Food and Agriculture through agreement 2018-70006-28884. [Nondiscrimination Policy](#). [Privacy Policy](#).

USDA Regional IPM Centers © 2022

[Help](#) | [Contact us](#)