

## Application Status Confirmation

Grants has marked the following application as submitted:

\* Please submit signed copies of forms if you have been instructed by your program or grant office.

U.S. FISH AND WILDLIFE SERVICE- G/F09  
FWS HEADQUARTERS 5275 LEESBURG PIKE  
FALLS CHURCH, VA 22041


Applicant	Tennessee Technological University
Application Number	FWS-ES2021001983
Program	F000 - US Fish and Wildlife Service
Announcement	<a href="#">Endangered Species Recovery Implementation</a>
Region	HQ-HQ
Project Title	Conservation Science to Support Recovery Implementation for the Hardin Crayfish and Pristine Crayfish: Genetics, Life History, and
Species Status A	
Due Date	09/30/2021 11:59 PM (GMT - 05:00) Eastern Time (US & Canada)
Submitted Date	05/12/2021 09:08 AM Eastern Time

### Application Details

Items	Item Attachments		
	Type	Date Expected	Date Received
<b>Other</b>			
Single Audit Reporting Statement	Upload	N/A	05/11/2021
New Award Applicant Responsibility Form	Upload	N/A	05/11/2021
Signed_TennesseeTech_NICRA	Upload	N/A	05/11/2021
Project Summary	Upload	N/A	05/11/2021
Overlap or Duplication of Effort Statement	Upload	N/A	05/11/2021
P19AC00105_Signed_CESU	Upload	N/A	05/11/2021
Required Indirect Cost Statement	Upload	N/A	05/11/2021
<b>Program Narrative</b>			
Project Narrative	Upload	N/A	05/11/2021
<b>SF-424 Application for Federal Assistance Version 2</b>			
<b>SF-424A Budget Information - Non-Construction</b>			
<b>SF-424B Assurances - Non-Construction</b>			

**Print Application:**[Original Submission](#)

Please check that all documents listed in the table of contents are correct in the PDF. If they are not correct, please notify the GrantSolutions Help Desk at [help@grantsolutions.gov](mailto:help@grantsolutions.gov)

Applicant	Tennessee Technological University
Application Number	FWS-ES2021001983 
Program	F000 - US Fish and Wildlife Service
Announcement	<a href="#">Endangered Species Recovery Implementation</a>
Service Area	HQ-HQ
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Additional Information to be Submitted	Enclosure(s)	Attachment(s)	Status
Other		7 <a href="#">Uploaded Files</a> 0 <a href="#">Mail-in Items</a>	✓
Program Narrative		1 <a href="#">Uploaded Files</a> 0 <a href="#">Mail-in Items</a>	✓
Online Forms	Enclosure(s)	Attachment(s)	Status
SF-424 Application for Federal Assistance Version 2	<a href="#">View Online</a> <a href="#">Print Completed</a>	0 <a href="#">Uploaded Files</a> 0 <a href="#">Mail-in Items</a>	✓
SF-424A Budget Information - Non-Construction	<a href="#">View Online</a> <a href="#">Print Completed</a>	N/A	✓
SF-424B Assurances - Non-Construction	<a href="#">View Online</a> <a href="#">Print Completed</a>	N/A	✓
SF-LLL Disclosure of Lobbying Activities (Version 2.0)	<a href="#">View Online</a>	N/A	✓

**Post Submission Supplemental Information**

Description	<a href="#">Attachment(s)</a> : Uploaded Files
No Attachments Uploaded	

[Application Package Status](#): Submitted

**Mail-In Package Information:** U.S. FISH AND WILDLIFE SERVICE- G/F09 is currently not expecting to receive a Mail-In Package for this application.

[Close](#)

## Table Of Contents

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted

**Please verify if all attachments in the application package appear as expected.**

Additional Information to be Submitted

Online Forms

### 1. Other

- (Upload #1): Overlap or Duplication of Effort Statement
- (Upload #2): Required Indirect Cost Statement
- (Upload #3): Single Audit Reporting Statement
- (Upload #4): New Award Applicant Responsibility Form
- (Upload #5): Signed\_TennesseeTech\_NICRA
- (Upload #6): P19AC00105\_Signed\_CESU
- (Upload #7): Project Summary
- (Upload #0): Project Narrative

### 2. Program Narrative

- (Upload #0): Overlap or Duplication of Effort Statement
- (Upload #0): Required Indirect Cost Statement
- (Upload #0): Single Audit Reporting Statement
- (Upload #0): New Award Applicant Responsibility Form
- (Upload #0): Signed\_TennesseeTech\_NICRA

- (Upload #0): P19AC00105\_Signed\_CESU
- (Upload #0): Project Summary
- (Upload #8): Project Narrative

3. SF-424 Application for Federal Assistance Version 2
4. SF-424A Budget Information - Non-Construction
5. SF-424B Assurances - Non-Construction
6. SF-LLL Disclosure of Lobbying Activities (Version 2.0)

Note: Upload document(s) printed in order after online forms.

## Disclosures

It appears that all attachments in the application have been processed correctly. Please review the application to ensure that the attached files display correctly as uploaded.

Application for Federal Assistance SF-424

Version 02

<b>* 1. Type of Submission:</b> <input type="radio"/> Preapplication <input checked="" type="radio"/> Application <input type="radio"/> Changed/Corrected Application		<b>* 2. Type of Application:</b> <input checked="" type="radio"/> New <input type="radio"/> Continuation <input type="radio"/> Revision		<b>* If Revision, select appropriate letter(s):</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-bottom: 5px;"></div> <b>* Other (Specify)</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>
<b>* 3. Date Received:</b> <div style="border: 1px solid black; padding: 2px;">05/12/2021</div>		<b>4. Applicant Identifier:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>		
<b>5a. Federal Entity Identifier:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>		<b>* 5b. Federal Award Identifier:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>		
<b>State Use Only:</b>				
<b>6. Date Received by State:</b> <div style="border: 1px solid black; padding: 2px;">05/12/2021</div>		<b>7. State Application Identifier:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>		
<b>8. APPLICANT INFORMATION:</b>				
<b>* a. Legal Name:</b> <div style="border: 1px solid black; padding: 2px;">Tennessee Technological University</div>				
<b>* b. Employer/Taxpayer Identification Number (EIN/TIN):</b> <div style="border: 1px solid black; padding: 2px;">62-064-6806</div>		<b>* c. Organizational DUNS:</b> <div style="border: 1px solid black; padding: 2px;">878648153</div>		
<b>d. Address:</b>				
<b>* Street1:</b> <div style="border: 1px solid black; padding: 2px;">1 William L Jones Dr</div>				
<b>Street2:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>				
<b>* City:</b> <div style="border: 1px solid black; padding: 2px;">Cookeville</div>				
<b>County:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>				
<b>* State:</b> <div style="border: 1px solid black; padding: 2px;">Tennessee</div>				
<b>Province:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>				
<b>* Country:</b> <div style="border: 1px solid black; padding: 2px;">UNITED STATES</div>				
<b>* Zip / Postal Code:</b> <div style="border: 1px solid black; padding: 2px;">38505-0001</div>				
<b>e. Organizational Unit:</b>				
<b>Department Name:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>		<b>Division Name:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>		
<b>f. Name and contact information of person to be contacted on matters involving this application:</b>				
<b>Prefix:</b> <div style="border: 1px solid black; padding: 2px;">Dr.</div>		<b>* First Name:</b> <div style="border: 1px solid black; padding: 2px;">Hayden</div>		
<b>Middle Name:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>				
<b>* Last Name:</b> <div style="border: 1px solid black; padding: 2px;">Mattingly</div>				
<b>Suffix:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>				
<b>Title:</b> <div style="border: 1px solid black; padding: 2px;">Director, School of Environmental Studies</div>				
<b>Organizational Affiliation:</b> <div style="border: 1px solid black; padding: 2px;">Tennessee Technological University</div>				
<b>* Telephone Number:</b> <div style="border: 1px solid black; padding: 2px;">9313723698</div>		<b>Fax Number:</b> <div style="border: 1px solid black; height: 15px; width: 100%; margin-top: 5px;"></div>		
<b>* Email:</b> <div style="border: 1px solid black; padding: 2px;">HMattingly@tntech.edu</div>				

**Application for Federal Assistance SF-424**

Version 02

**9. Type of Applicant 1: Select Applicant Type:**

Public/State Controlled Institution of Higher Education

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

\* Other (specify):

**\* 10. Name of Federal Agency:**

DOI-US Fish and Wildlife Service

**11. Catalog of Federal Domestic Assistance Number:**

15.657

CFDA Title:

Endangered Species Conservation – Recovery Implementation Funds

**\* 12. Funding Opportunity Number:**

F21AS00155

\* Title:

Endangered Species Recovery Implementation

**13. Competition Identification Number:**

F21AS00155

Title:

Endangered Species Recovery Implementation

**14. Areas Affected by Project (Cities, Counties, States, etc.):**

**\* 15. Descriptive Title of Applicant's Project:**

Conservation Science to Support Recovery Implementation for the Hardin Crayfish and Pristine Crayfish: Genetics, Life History, and Species Status A

Attach supporting documents as specified in agency instructions.

**Application for Federal Assistance SF-424**

Version 02

**16. Congressional Districts Of:**

\* a. Applicant

\* b. Program/Project

Attach an additional list of Program/Project Congressional Districts if needed.

**17. Proposed Project:**

\* a. Start Date:

\* b. End Date:

**18. Estimated Funding (\$):**

* a. Federal	<input type="text" value="100000"/>
* b. Applicant	<input type="text" value="89759"/>
* c. State	<input type="text" value="0"/>
* d. Local	<input type="text" value="0"/>
* e. Other	<input type="text" value="0"/>
* f. Program Income	<input type="text" value="0"/>
* g. TOTAL	<input type="text" value="189759"/>

**\* 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

- ☐ a. This application was made available to the State under the Executive Order 12372 Process for review on
- ☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.
- ☒ c. Program is not covered by E.O. 12372.

**\* 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes", provide explanation.)**

☐ Yes ☒ No

**21. \*By signing this application, I certify (1) to the statements contained in the list of certifications\*\* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances\*\* and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ **\*\* I AGREE**

\*\* The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

**Authorized Representative:**

Prefix:  \* First Name:

Middle Name:

\* Last Name:

Suffix:

\* Title:

\* Telephone Number:  Fax Number:

\* Email:

\* Signature of Authorized Representative:  \* Date Signed:



**Application for Federal Assistance SF-424**

Version 02

**\* Applicant Federal Debt Delinquency Explanation**

The following field should contain an explanation if the Applicant organization is delinquent on any Federal Debt. Maximum number of characters that can be entered is 4,000. Try and avoid extra spaces and carriage returns to maximize the availability of space.

**BUDGET INFORMATION - Non-Construction Programs****SECTION A - BUDGET SUMMARY**

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Recovery-Endangered Species	15.657			\$66,065.00	\$48,449.00	\$114,514.00
2. Recovery-Endangered Species						
3. Recovery-Endangered Species						
4. Recovery-Endangered Species						
5. Totals				\$66,065.00	\$48,449.00	\$114,514.00

**SECTION B - BUDGET CATEGORIES**

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total (5)
	(1) Recovery-Endangered Species	(2) Recovery-Endangered Species	(3) Endangered Species Conservation	(4) Endangered Species Conservation	
a. Personnel	\$41,400.00				\$41,400.00
b. Fringe Benefits	\$25,445.00				\$25,445.00
c. Travel	\$8,000.00				\$8,000.00
d. Equipment					
e. Supplies	\$5,798.00				\$5,798.00
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges (sum of 6a-6h)	\$80,643.00				\$80,643.00
j. Indirect Charges	\$33,871.00				\$33,871.00
k. TOTALS (sum of 6i and 6j)	\$114,514.00				\$114,514.00
7. Program Income					

Authorized for Local Reproduction

Standard Form 424A (Rev. 7-97)

Prescribed by OMB Circular A-102

**SECTION C - NON-FEDERAL RESOURCES**

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8 Recovery-Endangered Species Conservation – Recovery IF	\$48,449.00			\$48,449.00
9. Recovery-Endangered Species Conservation – Recovery IF				
10. Recovery-Endangered Species Conservation – Recovery IF				
11. Recovery-Endangered Species Conservation – Recovery IF				
12. TOTAL ( <i>sum of lines 8-11</i> )	\$48,449.00			\$48,449.00

**SECTION D - FORECASTED CASH NEEDS**

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	\$66,065.00	\$16,516.25	\$16,516.25	\$16,516.25	\$16,516.25
14. Non-Federal	\$48,449.00	\$12,112.25	\$12,112.25	\$12,112.25	\$12,112.25
15. TOTAL ( <i>sum of lines 13 and 14</i> )	\$114,514.00	\$28,628.50	\$28,628.50	\$28,628.50	\$28,628.50

**SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT**

(a) Grant Program	FUTURE FUNDING PERIODS (Years)			
	(b) First	(c) Second	(d) Third	(e) Fourth
16. Recovery-Endangered Species Conservation – Recovery IF	\$33,935.00			
17. Recovery-Endangered Species Conservation – Recovery IF				
18. Recovery-Endangered Species Conservation – Recovery IF				
19. Recovery-Endangered Species Conservation – Recovery IF				
20. TOTAL ( <i>sum of lines 16-19</i> )	\$33,935.00			

**SECTION F - OTHER BUDGET INFORMATION**

21. Direct Charges:	22. Indirect Charges: 17.5% of MTDC (CESU); NICRA 42% of MTDC
23. Remarks:	

## ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

**PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.**

**NOTE:** Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681- 1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee- 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327- 333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93- 205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.
19. Will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104) which prohibits grant award recipients or a sub-recipient from (1) Engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

<b>* SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL</b>  Francis Otuonye	<b>* TITLE</b>  Associate Vice President for Research
<b>* APPLICATION ORGANIZATION</b>  Tennessee Technological University	<b>* DATE SUBMITTED</b>  05/12/2021

Standard Form 424B (Rev. 7-97) Back

## Upload #1

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted  
Document Title: Overlap or Duplication of Effort Statement

**Overlap or Duplication of Effort Statement**

There are no overlaps or duplication between this application and any of our other Federal applications or funded projects, including in regards to activities, costs, or time commitment of key personnel.

## Upload #2

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted  
Document Title: Required Indirect Cost Statement



## Required Indirect Cost Statement

A Public/State Controlled Institution of Higher Education that is submitting this proposal for consideration under the “Cooperative Ecosystem Studies Unit Network”, which has a Department of the Interior-approved indirect cost rate cap of 17.5%. If we have an approved indirect cost rate with our cognizant agency, we understand that we must apply this reduced rate against the same direct cost base as identified in our approved indirect cost rate agreement per [2 CFR §1402.414](#). If we do not have an approved indirect cost rate with our cognizant agency, we understand that we must charge indirect costs against the modified total direct cost base defined in 2 CFR §200.68 “Modified Total Direct Cost (MTDC)”. We understand that we must request prior approval from the Service to use the 2 CFR 200 MTDC base instead of the base identified in our approved indirect cost rate agreement. We understand that Service approval of such a request will be based on: 1) a determination that our approved base is only a subset of the MTDC (such as salaries and wages); and 2) that use of the MTDC base will still result in a reduction of the total indirect costs to be charged to the award. In accordance with 2 CFR §200.405, we understand that indirect costs not recovered due to a voluntary reduction to our federally negotiated rate are not allowable for recovery via any other means.

### Upload #3

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted  
Document Title: Single Audit Reporting Statement

## **Single Audit Reporting Statement**

Tennessee Technological University is included as part of the Single Audit Report for the State of Tennessee. This audit was conducted in accordance with the requirements of the Single Audit Act Amendments of 1996 and the provisions of Title 2, Code of Federal Regulations, Part 200, "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards" (Uniform Guidance). The link to the current Single Audit Report is below:

<https://comptroller.tn.gov/content/dam/cot/sa/advanced-search/disclaimer/2021/2020SingleAudit.pdf>

Yearly financial statements for Tennessee Technological University can be found on the university's website: <https://www.tntech.edu/businessoffice/fin-reports.php>

## Upload #4

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted  
Document Title: New Award Applicant Responsibility Form

## FASO Operations New Award Checklist

This guide is intended as an aid to Service employees compiling Financial Assistance new award packages. This checklist is not a required part of a new award package, and is not to be submitted with the award materials.

<b>Application / Award #:</b>	
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### Applicant Responsibility

*All documentation submitted by the recipient is saved in GS under the Application Screen from original submission or Post Supplemental Information Section for updated documentation*

	Award Documentation	Comments/Notes
<input checked="" type="checkbox"/>	<a href="#">SF-424 Application</a>	
<input checked="" type="checkbox"/>	<a href="#">SF-424 A or C Budget</a>	
<input type="checkbox"/>	<a href="#">SF-424 D Assurances</a> Construction only. (SF424B is not required if entity is registered in SAM)	N/A
<input checked="" type="checkbox"/>	Project Narrative (Statement of Work)	
<input checked="" type="checkbox"/>	Budget Narrative	
<input checked="" type="checkbox"/>	<a href="#">Overlap/Duplication statement</a> (Resolution required Yes No)	
<input checked="" type="checkbox"/>	NICRA (Negotiated indirect cost rate agreement) - signed (If applicable, NICRA or CESU), check date of NICRA	
<input checked="" type="checkbox"/>	<a href="#">Indirect cost rate statement</a> (N/A for individuals separate from business or non-profit entity)	
<input checked="" type="checkbox"/>	A133 Single Audit Reporting Statement (N/A for awards to individuals or for-profit businesses)	
<input type="checkbox"/>	<a href="#">SF-LLL Disclosure of Lobbying Activities form</a> (If applicable)	
<input type="checkbox"/>	Pre-Award cost request (if applicable)	

## Upload #5

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted  
Document Title: Signed\_TennesseeTech\_NICRA



DEPARTMENT OF HEALTH & HUMAN SERVICES

Program Support Center  
Financial Management Portfolio  
Cost Allocation Services

7700 Wisconsin Avenue, Suite 2301  
Bethesda, MD 20814  
PHONE: (301) 492-4855  
FAX: (301) 492-5081  
EMAIL: [CAS-Bethesda@psc.hhs.gov](mailto:CAS-Bethesda@psc.hhs.gov)

March 23, 2017

Mr. Francis Otunye  
Associate Vice President for Research  
Tennessee Technologic University  
Box 5036  
1 William L. Jones Drive  
Cookeville, TN 38505

Dear Mr. Otunye:

A copy of an indirect cost rate agreement is being sent to you for signature. This agreement reflects an understanding reached between your organization and a member of my staff concerning the rate(s) that may be used to support your claim for indirect costs on grants and contracts with the Federal Government.

Please have the agreement signed by an authorized representative of your organization and return to me by email, retaining the copy for your files. Our email address is [CAS-Bethesda@psc.hhs.gov](mailto:CAS-Bethesda@psc.hhs.gov). We will reproduce and distribute the agreement to the appropriate awarding organizations of the Federal Government for their use.

An indirect cost proposal, together with the supporting information, is required to substantiate your claim for indirect cost under grants and contracts awarded by the Federal Government. Thus, your next proposal based on actual costs for the fiscal year ending 06/30/2020 is due in our office by 12/31/2020. Please submit your next proposal electronically via email to [CAS-Bethesda@psc.hhs.gov](mailto:CAS-Bethesda@psc.hhs.gov).

Sincerely,  
Darryl W.  
Mayes -A

Revised: Updated by (s) on 06/06/16  
06/11/16 11:11 AM  
06/11/16 11:11 AM  
06/11/16 11:11 AM

Darryl W. Mayes, Deputy Director  
Cost Allocation Services

Enclosure

PLEASE SIGN AND RETURN THE NEGOTIATION AGREEMENT BY EMAIL

## COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN: 1620646806A1

DATE: 03/23/2017

ORGANIZATION:

FILING REF.: The preceding  
agreement was dated  
09/06/2013

Tennessee Technological University

P.O. Box 5037

Cookeville, TN 38505-0001

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

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### SECTION I: Facilities And Administrative Cost Rates

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RATE TYPES:      FIXED                  FINAL                  PROV. (PROVISIONAL)      PRED. (PREDETERMINED)

#### EFFECTIVE PERIOD

<u>TYPE</u>	<u>FROM</u>	<u>TO</u>	<u>RATE(%)</u>	<u>LOCATION</u>	<u>APPLICABLE TO</u>
PRED.	07/01/2017	06/30/2021	42.00	On-Campus	All Programs
PRED.	07/01/2017	06/30/2021	11.50	Off-Campus	All Programs
PROV.	07/01/2021	Until Amended			Use same rates and conditions as those cited for fiscal year ending June 30, 2021.

#### \*BASE

Total direct costs excluding capital expenditures (buildings, individual items of equipment; alterations and renovations), that portion of each subaward in excess of \$25,000 and flow-through funds.



ORGANIZATION: Tennessee Technological University

AGREEMENT DATE: 3/23/2017

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## **SECTION II: SPECIAL REMARKS**

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### TREATMENT OF FRINGE BENEFITS:

The fringe benefits are specifically identified to each employee and are charged individually as direct costs. The directly claimed fringe benefits are listed below.

### TREATMENT OF PAID ABSENCES

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims are not made for the cost of these paid absences.

OFF-CAMPUS DEFINITION: For all activities performed in facilities not owned by the institution and to which rent is directly allocated to the project(s) the off-campus rate will apply. Grants or contracts will not be subject to more than one F&A cost rate. If more than 50% of a project is performed off-campus, the off-campus rate will apply to the entire project.

Fringe Benefits include: FICA, Retirement and Hospitalization Insurance.

Equipment means an article of nonexpendable tangible personal property having a useful life of more than one year, and an acquisition cost of \$5,000 or more per unit.

The four year extension of the indirect cost rate was granted in accordance with 2 CFR §200.414 (g).

Next proposal based on the fiscal year ending June 30, 2020 is due in our office by December 31, 2020.

### **BASES:**

(1) Prior to 06/30/08, the base is Direct salaries and wages including vacation, holiday, sick pay and other paid absences but excluding all other fringe benefits.

(2) Effective 07/01/08, the base is Total direct costs excluding capital expenditures (buildings, individual items of equipment; alterations and renovations), that portion of each subaward in excess of \$25,000 and flow-through funds.

ORGANIZATION: Tennessee Technological University

AGREEMENT DATE: 3/23/2017

### SECTION III: GENERAL

#### A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted; such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

#### B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

#### C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

#### D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Title 2 of the Code of Federal Regulations, Part 200 (2 CFR 200), and should be applied to grants, contracts and other agreements covered by 2 CFR 200, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

#### E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to these programs.

BY THE INSTITUTION:

Tennessee Technological University

(INSTITUTION)

(SIGNATURE)

(NAME)

(TITLE)

(DATE)

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

(AGENCY)

Darryl W. Mayes -A

(SIGNATURE)

Darryl W. Mayes

(NAME)

Deputy Director, Cost Allocation Services

(TITLE)

3/23/2017

(DATE) 0282

HHS REPRESENTATIVE:

Steven Zuraf

Telephone:

(301) 492-4855

## Upload #6

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted  
Document Title: P19AC00105\_Signed\_CESU

**Cooperative Ecosystem Studies Unit**  
**Cooperative Agreement P19AC00105**  
**Between**  
**The United States Department of The Interior**  
**National Park Service**  
**And**  
**Tennessee Technological University**  
**1 William L Jones Dr**  
**Cookeville, TN 38505-0001**  
**Duns: 878648153**

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CFDA: 15.945 Cooperative Research and Training Programs Resources of the National Park System  
Project Title: Provide research, technical assistance and education for resource management and research  
Federal Funds Obligated by this action: N/A  
Total Amount of Award: \$0  
Period of Performance: March 1, 2019 through February 29, 2024

This Agreement is made and entered into between the United States Department of the Interior, National Park Service (NPS) and Tennessee Technological University (the Recipient).

#### **ARTICLE I – BACKGROUND AND OBJECTIVES**

The partnership proposed by the Cooperator was selected due to merit review evaluations from the 2017 Notice of Funding Opportunity P17AS00037. The Cooperator demonstrated expertise in disciplines and subject areas of relevance to cooperative research and training. The Cooperator met the program interests of NPS with expertise, facilities, experience, diversity of programs, and history of collaborative research projects.

The Cooperator helps the NPS-CESU to meet its objectives to:

- Provide research, technical assistance and education to NPS for land management, and research;
- Develop a program of research, technical assistance and education that involves the biological, physical, social, and cultural sciences needed to address resources issues and interdisciplinary problem-solving at multiple scales and in an ecosystem context at the local, regional, and national level; and
- Place special emphasis on the working collaboration among NPS, universities, and their related partner institutions.

The CESU network seeks to provide scientifically-based information on the nature and status of selected biological, physical, and cultural resources occurring within the parks in a form that increases its utility for making management decisions, conducting scientific research, educating the public, developing effective monitoring programs, and developing management strategies for resource protection.

Studying the resources present in NPS parks benefits the Cooperator's goal of advancing knowledge through scientific discovery, integration, application, and teaching, which lead toward a holistic understanding of our environmental and natural resources.

The Cooperator is a public research university, sharing research, educational, and technological strengths with other institutions. Through inter-institutional collaboration, combined with the unique contributions of each constituent institution, the Cooperator strives to contribute substantially to the cultural, economic, environmental, scientific, social and technological advancement of the nation.

The NPS expects there to be substantial involvement between itself and the Cooperator in carrying out the activities contemplated in this Agreement.

The primary purpose of this study is not the acquisition of property or services for the direct benefit or use by the Federal Government, but rather to accomplish a public purpose of support or stimulation authorized the Legislative Authorities in ARTICLE II.

This agreement fulfills the Public Purpose of support and economic stimulation for the following reasons:

- Projects will engage recipients, partners, communities, and/or visitors in shared environmental stewardship.
- Projects will promote greater public and private participation in historic preservation programs and activities. The project builds resource stewardship ethics in its participants.
- The information, products and/or services identified or developed by projects will be shared through a variety of strategies to increase public awareness, knowledge and support for historic preservation and stewardship of the nation's cultural and historical heritage.
- Projects will support the Government's objective to provide opportunities for youth to learn about the environment by spending time working on projects in National Parks. The NPS receives the indirect benefit of completing conservation projects.
- Projects will motivate youth participants to become involved in the natural, cultural and /or historical resource protection of their communities and beyond.
- Students gain "real world" or hands-on experience outside of the classroom of natural, cultural and/or historical resource projects.
- The scientific community and/or researchers external to NPS gains by new knowledge provided through research and related results dissemination of natural, cultural and/or historical resource information.
- Projects assist in the creation, promotion, facilitation, and/or improvement of the public's understanding of natural, cultural, historic, recreational and other aspects of areas such as ecological conservation areas, and state and local parks.

For performance under this cooperative agreement, the regulations set forth in 2 CFR, Part 200, supersedes OMB Circulars A-21 (2 CFR 220), A-87 (2 CFR 225), A-110, and A-122 (2 CFR 230); Circulars A-89, A-102, and A-133; and the guidance in Circular A-50 on Single Audit Act follow-up apply. The Cooperator shall adhere to 2 CFR, Part 200 in its entirety in addition to any terms and conditions of the master agreement not superseded by 2 CFR 200, as well as the terms and conditions set forth in this agreement. In the event of a conflict between the original terms of the master agreement and 2 CFR, Part 200, relating to this task agreement, 2 CFR, Part 200 shall take precedence.

## **ARTICLE II - AUTHORITY**

NPS enters into this Agreement to assist in providing research, technical assistance, and education.

**a. 54 U.S.C. § 100703 - Agreements with Educational Institutions to Study National Park**

**System Resources and Non-Park Service Resources:** The NPS is authorized and directed to enter into cooperative agreements with colleges and universities in partnership with other Federal and State agencies, to establish cooperative study units to conduct multi-disciplinary research and develop integrated information products on the resources of the National Park System or the larger region of which parks are a part.

**b. 54 U.S.C. § 101702(b) – Cooperative Research and Training Programs:**

The NPS is authorized to enter into cooperative agreements with public or private educational institutions, States, and their political subdivisions, for the purpose of developing adequate, coordinated, cooperative research and training activities concerning the resources of the NPS.

**c. 54 U.S.C. § 101702(a) – Agreements for the Transfer of Appropriated Funds to Carry out NPS Programs:**

The NPS is authorized to enter into cooperative agreements that involve the transfer of National Park Service appropriated funds to State, local and tribal governments, other public entities, educational institutions, and private nonprofit organizations for the public purpose of carrying out National Park Service programs.

**d. 54 U.S.C. § 101702(d)(1) – Cooperative Agreements for National Park Natural Resource**

**Protection:** The NPS is authorized to enter into cooperative agreements with State, local, or tribal governments, other Federal agencies, other public entities, educational institutions, private nonprofit organizations, or participating private landowners for the purpose of protecting natural resources of units of the National Park System through collaborative efforts on land inside and outside of National Park System units.

**e. 54 U.S.C. § 200103(g)(1) - Outdoor Recreation of Programs, Research and Education:**

The NPS is authorized to sponsor, engage in, and assist in research relating to outdoor recreation, directly or by contract or cooperative agreements, and make payments for such purposes without regard to the limitations of section 3324(a) and (b) of title 31 concerning advances of funds when he considers such action in the public interest, (2) undertake studies and assemble information concerning outdoor recreation, directly or by contract or cooperative agreement, and disseminate such information without regard to the provisions of section 3204 of title 39, and (3) cooperate with educational institutions and others in order to assist in establishing education programs and activities and to encourage public use and benefits from outdoor recreation.

**ARTICLE III – STATEMENT OF WORK****A. The Cooperator agrees to:**

1. Conduct, a program of research, technical assistance, and education related to the CESU objectives and allow and encourage faculty to participate in the program as appropriate;
2. Promote the application of biological, physical, and cultural information to the conservation, restoration, and management of NPS's resources;
3. Encourage students and employees to participate in the activities of the CESU;

4. Allow and encourage faculty to engage in NPS research, technical assistance and education activities related to the CESU objectives, as appropriate;
5. Encourage its students to participate in the activities of the CESU;
6. Attend the CESU Manager's Committee meeting, at least annually, to provide advice and guidance, review of the annual work and multi-year strategic plans, and assist in evaluating the CESU;
7. Obtain research collecting permits through the appropriate NPS administrative unit for work accomplished through this Agreement;
8. Participate in symposiums, conferences, or workshops to promote the understanding and use of biodiversity information on NPS parks;
9. Support professional development for youth and visitors, whenever possible, with projects under this Agreement;
10. Provide to the NPS expert consultation in support of environmental policy and management of natural and cultural resources;
11. Assist the NPS in outreach to national and international audiences with information about the resources that are supported by national parks;
12. Provide the NPS with reports, manuscripts, popular-press articles, monographs, and research data generated by personnel conducting projects under this Agreement.

B. NPS agrees to:

1. Provide administrative assistance, as appropriate, necessary to execute this Agreement and subsequent modifications;
2. Participate in project activity research, technical assistance and education related to the CESU objectives to the extent allowed by NPS authorizing legislation;
3. Provide opportunities for research on national park lands or using federal facilities in cooperation with NPS, as appropriate, and according to all applicable laws, regulations, and policies;
4. Provide project funds and/or collaboration to support specific research, technical assistance and education projects, as appropriate;
5. Make available managers to serve on the CESU Manager's Committee;
6. Comply with the Cooperator's rules, regulations, and policies regarding professional conduct, health, safety, use of services and facilities, use of animals, recombinant DNA, infectious agents or radioactive substances, as well as other policies generally applied to the Cooperator's personnel;
7. Ensure its employees follow the Code of Ethics for Government Service (Pub. L. 96-303) and Standards of Ethical Conduct (5 CFR Part 2635);
8. Allow NPS employees to participate in the activities of the Cooperator, including serving on graduate committees and teaching courses, as appropriate, and as specifically determined in modifications to the Agreement; and
9. Provide substantial guidance and consultation to the Cooperator in connection with projects, as appropriate.
10. Familiarize the Cooperator with parks and park resources.
11. Provide the Cooperator with timely information on changes to park boundaries or land ownership.
12. Provide access to and use of the natural and cultural resources of units of the National Park System for appropriate research, monitoring, and educational activities of the Cooperator, except for those activities which may conflict with the values and purposes of the area as stated in Federal law or policy.

C. The Cooperator and NPS jointly agree to:

1. Maintain the CESU closely following the mission and goals of the CESU Network as described in the *CESU Network Strategic Plan*, adapting key elements to local and regional needs, as appropriate;
2. Maintain a CESU role and mission statement;
3. Operate under a multi-year strategic plan;
4. Issue individual funding documents, in accordance with NPS procedures, developed cooperatively between the NPS and Cooperator that individually include a specific “scope of work” statement and a brief explanation of the following:
  - a. the proposed work;
  - b. the project contribution to the objectives of the CESU;
  - c. the methodology of the project;
  - d. the substantial involvement of each party;
  - e. the project budget and schedule;
  - f. the specific project outputs or products.

Unless otherwise specified, the terms and conditions of this Cooperative Agreement will apply to Task Agreements written under it.

5. Provide data on CESU projects to the CESU Network National Office and/or host institution in accordance with CESU Network Council guidelines as posted on the CESU Network National Office website ([www.cesu.org](http://www.cesu.org));
6. Engage in collaborative activities consistent with federal scientific and scholarly integrity directives and policies (e.g., Presidential and OSTP Scientific Integrity Memoranda, as appropriate. The Code of Scientific and Scholarly Conduct for the Department of the Interior can be found at: <https://www.doi.gov/sites/doi.gov/files/migrated/scientificintegrity/upload/DOI-Code-of-Scientific-and-Scholarly-Conduct-Poster-December-2014.pdf>

#### ARTICLE IV – TERM OF AGREEMENT

- A. The Agreement will become effective **March 1, 2019 through February 29, 2024**, unless terminated earlier per Article XI. The period from the Effective Date to the Expiration Date is the period of performance for the Agreement (Agreement Term).
- B. For the purposes of this Agreement, amendments are changes (edits, deletions, or additions) to the Agreement that do not involve the transfer of funds. Amendments may be proposed by NPS or the Cooperator. Amendments shall be in writing, signed, and agreed to by NPS and the Cooperator.
- C. The expiration of this Agreement will not affect the validity or duration of projects which have been initiated under this Agreement prior to such expiration.

#### ARTICLE V – KEY OFFICIALS

- A. Key officials are essential to ensure maximum coordination and communications between the parties and the work being performed. They are:
  1. **For the NPS:**



**Signatory**

**Brian J. Straka**

Financial Assistance Awarding Officer (AO)  
Great Smoky Mountains National Park  
107 Park Headquarters Road  
Gatlinburg, TN 37738  
(865) 436-1217  
[Brian\\_Straka@nps.gov](mailto:Brian_Straka@nps.gov)

**Agreement Technical Representative (ATR)**

**Ray Albright**

272 Ellington PS Bldg.  
University of Tennessee  
Knoxville, TN 37996  
O (865) 974-8443  
C (865) 604-9357  
[ray\\_albright@nps.gov](mailto:ray_albright@nps.gov)

2. **For Tennessee Technological University**

**Signatory**

Dr. Francis Otuonye  
Associate Vice President of Research  
Office of Research, Box 5164  
1 William L. Jones Drive  
Cookeville, TN 38505  
(931) 372 – 3374  
Correspond with Nicole Clark [nclark@tntech.edu](mailto:nclark@tntech.edu)

**Technical Representative**

Dr. Justin Murdock  
Associate Professor  
Department of Biology, Box 5063  
Pennebaker Hall 315  
Cookeville, TN 38505  
(931) 372-3147  
[jmurdock@tntech.edu](mailto:jmurdock@tntech.edu)

- B. **Communications.** Cooperator shall address any communication regarding this Agreement to the ATR with a copy to the AO. Communications that relate solely to technical matters may be sent only to the ATR.
- C. **Changes in Key Officials.** Neither the NPS nor Cooperator may make any permanent change in a key official without written notice to the other party reasonably in advance of the proposed change. The notice will include a justification with sufficient detail to permit evaluation of the impact of such a change on the scope of work specified within this Agreement. Any permanent change in key officials will be made only by modification to this Agreement.

**ARTICLE VI – AWARD AND PAYMENT**

- A. The commitment of funds in furtherance of this Agreement will be authorized by individual Task Agreements issued against this Cooperative Agreement identifying each project or group of projects, the amount of financial assistance and any other special terms or conditions applicable to the project tasks.
- B. A 17.5% indirect cost rate will be paid on work covered by the Agreement and all its modifications or task agreements. Non-CESU sub-recipients may be asked to follow the rate, but may not be required.
- C. Cooperator shall request payment in accordance with the following:
  - 1. **Method of Payment.** Payment will be made by advance and/or reimbursement through the Department of Treasury's Automated Standard Application for Payments (ASAP) system.
  - 2. **Requesting Advances.** Requests for advances must be submitted via the ASAP system. Requests may be submitted as frequently as required to meet the needs of the Financial Assistance (FA) Cooperator to disburse funds for the Federal share of project costs. If feasible, each request should be timed so that payment is received on the same day that the funds are dispersed for direct project costs and/or the proportionate share of any allowable indirect costs. If same-day transfers are not feasible, advance payments must be as close to actual disbursements as administratively feasible.
  - 3. **Requesting Reimbursement.** Requests for reimbursements must be submitted via the ASAP system. Requests for reimbursement should coincide with normal billing patterns. Each request must be limited to the amount of disbursements made for the Federal share of direct project costs and the proportionate share of allowable indirect costs incurred during that billing period.
  - 4. **Adjusting Payment Requests for Available Cash.** Funds that are available from repayments to, and interest earned on, a revolving fund, program income, rebates, refunds, contract settlements, audit recoveries, credits, discounts, and interest earned on any of those funds must be disbursed before requesting additional cash payments.
  - 5. **Bank Accounts.** All payments are made through electronic funds transfer to the bank account identified in the ASAP system by the FA Cooperator.
  - 6. **Supporting Documents and Agency Approval of Payments.** Additional supporting documentation and prior NPS approval of payments may be required when/if a FA Cooperator is determined to be "high risk" or has performance issues. If prior Agency payment approval is in effect for an award, the ASAP system will notify the FA Cooperator when they submit a request for payment. The Cooperator must then notify the NPS AO that a payment request has been submitted. The NPS AO may request additional information from the Cooperator to support the payment request prior to approving the release of funds, as deemed necessary. The FA Cooperator is required to comply with these requests. Supporting documents may include invoices, copies of contracts, vendor quotes, and other expenditure explanations that justify the reimbursement requests.

- D. **System for Award Management (SAM).** In order to receive a financial assistance award and to ensure proper payment, it is required that Cooperator maintain their registration with SAM, accessed at <http://www.sam.gov>. Failure to maintain registration can impact obligations and payments under this Agreement and/or any other financial assistance or procurements documents the Cooperator may have with the Federal government.
- E. **Anti-Deficiency Act.** Any award beyond the current fiscal year is subject to availability of funds; funds may be provided in subsequent fiscal years if project work is satisfactory and funding is available.
- F. **Allowable and Eligible Costs.** Expenses charged against awards under the Agreement may not be incurred prior to the beginning of the Agreement, and may be incurred only as necessary to carry out the approved objectives, scope of work and budget with prior approval from the NPS AO. The Cooperator shall not incur costs or obligate funds for any purpose pertaining to the operation of the project, program, or activities beyond the expiration date stipulated in the award.
- G. **Travel Costs.** For travel costs charged against awards under the Agreement, costs incurred must be considered reasonable and otherwise allowable only to the extent such costs do not exceed charges normally allowed by the Cooperator in its regular operations as the result of the Cooperator's written travel policy. If the Cooperator does not have written travel policies established, the Cooperator and its contractors shall follow the travel policies in the Federal Travel Regulation, and may not be reimbursed for travel costs that exceed the standard rates. All charges for travel must conform to the applicable cost principles.
- H. **Cooperator Cost Share or Match.** Any non-Federal share, whether in cash or in-kind, is expected to be paid out at the same general rate as the Federal share. Exceptions to this requirement may be granted by the AO based on sufficient documentation demonstrating previously determined plans for or later commitment of cash or in-kind contributions. In any case, the Cooperator must meet their cost share commitment over the life of the award.
- I. Nothing herein shall be construed as obligating the NPS to expend, or as involving the NPS in any contract or other obligation for the future payment of money, in excess of appropriations authorized by law and administratively allocated for specific work.

## ARTICLE VII – PRIOR APPROVAL

The Cooperator shall obtain prior approval for budget and program revisions, in accordance with 2 CFR 200.308.

## ARTICLE VIII – INSURANCE AND LIABILITY

- A. **Insurance.** The State of Tennessee is self-insured and does not carry or maintain commercial general liability insurance or medical, professional or hospital liability insurance. Any and all claims against the State of Tennessee, including the Institution or its employees, shall be heard and determined by the Tennessee Claims Commission in the manner prescribed by law. Damages recoverable against the Institution shall be expressly limited to claims paid by the Claims Commission pursuant to T.C.A. Section 9-8-301 et seq.
- B. **Flow-down:** For the purposes of this Article VIII, "Cooperator" includes such sub-Cooperators, contractors, or subcontractors as, in the judgment of the Cooperator and subject to the NPS's

determination of sufficiency, have sufficient resources and/or maintain adequate and appropriate insurance to achieve the purposes of this Article VIII.

## ARTICLE IX – REPORTS AND/OR DELIVERABLES

- A. Specific projects, tasks or activities for which funds are advanced will be tracked and reported by submission of a SF-425 Federal Financial Report (FFR) and narrative Performance Report, as specified in each individual task agreement.

## ARTICLE X – PROPERTY UTILIZATION

All equipment and facilities furnished by NPS will be on a loan basis. Equipment and facilities will be returned in the same condition received except for normal wear and tear in project use. Property management standards set forth in 2 CFR 200.310 through 200.316 apply to this Agreement.

## ARTICLE XX - CESU COOPERATIVE AND JOINT VENTURE AGREEMENT COMPLIANCE

In addition to the terms and conditions of this agreement, the Recipient shall also comply with the terms and conditions of the P14AC00882, Southern Appalachian Mountains Cooperative Ecosystem Studies Unit and Joint Venture Agreement. In the instance of conflicting terms and conditions, the terms and conditions of this agreement shall apply.

## ARTICLE XI – MODIFICATION, REMEDIES FOR NONCOMPLIANCE TERMINATION

- A. This Agreement may be modified only by a written instrument executed by the parties. Modifications will be in writing and approved by the NPS AO and the authorized representative of Cooperator.
- B. Additional conditions may be imposed by NPS if it is determined that the Cooperator is non-compliant to the terms and conditions of this agreement. Remedies for Noncompliance can be found in 2 CFR 200.338.
- C. This Agreement may be terminated consistent with applicable termination provisions for Agreements found in 2 CFR 200.339 through 200.342.

## ARTICLE XII – GENERAL AND SPECIAL PROVISIONS

### A. General Provisions

1. **OMB Circulars and Other Regulations.** The following Federal regulations are incorporated by reference into this Agreement (full text can be found at <http://www.ecfr.gov>):
  - a. **Administrative Requirements:** *2 CFR, Part 200 – Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, in its entirety;*
  - b. **Determination of Allowable Costs:** *2 CFR, Part 200 – Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, Subpart E; and*
  - c. **Audit Requirements:** *2 CFR, Part 200 – Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, Subpart F.*
  - d. **Code of Federal Regulations/Regulatory Requirements:** *2 CFR Part 182 & 1401, “Government-wide Requirements for a Drug-Free Workplace”;*

*2 CFR 180 & 1400*, “Non-Procurement Debarment and Suspension”, previously located at 43 CFR Part 42, “Governmentwide Debarment and Suspension (NonProcurement)”;

*43 CFR 18*, “New Restrictions on Lobbying”;

*2 CFR Part 175*, “Trafficking Victims Protection Act of 2000”;

*FAR Clause 52.203-12, Paragraphs (a) and (b)*, Limitation on Payments to Influence Certain Federal Transactions;

*2 CFR Part 25*, System for Award Management ([www.SAM.gov](http://www.SAM.gov)) and Data Universal Numbering System (DUNS); and

*2 CFR Part 170*, “Reporting Subawards and Executive Compensation”.

2. **Non-Discrimination.** All activities pursuant to this Agreement shall be in compliance with the requirements of Executive Order 11246, as amended; Title VI of the Civil Rights Act of 1964, as amended, (78 Stat. 252; 42 U.S.C. §§2000d et seq.); Title V, Section 504 of the Rehabilitation Act of 1973, as amended, (87 Stat. 394; 29 U.S.C. §794); the Age Discrimination Act of 1975 (89 Stat. 728; 42 U.S.C. §§6101 et seq.); and with all other federal laws and regulations prohibiting discrimination on grounds of race, color, sexual orientation, national origin, disabilities, religion, age, or sex.
3. **Lobbying Prohibition.** 18 U.S.C. §1913, Lobbying with Appropriated Moneys, as amended by Public Law 107-273, Nov. 2, 2002 - No part of the money appropriated by any enactment of Congress shall, in the absence of express authorization by Congress, be used directly or indirectly to pay for any personal service, advertisement, telegram, telephone, letter, printed or written matter, or other device, intended or designed to influence in any manner a Member of Congress, a jurisdiction, or an official of any government, to favor, adopt, or oppose, by vote or otherwise, any legislation, law, ratification, policy, or appropriation, whether before or after the introduction of any bill, measure, or resolution proposing such legislation, law, ratification, policy, or appropriation; but this shall not prevent officers or employees of the United States or of its departments or agencies from communicating to any such Members or official, at his request, or to Congress or such official, through the proper official channels, requests for legislation, law, ratification, policy, or appropriations which they deem necessary for the efficient conduct of the public business, or from making any communication whose prohibition by this section might, in the opinion of the Attorney General, violate the Constitution or interfere with the conduct of foreign policy, counter-intelligence, intelligence, or national security activities. Violations of this section shall constitute violations of section 1352(a) of title 31. In addition to the above, the related restrictions on the use of appropriated funds found in Div. F, § 402 of the Omnibus Appropriations Act of 2008 (P.L. 110-161) also apply.
4. **Anti-Deficiency Act.** Pursuant to 31 U.S.C. §1341 nothing contained in this Agreement shall be construed as binding the NPS to expend in any one fiscal year any sum in excess of appropriations made by Congress, for the purposes of this Agreement for that fiscal year, or other obligation for the further expenditure of money in excess of such appropriations.

5. **Minority Business Enterprise Development.** Pursuant to Executive Order 12432 it is national policy to award a fair share of contracts to small and minority firms. NPS is strongly committed to the objectives of this policy and encourages all Cooperators of its Cooperative Agreements to take affirmative steps to ensure such fairness by ensuring procurement procedures are carried out in accordance with the Executive Order.
6. **Assignment.** No part of this Agreement shall be assigned to any other party without prior written approval of the NPS and the Assignee.
7. **Member of Congress.** Pursuant to 41 U.S.C. § 22, no Member of Congress shall be admitted to any share or part of any contract or agreement made, entered into, or adopted by or on behalf of the United States, or to any benefit to arise thereupon.
8. **Agency.** The Cooperator is not an agent or representative of the United States, the Department of the Interior, NPS, or the Park, nor will the Cooperator represent its self as such to third parties. NPS employees are not agents of the Cooperator and will not act on behalf of the Cooperator.
9. **Non-Exclusive Agreement.** This Agreement in no way restricts the Cooperator or NPS from entering into similar agreements, or participating in similar activities or arrangements, with other public or private agencies, organizations, or individuals.
10. **Survival.** Any and all provisions which, by themselves or their nature, are reasonably expected to be performed after the expiration or termination of this Agreement shall survive and be enforceable after the expiration or termination of this Agreement. Any and all liabilities, actual or contingent, which have arisen during the term of and in connection with this Agreement shall survive expiration or termination of this Agreement.
11. **Partial Invalidity.** If any provision of this Agreement or the application thereof to any party or circumstance shall, to any extent, be held invalid or unenforceable, the remainder of this Agreement or the application of such provision to the parties or circumstances other than those to which it is held invalid or unenforceable, shall not be affected thereby and each provision of this Agreement shall be valid and be enforced to the fullest extent permitted by law.
12. **Captions and Headings:** The captions, headings, article numbers and paragraph numbers appearing in this Agreement are inserted only as a matter of convenience and in no way shall be construed as defining or limiting the scope or intent of the provision of this Agreement nor in any way affecting this Agreement.
13. **No Employment Relationship.** This Agreement is not intended to and shall not be construed to create an employment relationship between NPS and Cooperator or its representatives. No representative of Cooperator shall perform any function or make any decision properly reserved by law or policy to the Federal government.
14. **No Third-Party Rights.** This Agreement creates enforceable obligations between only NPS and Cooperator. Except as expressly provided herein, it is not intended nor shall it be construed to create any right of enforcement by or any duties or obligation in favor of persons or entities not a party to this Agreement.

15. **Foreign Travel.** The Cooperator shall comply with the provisions of the Fly America Act (49 USC 40118). The implementing regulations of the Fly America Act are found at 41 CFR 301-10.131 through 301-10.143.

**B. Special Provisions**

**1. Public Information and Endorsements.**

- a. Cooperator shall not publicize or otherwise circulate promotional material (such as advertisements, sales brochures, press releases, speeches, still and motion pictures, articles, manuscripts or other publications) which states or implies governmental, Departmental, bureau, or government employee endorsement of a business, product, service, or position which the Cooperator represents. No release of information relating to this award may state or imply that the Government approves of the Cooperator's work products, or considers the Cooperator's work product to be superior to other products or services.
- b. All information submitted for publication or other public releases of information regarding this project shall carry the following disclaimer.
- c. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government.
- d. Cooperator must obtain prior Government approval for any public information releases concerning this award which refer to the Department of the Interior or any bureau or employee (by name or title). The specific text, layout photographs, etc. of the proposed release must be submitted with the request for approval.
- e. Cooperator further agrees to include this provision in a subaward to a subrecipient, except for a subaward to a State government, a local government, or to a federally recognized Indian tribal government.

- 2. Publications of Results of Studies.** No party will unilaterally publish a joint publication without consulting the other party. This restriction does not apply to popular publications of previously published technical matter. Publications pursuant to this Agreement may be produced independently or in collaboration with others; however, in all cases proper credit will be given to the efforts of those parties contribution to the publication. In the event no agreement is reached concerning the manner of publication or interpretation of results, either party may publish data after due notice and submission of the proposed manuscripts to the other. In such instances, the party publishing the data will give due credit to the cooperation but assume full responsibility for any statements on which there is a difference of opinion.

- 3. Rights in Data.** The Cooperator must grant the United States of America a royalty-free, non-exclusive and irrevocable license to publish, reproduce and use, and dispose of in any manner and for any purpose without limitation, and to authorize or ratify publication, reproduction or use by others, of all copyrightable material first produced or composed under this Agreement by the Cooperator, its employees or any individual or concern specifically employed or assigned to originate and prepare such material.

- 4. Retention and Access Requirements for Records.** All Cooperator financial and programmatic records, supporting documents, statistical records, and other grants-related records shall be maintained and available for access in accordance with 2 CFR Part 200.333-200.337.

**5. Audit Requirements.**

- a. Non-Federal entities that expend \$750,000 or more during a year in Federal awards shall have a single or program-specific audit conducted for that year in accordance with the Single Audit Act Amendments of 1996 (31 U.S.C. 7501-7507) and 2 CFR Part 200, Subpart F, which is available at <http://www.ecfr.gov/cgi-bin/text-idx?SID=fd6463a517ceea3fa13e665e525051f4&node=sp2.1.200.f&rgn=div6>
- b. Non-Federal entities that expend less than \$750,000 for a fiscal year in Federal awards are exempt from Federal audit requirements for that year, but records must be available for review or audit by appropriate officials of the Federal agency, pass-through entity, and General Accounting Office (GAO).
- c. Audits shall be made by an independent auditor in accordance with generally accepted government auditing standards covering financial audits. Additional audit requirements applicable to this agreement are found at 2 CFR Part 200, Subpart F, as applicable. Additional information on single audits is available from the Federal Audit Clearinghouse at <http://harvester.census.gov/sac/>.

**6. Procurement Procedures.** It is a national policy to place a fair share of purchases with minority business firms. The Department of the Interior is strongly committed to the objectives of this policy and encourages all Cooperators of its grants and cooperative agreements to take affirmative steps to ensure such fairness. Positive efforts shall be made by Cooperators to utilize small businesses, minority-owned firms, and women's business enterprises, whenever possible. Cooperators of Federal awards shall take all of the following steps to further this goal:

- a. Ensure that small businesses, minority-owned firms, and women's business enterprises are used to the fullest extent practicable.
- b. Make information on forthcoming opportunities available and arrange time frames for purchases and contracts to encourage and facilitate participation by small businesses, minority-owned firms, and women's business enterprises.
- c. Consider in the contract process whether firms competing for larger contracts intend to subcontract with small businesses, minority-owned firms, and women's business enterprises.
- d. Encourage contracting with consortiums of small businesses, minority-owned firms and women's business enterprises when a contract is too large for one of these firms to handle individually.
- e. Use the services and assistance, as appropriate, of such organizations as the Small Business Development Agency in the solicitation and utilization of small business, minority-owned firms and women's business enterprises.

**7. Prohibition on Text Messaging and Using Electronic Equipment Supplied by the Government while Driving.** Executive Order 13513, Federal Leadership On Reducing Text Messaging While Driving, was signed by President Barack Obama on October 1, 2009. This Executive Order introduces a Federal Government-wide prohibition on the use of text messaging while driving on official business or while using Government-supplied equipment. **Additional guidance enforcing the ban will be issued at a later date.** In the meantime, please adopt and enforce policies that immediately ban text messaging while driving company-owned or –rented vehicles, government-owned or leased vehicles, or while driving privately owned vehicles when on official government business or when performing any work for or on behalf of the government.



8. **Seat Belt Provision.** The Cooperator is encouraged to adopt and enforce on-the-job seat belt use policies and programs for their employees when operating company-owned, rented, or personally owned vehicles. These measures include, but are not limited to, conducting education, awareness, and other appropriate programs for their employees about the importance of wearing seat belts and the consequences of not wearing them.
9. **Trafficking in Persons.** This term of award is pursuant to paragraph (g) of Section 106 of the Trafficking Victims Protections Act of 2000, as amended (2 CFR §175.15).
  - a. Provisions applicable to a Cooperator that is a private entity.
    1. You as the Cooperator, your employees, subCooperators under this award, and subrecipients' employees may not-
      - i. Engage in severe forms of trafficking in persons during the period of time that the award is in effect;
      - ii. Procure a commercial sex act during the period of time that the award is in effect; or
      - iii. Use forced labor in the performance of the award or subawards under the award.
    2. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a subrecipient that is a private entity-
      - i. Is determined to have violated a prohibition in paragraph a.1 of this award term; or
      - ii. Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph a.1 of this award term through conduct that is either:
        - a. Associated with performance under this award; or
        - b. Imputed to you or the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, "OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (NonProcurement)," as implemented by our agency at 2 CFR part 1400.
  - b. Provision applicable to a Cooperator other than a private entity. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a subrecipient that is a private entity-
    1. Is determined to have violated an applicable prohibition in paragraph a.1 of this award term; or
    2. Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph a.1 of this award term through conduct that is either:
      - i. Associated with performance under this award; or
      - ii. Imputed to the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, "OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (NonProcurement)," as implemented by our agency at 2 CFR part 1400.
  - c. Provisions applicable to any Cooperator.

1. You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph a.1 of this award term.
  2. Our right to terminate unilaterally that is described in paragraph a.2 or b of this section:
    - i. Implements section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 USC 7104(g)), and
    - ii. Is in addition to all other remedies for noncompliance that are available to us under this award.
  3. You must include the requirements of paragraph a.1 of this award term in any subaward you make to a private entity.
- d. Definitions. For purposes of this award term:
1. “Employee” means either:
    - i. An individual employed by you or a subrecipient who is engaged in the performance of the project or program under this awards; or
    - ii. Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.
  2. “Forced labor” means labor obtained by any of the following methods: The recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.
  3. “Private entity” means:
    - i. Any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 CFR 175.25; and
    - ii. Includes:
      - a. A nonprofit organization, including any nonprofit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 CFR 175.25(b).
      - b. A for-profit organization.
  4. “Severe forms of trafficking in persons,” “commercial sex act,” and “coercion” have the meanings given at section 103 of the TVPA, as amended (22 USC 7102).

**10. Cooperator Employee Whistleblower Rights and Requirement to Inform Employees of Whistleblower Rights.**

- a. This award and employees working on this financial assistance agreement will be subject to the whistleblower rights and remedies in the pilot program on Award Cooperator employee whistleblower protections established at 41 U.S.C. 4712 by section 828 of the National Defense Authorization Act for Fiscal Year 2013 (Pub. L. 112-239).
- b. The Award Cooperator shall inform its employees in writing, in the predominant language of the workforce, of employee whistleblower rights and protections under 41 U.S.C. 4712.

- c. The Award Cooperator shall insert the substance of this clause, including this paragraph (c), in all subawards or subcontracts over the simplified acquisition threshold, 42 CFR § 52.203-17 (as referenced in 42 CFR § 3.908-9).

## 11. Reporting Subawards and Executive Compensation

- a. Reporting of first-tier subawards.
  - 1. Applicability. Unless you are exempt as provided in paragraph D. of this award term, you must report each action that obligates \$25,000 or more in Federal funds that does not include Recovery Act funds (as defined in section 1512(a)(2) of the American Recovery and Reinvestment Act of 2009, Pub. L. 111–5) for a subaward to an entity (see definitions in paragraph E. of this award term).
  - 2. Where and when to report.
    - i. You must report each obligating action described in paragraph A.1. of this award term to <http://www.fsrs.gov>.
    - ii. For subaward information, report no later than the end of the month following the month in which the obligation was made. (For example, if the obligation was made on November 7, 2014, the obligation must be reported by no later than December 31, 2014.)
  - 3. What to report. You must report the information about each obligating action that the submission instructions posted at <http://www.fsrs.gov> specify.
- b. Reporting Total Compensation of Cooperator Executives.
  - 1. Applicability and what to report. You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if—
    - i. The total Federal funding authorized to date under this award is \$25,000 or more;
    - ii. In the preceding fiscal year, you received—
      - a. 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and
      - b. \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and
    - iii. The public does not have access to information about the compensation of the 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. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)
  - 2. Where and when to report. You must report executive total compensation described in paragraph A.1. of this award term:
    - i. As part of your registration profile at <https://www.sam.gov>.

- ii. By the end of the month following the month in which this award is made, and annually thereafter.
- c. Reporting of total compensation of subrecipient executives.
  - 1. Applicability and what to report. Unless you are exempt as provided in paragraph D. of this award term, for each first-tier subrecipient under this award, you shall report the names and total compensation of each of the subrecipient's five most highly compensated executives for the subrecipient's preceding completed fiscal year, if—
    - i. In the subrecipient's preceding fiscal year, the subrecipient received—
      - a. 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and
      - b. \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and subawards); and
    - ii. The public does not have access to information about the compensation of the 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. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)
  - 2. Where and when to report. You must report subrecipient executive total compensation described in paragraph c.1. of this award term:
    - i. To the Cooperator.
    - ii. By the end of the month following the month during which you make the subaward. For example, if a subaward is obligated on any date during the month of October of a given year (i.e., between October 1 and 31), you must report any required compensation information of the subrecipient by November 30 of that year.
- d. Exemptions.
  - 1. If, in the previous tax year, you had gross income, from all sources, under \$300,000, you are exempt from the requirements to report:
    - i. Subawards, and
    - ii. The total compensation of the five most highly compensated executives of any subrecipient.
- e. Definitions. For purposes of this award term:
  - 1. Entity means all of the following, as defined in 2 CFR part 25:
    - i. A Governmental organization, which is a State, local government, or Indian tribe;
    - ii. A foreign public entity;
    - iii. A domestic or foreign nonprofit organization;
    - iv. A domestic or foreign for-profit organization;

- v. A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.
- 2. Executive means officers, managing partners, or any other employees in management positions.
- 3. Subaward:
  - i. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the Cooperator award to an eligible subrecipient.
  - ii. The term includes your procurement of property and services needed to carry out the project or program. The term does not include procurement of incidental property and services needed to carry out the award project or program.
  - iii. A subaward may be provided through any legal agreement, including an agreement that you or a subrecipient considers a contract.
- 4. Subrecipient means an entity that:
  - i. Receives a subaward from you (the Cooperator) under this award; and
  - ii. Is accountable to you for the use of the Federal funds provided by the subaward.
- 5. Total compensation means the cash and noncash dollar value earned by the executive during the Cooperator's or subrecipient's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):
  - i. Salary and bonus.
  - ii. Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.
  - iii. Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.
  - iv. Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.
  - v. Above-market earnings on deferred compensation which is not tax-qualified.
  - vi. Other compensation, if the aggregate value of all such other compensation (e.g. severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds \$10,000.

## 12. Conflict of Interest

- a. The Cooperator must establish safeguards to prohibit its employees and Subrecipients from using their positions for purposes that constitute or present the appearance of a personal or organizational conflict of interest. The Cooperator is responsible for notifying the Awarding Officer in writing of any actual or potential conflicts of interest that may arise during the life of this award. Conflicts of interest include any relationship or matter which might place the

Cooperator or its employees in a position of conflict, real or apparent, between their responsibilities under the agreement and any other outside interests. Conflicts of interest may also include, but are not limited to, direct or indirect financial interests, close personal relationships, positions of trust in outside organizations, consideration of future employment arrangements with a different organization, or decision-making affecting the award that would cause a reasonable person with knowledge of the relevant facts to question the impartiality of the Cooperator and/or Cooperator's employees and Subrecipients in the matter.

- b. The Awarding Officer and the servicing Ethics Counselor will determine if a conflict of interest exists. If a conflict of interest exists, the Awarding Officer will determine whether a mitigation plan is feasible. Mitigation plans must be approved by the Awarding Officer in writing.
- c. Failure to resolve conflicts of interest in a manner that satisfies the government may be cause for termination of the award. Failure to make required disclosures may result in any of the remedies described in 2 CFR § 200.338, Remedies/or Noncompliance, including suspension or debarment (see also 2 CFR Part 180).

13. **Minimum Wages Under Executive Order 13658 (January 2015)**

- a. *Definitions.* As used in this clause—
  - “United States” means the 50 states and the District of Columbia.
  - “Worker”—
    - 1. Means any person engaged in performing work on, or in connection with, an agreement covered by [Executive Order 13658](#), and
      - i. Whose wages under such agreements are governed by the Fair Labor Standards Act (29 U.S.C. chapter 8), the Service Contract Labor Standards statute (41 U.S.C. chapter 67), or the Wage Rate Requirements (Construction) statute (40 U.S.C. chapter 31, subchapter IV),
      - ii. Other than individuals employed in a bona fide executive, administrative, or professional capacity, as those terms are defined in [29 C.F.R. § 541](#),
      - iii. Regardless of the contractual relationship alleged to exist between the individual and the employer.
    - 2. Includes workers performing on, or in connection with, the agreement whose wages are calculated pursuant to special certificates issued under [29 U.S.C. § 214\(c\)](#).
    - 3. Also includes any person working on, or in connection with, the agreement and individually registered in a bona fide apprenticeship or training program registered with the Department of Labor's Employment and Training Administration, Office of Apprenticeship, or with a State Apprenticeship Agency recognized by the Office of Apprenticeship.
- b. *Executive Order Minimum Wage rate.*
  - 1. The Cooperator shall pay to workers, while performing in the United States, and performing on, or in connection with, this agreement, a minimum hourly wage rate of \$10.10 per hour beginning January 1, 2015.

2. The Cooperator shall adjust the minimum wage paid, if necessary, beginning January 1, 2016 and annually thereafter, to meet the Secretary of Labor's annual E.O. minimum wage. The Administrator of the Department of Labor's Wage and Hour Division (the Administrator) will publish annual determinations in the Federal Register no later than 90 days before the effective date of the new E.O. minimum wage rate. The Administrator will also publish the applicable E.O. minimum wage on [www.wdol.gov](http://www.wdol.gov) (or any successor Web site) and on all wage determinations issued under the Service Contract Labor Standards statute or the Wage Rate Requirements (Construction) statute. The applicable published E.O. minimum wage is incorporated by reference into this agreement.
3.
  - i. The Cooperator may request a price adjustment only after the effective date of the new annual E.O. minimum wage determination. Prices will be adjusted only if labor costs increase as a result of an increase in the annual E.O. minimum wage, and for associated labor costs and relevant subaward costs. Associated labor costs shall include increases or decreases that result from changes in social security and unemployment taxes and workers' compensation insurance, but will not otherwise include any amount for general and administrative costs, overhead, or profit.
  - ii. Subrecipients may be entitled to adjustments due to the new minimum wage, pursuant to paragraph (b)(2). Cooperators shall consider any Subrecipient requests for such price adjustment.
  - iii. The Awarding Officer will not adjust the agreement price under this clause for any costs other than those identified in paragraph (b)(3)(i) of this clause, and will not provide duplicate price adjustments with any price adjustment under clauses implementing the Service Contract Labor Standards statute or the Wage Rate Requirements (Construction) statute.
4. The Cooperator warrants that the prices in this agreement do not include allowance for any contingency to cover increased costs for which adjustment is provided under this clause.
5. The Cooperator shall pay, unconditionally to each worker, all wages due free and clear without subsequent rebate or kickback. The Cooperator may make deductions that reduce a worker's wages below the E.O. minimum wage rate only if done in accordance with [29 C.F.R. § 10.23](#), Deductions.
6. The Cooperator shall not discharge any part of its minimum wage obligation under this clause by furnishing fringe benefits or, with respect to workers whose wages are governed by the Service Contract Labor Standards statute, the cash equivalent thereof.
7. Nothing in this clause shall excuse the Cooperator from compliance with any applicable Federal or State prevailing wage law or any applicable law or municipal ordinance establishing a minimum wage higher than the E.O. minimum wage. However, wage increases under such other laws or municipal ordinances are not subject to price adjustment under this subpart.

8. The Cooperator shall pay the E.O. minimum wage rate whenever it is higher than any applicable collective bargaining agreement(s) wage rate.
  9. The Cooperator shall follow the policies and procedures in [29 C.F.R. § 10.24\(b\)](#) and 10.28 for treatment of workers engaged in an occupation in which they customarily and regularly receive more than \$30 a month in tips.
- c.
1. This clause applies to workers as defined in paragraph (a). As provided in that definition—
    - i. Workers are covered regardless of the contractual relationship alleged to exist between the Cooperator or Subrecipient and the worker;
    - ii. Workers with disabilities whose wages are calculated pursuant to special certificates issued under [29 U.S.C. § 214\(c\)](#) are covered; and
    - iii. Workers who are registered in a bona fide apprenticeship program or training program registered with the Department of Labor's Employment and Training Administration, Office of Apprenticeship, or with a State Apprenticeship Agency recognized by the Office of Apprenticeship, are covered.
  2. This clause does not apply to—
    - i. Fair Labor Standards Act (FLSA) – covered individuals performing in connection with contracts covered by the E.O., *i.e.* those individuals who perform duties necessary to the performance of the agreement, but who are not directly engaged in performing the specific work called for by the agreement, and who spend less than 20 percent of their hours worked in a particular workweek performing in connection with such agreements;
    - ii. Individuals exempted from the minimum wage requirements of the FLSA under [29 U.S.C. § 213\(a\)](#) and 214(a) and (b), unless otherwise covered by the Service Contract Labor Standards statute, or the Wage Rate Requirements (Construction) statute. These individuals include but are not limited to—
      - A. Learners, apprentices, or messengers whose wages are calculated pursuant to special certificates issued under [29 U.S.C. § 214\(a\)](#).
      - B. Students whose wages are calculated pursuant to special certificates issued under [29 U.S.C. § 214\(b\)](#).
      - C. Those employed in a bona fide executive, administrative, or professional capacity ([29 U.S.C. § 213\(a\)\(1\)](#) and [29 C.F.R. § part 541](#)).
- d. *Notice.* The Cooperator shall notify all workers performing work on, or in connection with, this agreement of the applicable E.O. minimum wage rate under this clause. With respect to workers covered by the Service Contract Labor Standards statute or the Wage Rate Requirements (Construction) statute, the Contractor may meet this requirement by posting, in a prominent and accessible place at the worksite, the applicable wage determination under those statutes. With respect to workers whose wages are governed by the FLSA, the Cooperator



shall post notice, utilizing the poster provided by the Administrator, which can be obtained at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts), in a prominent and accessible place at the worksite. Cooperators that customarily post notices to workers electronically may post the notice electronically provided the electronic posting is displayed prominently on any Web site that is maintained by the Cooperator, whether external or internal, and customarily used for notices to workers about terms and conditions of employment.

e. *Payroll Records.*

1. The Cooperator shall make and maintain records, for three years after completion of the work, containing the following information for each worker:
  - i. Name, address, and social security number;
  - ii. The worker's occupation(s) or classification(s);
  - iii. The rate or rates of wages paid;
  - iv. The number of daily and weekly hours worked by each worker;
  - v. Any deductions made; and
  - vi. Total wages paid.
2. The Cooperator shall make records pursuant to paragraph (e)(1) of this clause available for inspection and transcription by authorized representatives of the Administrator. The Cooperator shall also make such records available upon request of the Contracting Officer.
3. The Cooperator shall make a copy of the agreement available, as applicable, for inspection or transcription by authorized representatives of the Administrator.
4. Failure to comply with this paragraph (e) shall be a violation of [29 C.F.R. § 10.26](#) and this agreement. Upon direction of the Administrator or upon the Awarding Officer's own action, payment shall be withheld until such time as the noncompliance is corrected.
5. Nothing in this clause limits or otherwise modifies the Cooperator's payroll and recordkeeping obligations, if any, under the Service Contract Labor Standards statute, the Wage Rate Requirements (Construction) statute, the Fair Labor Standards Act, or any other applicable law.

f. *Access.* The Cooperator shall permit authorized representatives of the Administrator to conduct investigations, including interviewing workers at the worksite during normal working hours.

g. *Withholding.* The Awarding Officer, upon his or her own action or upon written request of the Administrator, will withhold funds or cause funds to be withheld, from the Cooperator under this or any other Federal agreement with the same Cooperator, sufficient to pay workers the full amount of wages required by this clause.

h. *Disputes.* Department of Labor has set forth in [29 C.F.R. § 10.51](#), Disputes concerning Cooperator compliance, the procedures for resolving disputes concerning an Cooperator's compliance with Department of Labor regulations at [29 C.F.R. § 10](#). Such disputes shall be resolved in accordance with those. This includes disputes between the Cooperator (or any of its Subrecipients) and the contracting agency, the Department of Labor, or the workers or their

representatives.

- i. *Antiretaliation.* The Cooperator shall not discharge or in any other manner discriminate against any worker because such worker has filed any complaint or instituted or caused to be instituted any proceeding under or related to compliance with the E.O. or this clause, or has testified or is about to testify in any such proceeding.
- j. *Subcontractor compliance.* The Cooperator is responsible for Subrecipient compliance with the requirements of this clause and may be held liable for unpaid wages due Subrecipient workers.
- i. *Subawards.* The Cooperator shall include the substance of this clause, including this paragraph (k) in all subawards, regardless of dollar value, that are subject to the Service Contract Labor Standards statute or the Wage Rate Requirements (Construction) statute, and are to be performed in whole or in part in the United States.

#### ARTICLE XIII – ATTACHMENTS

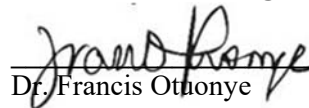
Attachment A. SF-424 – Application for Federal Assistance, incorporated by reference.

Attachment B. SF-424 B – Assurances, incorporated by reference

#### ARTICLE XIV – SIGNATURES

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the date(s) set forth below.

**Tennessee Technological University**

  
\_\_\_\_\_  
Dr. Francis Othonye  
Associate Vice President of Research

03/08/2019

Date

**The National Park Service**

**BRIAN STRAKA** Digitally signed by BRIAN STRAKA  
Date: 2019.03.20 11:00:34 -04'00'

\_\_\_\_\_  
Brian J. Straka  
Financial Assistance Awarding Officer

## Upload #7

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted  
Document Title: Project Summary

## Project Summary

Project Name: Conservation Science to Support Recovery Implementation for the Hardin Crayfish and Pristine Crayfish: Genetics, Life History, and Species Status Assessment

Applicant: Tennessee Technological University; Hayden Mattingly (PI) and Carla Hurt (Co-PI)

### Applicant Address and Contact Information:

Hayden Mattingly, Professor and Director  
School of Environmental Studies  
Tennessee Tech, Cookeville TN 38505  
Telephone: (931) 349-6387  
Email: [hmattingly@tntech.edu](mailto:hmattingly@tntech.edu)

Carla Hurt, Associate Professor  
Department of Biology  
Tennessee Tech, Cookeville TN 38505  
Telephone: (931) 372-3143  
Email: [churt@tntech.edu](mailto:churt@tntech.edu)

Type of Project: Recovery Implementation

Summary of Proposed Project and Location: We propose to develop a Species Status Assessment document for the Hardin Crayfish, *Faxonius wrighti*. To facilitate SSA development, we will study the species' genetics, distribution, abundance, life cycle, habitat use, and watershed threats to provide current information on taxonomic status, population resiliency, redundancy, and representation, to enable development of SSA components such as the influence diagram, current condition matrix and future condition scenarios. This information is currently unknown for Hardin Crayfish and will be needed to effectively design and implement appropriate conservation strategies. In addition to our work on Hardin Crayfish, we will also provide a 12-month life history study of the Pristine Crayfish, *Cambarus pristinus*, because this information is currently unknown and therefore limiting the effective design and implementation of conservation strategies. We will also study water temperatures profiles in Pristine Crayfish streams to better understand the potential threat posed by construction of small impoundments in their watersheds. The project will be located in Hardin and McNairy counties of southwestern Tennessee and Alcorn County of northeastern Mississippi for the Hardin Crayfish, and centered around Cumberland County, Tennessee, for the Pristine Crayfish. The researchers are based at Tennessee Tech University in Cookeville, Putnam County, Tennessee.

Requested Funding = \$100,000 with the project beginning September 2021 and ending August 2023.

Matching Funding: Although matching is not required, we understand per the FOA that additional points will be awarded based on the amount of cost share provided. Therefore, Tennessee Tech commits to providing a PhD assistantship (\$1750 per month stipend plus tuition and fees) from January 2022 to August 2023. In addition, the CESU indirect cost rate of 17.5% will be used which results in Tech waiving 24.5% of indirect costs from its federally negotiated rate of 42%. Total match = \$89,759.

## Upload #8

Applicant: Tennessee Technological University  
Application Number: FWS-ES2021001983  
Project Title: Conservation Science to Support Recovery Implementation for the Hardin  
Crayfish and Pristine Crayfish: Genetics, Life  
History, and Species Status A  
Status: Submitted  
Document Title: Project Narrative

## **Project Narrative**

### **Project Title**

Conservation Science to Support Recovery Implementation for the Hardin Crayfish and Pristine Crayfish: Genetics, Life History, and Species Status Assessment

### **Description of Entities Undertaking the Project**

Tennessee Tech University, located in Cookeville, Tennessee, is a public institution of higher education with an enrollment of approximately 10,000 students. The university has a new laboratory science building and extensive facilities to support successful completion of the project. The Principal Investigator will be Hayden Mattingly, Professor and Director of Environmental Studies. His contact information is (931) 349-6387 and [hmattingly@tnitech.edu](mailto:hmattingly@tnitech.edu). Dr. Mattingly earned his Ph.D. in Fisheries from University of Missouri-Columbia in 1999 and has conducted numerous projects on endangered aquatic species over the past 25 years. The Co-Principal Investigator is Carla Hurt, Associate Professor of Biology. Dr. Hurt earned her Ph.D. from Arizona State University and is an expert on conservation genetics of aquatic species, especially crustaceans. Her contact information is (931) 372-3143 and [churt@tnitech.edu](mailto:churt@tnitech.edu). Brooke Grubb will be the doctoral student working on the Hardin Crayfish components of the project and Kendell Hamm will be the master's student working on the Pristine Crayfish components of the project. The students will work collaboratively under the direct supervision of Drs. Hurt and Mattingly. Brooke Grubb earned her bachelor's degree from Southeast Missouri State University and master's degree from Austin Peay State University where she studied the population genetics of Pristine Crayfish. Kendell Hamm earned her bachelor's degree from Birmingham Southern College where she conducted research on endangered darters near Birmingham, Alabama. The four personnel from Tennessee Tech will be frequently interacting with U.S. Fish and Wildlife Service personnel to develop the components of the Hardin Crayfish SSA document and to study Pristine Crayfish life history.

### **Statement of Need**

The project is necessary because the Hardin Crayfish and Pristine Crayfish have been petitioned for federal listing and listing decisions are due in the next 1-3 years. A Species Status Assessment (SSA) for Pristine Crayfish is already under development by Tennessee Tech personnel (Hayden Mattingly and Kendell Hamm) but an SSA has not been started for Hardin Crayfish. There is very little biological or scientific information available for Hardin Crayfish and this project will provide the necessary knowledge to enable production of a high-quality SSA. The genetics research on Hardin Crayfish will also clarify its taxonomic status which is currently in question. Knowledge of stressors, current condition, and predictions of future condition for both species will be needed to implement recovery strategies. The life history of Pristine Crayfish is currently unknown and this information will be vital to designing and implementing effective conservation strategies. In short, the implementation of recovery actions will be greatly enhanced by the conservation science provided by the proposed project.

## Project Purpose

We propose to develop a Species Status Assessment for the Hardin Crayfish in collaboration with U.S. Fish and Wildlife Service Region 4 personnel. Development of the SSA will entail gathering new information on the current condition of Hardin Crayfish, describing its genetic diversity, clarifying its taxonomic status, building an influence diagram, and developing well-informed future condition scenarios. We will conduct field surveys to gather Hardin Crayfish seasonal life cycle information, habitat use, tissues for genetic analyses, and to assess watershed stressors. We will also sequence the Hardin Crayfish genome to enable more accurate genetic analyses. For the Pristine Crayfish, we will conduct a formal 12-month life history study in at least two populations to better understand the biology and ecology of this species. We will also collect data on stream water temperatures in relation to small impoundments that are suspected to be influencing Pristine Crayfish populations.

The targeted species are Hardin Crayfish, *Faxonius wrighti*, located in Tennessee and Mississippi, and Pristine Crayfish, *Cambarus pristinus*, located in Tennessee. The proposed project fits into the recovery strategy for the species by providing scientific information that is vital to developing the SSA (in the case of Hardin Crayfish) and to understanding life history and watershed stressors (in the case of Pristine Crayfish). Without the proposed study, it will be difficult to design recovery strategies that can effectively (a) target the most vulnerable aspects of the species' biology/ecology and (b) mitigate and manage stressors that exist within their occupied watersheds.

## Project Objectives

- *Objective 1.* Produce a Species Status Assessment document for the Hardin Crayfish in collaboration with USFWS Region 4 personnel by August 2023.
- *Objective 2.* Achieve a thorough understanding of Hardin Crayfish conservation genetics by sequencing its genome and analyzing population-level genetic diversity to (a) clarify its taxonomic status and (b) provide information needed to characterize population representation for the SSA.
- *Objective 3.* Survey all known Hardin Crayfish populations in multiple seasons of the year to quantify distribution and abundance, collect tissues for genetic analyses, gather life cycle information, describe habitat use, and assess watershed stressors to provide information needed to (a) characterize resiliency and redundancy for the SSA, (b) construct an influence diagram and current condition matrix for the SSA, and (c) produce plausible future condition scenarios for the SSA.
- *Objective 4.* Acquire an understanding of Pristine Crayfish life history by collecting monthly life history data on at least two populations ( $\geq 1$  population in Caney Fork and  $\geq 1$  population in Sequatchie River) for a contiguous 12-month period.
- *Objective 5.* Measure water temperatures in Pristine Crayfish streams in relation to small impoundments to provide data needed to evaluate and address the potential effects of impoundments on Pristine Crayfish population resiliency and viability.

## Timetable or Milestones

The proposed project will run for two years beginning September 1, 2021 and ending August 31, 2023. Hardin Crayfish mitochondrial analyses will be conducted early in the project to provide a framework for population-level SNP genotyping. Field trips will occur in multiple seasons of the year beginning in Fall 2021. Development of the Hardin SSA document will begin in Fall 2021 and the SSA document will be completely drafted by August 2023. Pristine Crayfish life history and water temperature collection will begin in September 2021 and continue through August 2022. Data analyses will take place in late 2022 into early 2023, and a final report will be submitted by autumn of 2023.

Project Objectives and Activities	2021 Sept.- Dec.	2022 Jan.- Apr.	2022 May- Aug.	2022 Sept.- Dec.	2023 Jan.- Apr.	2023 May- Aug.
Interim Project Report						
Final Project Report						
Hardin Crayfish, <i>Faxonius wrighti</i>						
• Objective 1. Species Status Assessment document preparation						
• Objective 2. Tissue collections and whole genome sequencing (WGS) and assembly						
• Objective 2. Mitochondrial sequencing and genotyping-by-sequencing (GBS)						
• Objective 2. Genetic sequence analyses						
• Objective 3. Surveys for distribution, abundance, life cycle, habitat, and watershed stressors						
Pristine Crayfish, <i>Cambarus pristinus</i>						
• Objective 4. Twelve-month life history sampling						
• Objective 5. Small impoundments and water temperatures						



## Methodology

*Background Information for Hardin Crayfish Methods.* The Hardin Crayfish (*Faxonius wrighti*) is a species of conservation concern due to its limited distribution in western tributary systems of the Tennessee River (Figure 1). The crayfish has been assigned the status of imperiled species (Taylor et al. 2007; NatureServe 2021), an IUCN listing of vulnerable (Adams et al. 2010), and state listing of endangered in Tennessee. It has been petitioned for federal listing under the U.S. Endangered Species Act. The Hardin Crayfish exhibits a disjunct distribution in Beason Creek, Snake Creek, Robinson Creek, and Chambers Creek in southwestern Tennessee and northern Mississippi. The species has not been collected in the mainstem Tennessee River despite multiple surveys in the area (Rohrbach and Withers 2006; Thoma 2018). The Hardin Crayfish has been petitioned for listing and an SSA will be needed prior to the listing decision. Information regarding habitat requirements, taxonomy, and the geographic patterns of genetic variation will be needed to design and implement effective management strategies to ensure the persistence of this species.

Habitat degradation including sedimentation and poor water quality have likely contributed to population declines and fragmentation of the Hardin Crayfish. In its original description, Hobbs (1948) noted that the species was patchily distributed within headwater tributaries and was associated with patches of rock/rubble substrates and low velocities (also see Rohrbach and Withers 2006). In a more recent survey in 2015, Thoma (2018) noted that the Hardin Crayfish was absent at sites that mainly consisted of fine substrates due to sedimentation overload from non-point runoff. Population densities for this species appear to be low; surveys in 2004-2005 (Rohrbach and Withers 2006) and again in 2015 (Thoma 2018) observed fewer than 20 individuals at several of the surveyed sites. Small, genetically isolated populations are at increased risk of extirpation due to effects of genetic drift. When the number of reproductive individuals is small, stochastic fluctuations in allele frequencies can lead to fixation of deleterious alleles, and a loss of adaptive genetic variation (Frankham 1995; Angermeier 1995; Bradburd et al. 2013; Souty-Grosset 2016). Sedimentation and disruption of migration corridors are leading factors in the decline of several crayfish, including two federally listed species, Guyanadotte Crayfish (*Cambarus veteranus*) and Big Sandy Crayfish (*Cambarus callainus*) (Allert et al. 2013; Richman et al. 2015; Loughman et al. 2016; 2017).

Preliminary genetic analyses raise questions regarding the taxonomic status of the Hardin Crayfish. Phylogenetic reconstructions based on a 630 bp region of the mitochondrial gene cytochrome oxidase I (COI) recovers the Hardin Crayfish as a paraphyletic group that also includes two other congeneric species, the Reticulate Crayfish (*F. erichsonianus*) and the Spinywrist Crayfish (*F. yanahindus*) (Figure 2). These three species had been assigned to three different subgenera based on differences in gonopod morphology in first-form males (Fitzpatrick 1987). Gonopod morphology has historically played an important role in crayfish taxonomy and identification; however, molecular evidence has shown that gonopods demonstrate convergent evolution and may misrepresent evolutionary relationships between species (Taylor and Knouft 2006). Similarities in color patterns support molecular evidence suggesting a closer relationship between these three species (Schuster 2020; Figure 3). An integrative species delimitation analysis that combines population-level genomic sampling, morphology, and ecology can be used to clarify these relationships. A robust assessment of

the taxonomic boundaries of this species group will be needed to determine the conservation status of the Hardin Crayfish.

Moreover, little is known regarding life history, habitat ecology, and watershed threats to the Hardin Crayfish—all vital information needed to accurately prepare the SSA document and guide the listing decision along with other conservation activities. As detailed below, we will collect current data in multiple seasons to describe important life cycle events such as molting, reproductive maturity, and longevity. In these field surveys, we will also characterize habitat use and identify watershed threats and other influences. This new information will be directly applied to developing the components of the SSA document such as the influence diagram, current condition matrix, and future condition scenarios.

In summary, this portion of our research project would investigate geographic patterns of genetic variation, taxonomic relationships, habitat requirements, and life-cycle characteristics of the Hardin Crayfish to inform an SSA for this species. This new information would be used to inform population resiliency, redundancy, and representation which would be described in an SSA document that we would produce in conjunction and coordination with USFWS personnel.

*Hardin Crayfish Tissue Collections.* Field trips to streams occupied by the Hardin Crayfish will be performed to efficiently address all activities needed for habitat characterization, life history assessment, and tissue collections for molecular work. Sample sites for molecular analyses will include all historical populations of the Hardin Crayfish and representative populations of the Reticulate Crayfish and the Spinywrist Crayfish from throughout their respective distributions (Table 1). In addition to newly collected tissues, we will also have access to additional tissues collected by Tennessee Valley Authority biologists (TVA; Jeff Simmons, pers. comm). We will collect tissue samples for genetic analyses while surveying for distribution and abundance.

*Hardin Crayfish Mitochondrial Sequencing.* For each of the sampled populations across all three species, up to 15-30 individuals will be selected for Sanger sequencing at two mitochondrial genes (CO1 and 16S); these regions have been shown to be informative for phylogenetic reconstruction and species delimitation in other crayfish groups (Bloom et al. 2019, Hurt et al. 2019, Owens et al. 2105). Net pairwise sequence divergence for the mitochondrial COI barcoding gene will be estimated using the Kimura-2-parameter distance method. This region is well represented in public sequence databases and is commonly used for preliminary species delimitation, making it ideal for cross-study comparisons. Concatenated sequence datasets will be used in phylogenetic reconstructions; analyses will include both maximum likelihood and Bayesian optimality criteria as well as haplotype network analyses. Results from phylogenetic reconstructions based on mitochondrial data sets will then be used to generate initial hypotheses regarding taxonomic relationships.

*Hardin Crayfish Single Nucleotide Polymorphisms.* Genome-wide patterns of genetic variation for the Hardin Crayfish will be investigated using single nucleotide polymorphism (SNP) datasets generated using the genotyping-by-sequencing (GBS) method (Elshire *et al.* 2011). Between 15-30 individuals per population will be included for SNP genotyping. We will document individuals via digital images, collect a single chela per individual, and release individuals back to the stream. This protocol has successfully been used in our lab to both identify and genotype hundreds of population-level SNP

markers in the Nashville Crayfish (*F. shoupi*) and the Bigclaw Crayfish (*F. placidus*) species complex; the resulting datasets have been highly informative for taxonomic delimitation and for reconstructing demographic histories (Hildreth *et al.* in prep, Hurt *et al.* in review). All equipment needed for Sanger sequencing, GBS library preparation, and next-generation sequencing is already available in the Hurt Lab and at the Water Center at Tennessee Tech University.

Performance of GBS for SNP identification is greatly enhanced by the use of whole genome sequence (WGS) data for the alignment of independent sequence reads. We will perform WGS and assembly (30X coverage) for a single *F. wrighti* individual collected from the type locality. Genome assembly will be performed using the assembly pipeline SOAPdenovo2 (Ruibang *et al.* 2012). The assembled genome will serve as a reference for alignment of read data and will provide information regarding linkage of SNPs, improving estimates of demographic parameters including effective population size ( $N_e$ ). This would be the first whole genome sequence available for the crayfish genus *Faxonius* and would facilitate ongoing molecular studies of regionally endemic species of conservation interest within this genus.

Bioinformatic workflows, including quality filtering, de-multiplexing, locus assembly, and genotyping will be implemented using the software pipeline iPyrad (Eaton 2020) and will take place on the high-performance computer cluster at Tennessee Tech. We will apply the reference sequence assembly protocol for tag alignment and SNP identification using the WGS from the representative *F. wrighti* genome generated in this study.

*Hardin Crayfish Molecular Analyses.* Standard measures of within population genetic variation, including observed/expected heterozygosity and nucleotide diversity, will be estimated using the package *diveRsity* in the R statistical suite (Keenan *et al.* 2013). For populations with sufficient sample sizes (>20 individuals), effective population sizes will be estimated using the software LDNe (Waples and Do 2008). We will also examine demographic histories using the test for excess heterozygosity and mode shift test as performed in the software BOTTLENECK (Piry *et al.* 1999). The geographic structure of genetic variation will be investigated using pairwise  $F_{ST}'$  and  $\Phi_{ST}$  (Bird *et al.* 2011), Bayesian assignment tests (Pritchard 2000), and Discriminant Analysis of Principal Components (Jombart 2010).

Species delimitation analyses will be performed using both single locus and multi-locus methods. Single locus methods, including the Generalized Mixed Yule-Coalescent model (GMYC; Pons *et al.* 2006; Fujisawa and Barraclough 2013), Automated Barcode Gap Discovery method (ABGD; Puillandre 2012), and the Bayesian Phylogenetics and Phylogeography (BPP) (Yang 2015), will be applied to mitochondrial sequence datasets and genomic SNP datasets will be analyzed using the coalescent-based Bayesian Phylogenetics and Phylogeography method (BPP; Yang 2015, Rannala and Yang 2017). Molecular based species assignments will be combined with population-level observations of morphological characters and color patterns to clarify taxonomic boundaries among the Hardin Crayfish, the Reticulate Crayfish, and the Spinywrist Crayfish.

*Hardin Crayfish Species Status Assessment.* In addition to the conservation genetics work described above, we will also be producing an SSA document for the Hardin Crayfish. The SSA framework provides a rigorous, science-based process for evaluating species for listing decisions and

implementing management actions to promote species recovery (USFWS 2016a). The SSA document contains the biological and ecological information needed to guide important decisions related to implementation of provisions in the U.S. Endangered Species Act of 1973, such as species listing, recovery planning, consultations, and permitting (USFWS 2016a). The document can be updated through time as new information is discovered.

Our approach to developing the Hardin Crayfish SSA will follow the guidance provided in the USFWS Species Status Assessment Framework (USFWS 2016b). We will also widely review examples of existing SSAs for other species, especially focusing on those completed for other crayfishes, including the Brawleys Fork Crayfish and Pristine Crayfish SSAs currently under development by our research team. Briefly, the general sequence of steps will include (1) compilation of current scientific information known about the species, including taxonomy, life history and ecology; (2) summary of ecological and environmental factors known or suspected to influence affect individuals, populations, and the species and its habitat; (3) plausible explanations for past and current changes in distribution and abundance across the species' geographic range; and (4) future projections of the species' response to different scenarios of environmental conditions and conservation actions. We will work closely with USFWS colleagues as part of a Hardin Crayfish SSA development team to compose the document in a timely fashion.

*Hardin Crayfish Life Cycle, Habitat, and Watershed Threats.* Sampling for tissues (described above) will be dovetailed with collection of information on life cycle, habitat, and watershed conditions. This information will greatly facilitate development of the influence diagram, current condition matrix, and future condition scenarios for the SSA. We will sample seasonally (approximately 4 times per year) to collect information on Hardin Crayfish distribution, abundance, timing of molting, population length frequency (to determine age class structure), timing of reproductive events, sex ratios, and other relevant life history information. We will also measure habitat conditions where Hardin Crayfish are located, including water velocity, water depth, and substrate conditions. The adjacent watershed conditions will be characterized by on-ground habitat quality metrics (such as provided by Tennessee Department of Environment and Conservation) and augmented with GIS analyses of adjacent landcover and other potential influences or threats in the stream watersheds occupied by Hardin Crayfish.

*Background Information for Pristine Crayfish Methods.* The Pristine Crayfish (*Cambarus pristinus*) is known from the upper Caney Fork River watershed on the Cumberland Plateau physiographic province (Rorhbach and Withers 2006). Two morphological forms of the species, representing two genetically distinct clades (Grubb 2019), reside in the upper Caney Fork River and the upper Sequatchie River watersheds on the plateau. Johansen et al. (2016) studied the geographic distribution and population densities of the Caney Fork nominal form. Johansen (2018) modeled Pristine Crayfish habitat relationships and evaluated its rarity compared to other crayfish taxa, while Grubb (2019) studied Pristine Crayfish phylogeography and population genetics.

An SSA document is currently under development for the Pristine Crayfish. The SSA development team identified the lack of knowledge regarding Pristine Crayfish life history as the most important missing information for the species. The lack of life history information places limitations on developing and implementing the most effective conservation strategies.

Also, during the SSA development process, it became clear in the expert elicitation meetings that one of the primary suspected influences and threats to Pristine Crayfish appears to be the proliferation of small impoundments within its watersheds, particularly in headwater stream reaches. The suspected stressor is alteration of the natural stream temperature profile, with warmer-than-usual summer temperatures predicted to negatively impact the resiliency of Pristine Crayfish populations. Collecting data on stream temperatures associated in areas with and without impoundments will provide important insight into this potential threat.

*Pristine Crayfish Life History Study.* Life history information for two or three populations of Pristine Crayfish will be collected for 12 months beginning in September 2021 and ending in August 2022. We will select at least one population in the Caney Fork system and at least one population in the Sequatchie River system. Populations will be selected from streams that support sufficient densities to allow collection of 100 individuals per month. Most if not all individuals will be measured on site and released unharmed. A few ovigerous females ( $\leq 10$  per site for the whole study) may be retained for laboratory counts of embryos to develop regression models of fecundity as a function of female body size.

For the life history study, we will use the standard approach of repeated monthly sampling to collect data including body size (carapace length), reproductive status, length frequency, size at maturity, sex ratios, growth and longevity, frequency of molting, timing of reproductive events, fecundity, color morphs, and presence/absence of branchiobdellid worms or porcelain disease. Population age class structure and individual age-class growth rates will be determined using monthly length-frequency histograms. Life history study sites will be located on stream reaches where we obtain landowner permission to access 0.6-1.0 km of contiguous stream habitat. Three 200-m reaches will be established at each site for rotational sampling, whereby one reach is sampled only once during each season of the year to reduce disturbance to the individuals in the study area. We have used this approach with success for our current life-history study of Brawleys Fork Crayfish (Giddens and Mattingly 2020).

*Pristine Crayfish Small Impoundment Study.* During development of the Pristine Crayfish SSA, we became aware (through expert elicitations) that small impoundments in or near headwater streams represent a potential stressor to Pristine Crayfish populations. We propose to collect information to help inform the validity of this potential influence and threat to the species. We will deploy stream water temperature loggers in multiple locations throughout the range of Pristine Crayfish and collect data over an annual cycle. We will analyze stream temperature patterns in relation to spatial proximity to small impoundments, using GIS and other spatial approaches as needed. Other water quality data will be collected monthly to augment the water temperature data, but water temperature will be the primary focus of our attention, due to its suspected role in observed Pristine Crayfish declines subsequent to small impoundment installation.

## Project Deliverables

The Hardin Crayfish, *Faxonius wrighti*, and Pristine Crayfish, *Cambarus pristinus*, are found primarily in Tennessee, with Hardin Crayfish also known from northern Mississippi. Both species have been petitioned for federal listing, with listing decisions due in the upcoming 1-3 years. Herein we request \$100,000 to fund conservation-science studies to support recovery implementation. The project will leverage matching funds from Tennessee Tech University in the amount of \$89,759. Deliverables will include a Species Status Assessment (SSA) document incorporating new information on genetic diversity, life-cycle patterns, habitat, and watershed threats for the Hardin Crayfish, along with a 12-month formal life-history study for the Pristine Crayfish with new information on influences such as stream water temperatures and small impoundments. Specific details regarding project deliverables are provided below:

- We will produce a complete Species Status Assessment for the Hardin Crayfish (*F. wrighti*) in collaboration with USFWS colleagues on the SSA development team.
- We will document distribution, abundance, and important life cycle events, habitat use, and watershed influence for the Hardin Crayfish on a seasonal basis and incorporate that information into the SSA document.
- We will provide information on genetic variation and phylogenetic relationships among the Hardin crayfish, the Reticulate Crayfish (*F. erichsonianus*), and the Spinywrist Crayfish (*F. yanahindus*) to enhance the accuracy of the SSA in terms of the conservation status of the Hardin Crayfish. The genetic variation will also immediately inform the resiliency, representation, and redundancy components needed for the SSA.
- We will sequence the entire genome of the Hardin Crayfish. The reference whole-genome sequence (WGS) generated from this project will not only allow us to more accurately reconstruct demographic histories, population structure, and taxonomic boundaries for the Hardin Crayfish, but will also inform other molecular-based investigations into patterns of genetic diversity in related *Faxonius* crayfish in the southeastern United States. Our lab is currently investigating the genetic structure of several other regionally endemic species in the genus *Faxonius*, including the Bigclaw Crayfish (*F. placidus*), the Nashville Crayfish (*F. shoupi*), the Saddle Crayfish (*F. durrelli*), and the Surgeon Crayfish (*F. forceps*). A representative WGS for *Faxonius* will be valuable for establishing conservation priorities in these related studies. Reference genomes can be used to improve demographic parameter estimates, population structure, and signatures of adaptation (McMahon et al. 2014, Shafer et al. 2015).
- All information gathered from the approach described above will be fed directly into development of the Hardin Crayfish SSA document which will be coordinated with USFWS personnel in a similar fashion to the SSAs currently being developed for the Pristine Crayfish and Brawleys Fork Crayfish (Kendell Hamm, Hayden Mattingly).

- We will provide a full 12-month life history study of Pristine Crayfish. Knowledge of life history will allow better recovery strategies to implement recovery actions for the species. For example, the timing of molting, timing of reproduction, population age-class structure, length of juvenile period, longevity, and prevalence of porcelain disease are currently unknown.
- We will deliver stream water temperature data profiles and analysis of temperature and other water quality patterns in relation to small impoundments located near Pristine Crayfish populations. We will provide an assessment of the potential influence of small impoundments and stream water temperatures on the viability of Pristine Crayfish populations.

### **Project Location**

*Field Sites.* The Hardin Crayfish has a limited geographic range in Hardin and McNairy counties in southwestern Tennessee and Alcorn County in northeastern Mississippi (Figure 1). The Pristine Crayfish has a limited geographic range on the Cumberland Plateau in Tennessee, with two distinct taxonomic forms distributed separately in the upper Caney Fork and Sequatchie River watersheds (Figure 4).

*Laboratory Site.* The laboratory components of the study will be conducted in the newly constructed Laboratory Science Commons building on the campus of Tennessee Tech University in Cookeville, Tennessee. The campus is centrally located in between the geographic distributions of the two focal crayfish species.

### **Coordination with State and/or Other Federal Agencies, or Other Partners**

We will be working with U.S. Fish and Wildlife personnel based in the Region 4 Office (Atlanta, GA) and the Tennessee Ecological Services Field Office (Cookeville, TN) as part of an SSA team to develop the components of the Hardin Crayfish SSA document. The Hardin Crayfish SSA team leader will be an employee of USFWS and the team members will include Hayden Mattingly and Brooke Grubb from Tennessee Tech and biologists from the USFWS field office. This approach will be similar to that taken with the SSA development team for Brawleys Fork Crayfish and Pristine Crayfish. We will also coordinate with state biologists (e.g., Tennessee Department of Environment and Conservation, Tennessee Wildlife Resources Agency) and other species experts (e.g., Austin Peay State University, Fisk University, Tennessee Valley Authority) during the SSA development process. The requested funding builds upon (but does not overlap in scope) the funding provided by U.S. Fish and Wildlife Service to develop an SSA for the Brawleys Fork Crayfish and Pristine Crayfish which is scheduled to end in September 2021.

### **Duration of Proposed Project**

The project will begin on September 1, 2021 and end on August 31, 2023. The timing of each objective is given in the “Timetable or Milestones” section above.

## **Statement Regarding Partial Funding of the Project**

If necessary, the project could be divided into separate projects for the Hardin Crayfish (Objectives 1, 2, and 3) and the Pristine Crayfish (Objective 4 and 5) at an estimated cost of \$55,000 for Hardin Crayfish objectives and \$45,000 for Pristine Crayfish objectives. It would be more efficient in terms of personnel time and resources to keep the projects bundled together.

## **Criteria for Success**

For Hardin Crayfish, the incremental improvements will be knowledge of current condition, watershed stressors, and scenarios for future condition as components of the SSA that will be developed during this proposed project. Further, we will acquire an understanding of resiliency, redundancy, and representation through the field work and genetics work on Hardin Crayfish – these factors are currently unknown. We will also sequence the genome of Hardin Crayfish, an accomplishment that will not only aid in conservation of this species, but other crayfish species in genus *Faxonius*, which contains several endangered crayfishes in the southeastern United States. For Pristine Crayfish, the incremental improvements will be knowledge of life history for both forms (Caney Fork and Sequatchie) – life history is currently unknown for this species which is limiting the development of appropriate conservation actions. For example, we will be able to better assess population resiliency if we understand timing of molting, reproduction, juvenile period, age class structure, and longevity. Further, we will examine water temperatures in relation to small impoundments to better understand the potential impacts of this suspected stressor to Pristine Crayfish populations. One population has already disappeared after construction of a small impoundment within its watershed. The success of the project will be measured in the quantity and quality of current scientific information produced for each crayfish species as described in the deliverables section of the proposal. The proposed project requests \$100,000 from U.S. Fish and Wildlife Service and leverages a matching amount of \$89,759 from Tennessee Tech University.

## **Information to Support Environmental Compliance Review Requirements**

To the best of our knowledge, there are no applicable issues regarding NEPA, ESA, or NHPA for either of these crayfish species. Federal permits will not be required to conduct the proposed research. We will continue to maintain Tennessee Wildlife Resources Agency scientific collecting permits, and we will apply for a Mississippi state permit if collections or surveys are conducted in northeastern Mississippi.

## **Information on Key Project Personnel**

The Principal Investigator will be Hayden Mattingly, Professor and Director of Environmental Studies. Dr. Mattingly earned his Ph.D. in Fisheries from University of Missouri-Columbia in 1999 and has conducted numerous projects on endangered aquatic species. His CV and Google Scholar profile are accessible at the following link: <https://www.tntech.edu/directory/cis/ses/hayden-mattingly.php>. The Co-Principal Investigator is Carla Hurt, Associate Professor of Biology. Dr. Hurt earned her Ph.D. from



Arizona State University and is an expert on conservation genetics of aquatic species, especially crustaceans. Brooke Grubb will be the doctoral student working on the Hardin Crayfish components of the project and Kendell Hamm will be the master's student working on the Pristine Crayfish components of the project. Brooke Grubb earned her bachelor's degree from Southeast Missouri State University and master's degree from Austin Peay State University where she studied the population genetics of Pristine Crayfish. Kendell Hamm earned her bachelor's degree from Birmingham Southern College where she did her senior research project on endangered darters near Birmingham, Alabama.

### **Supporting Information**

Additional supporting information can be provided upon request.

### **Budget Narrative**

*Personnel.* Faculty members at Tennessee Tech are paid by the university on a nine-month salary. Faculty earnings during summer months are optional and can be supported through teaching, administration, or external grants. Hayden Mattingly will serve as Principal Investigator (PI) and will devote approximately two weeks in the summer of 2022 to the project, for an amount of **\$2,500**. Carla Hurt will serve as Co-PI and will also devote approximately two weeks during summer 2022 to the project, for an amount of **\$2,500**. Brooke Grubb will serve as a Graduate Research Assistant on the project, with **\$7,000** requested to cover her stipend from September through December 2021. Tennessee Tech's Water Center will cover her stipend from January 2022 through August 2023 as a **\$31,500** match to the project. Kendell Hamm will also serve as a Graduate Research Assistant on the project, with **\$20,300** requested to cover her stipend from October 2021 through December 2022. Personnel Summary: **\$32,300** is requested from U.S. Fish and Wildlife Service and **\$31,500** will be provided in matching funds by Tennessee Tech.

*Benefits.* The benefit rate for faculty summer pay is 18.36% for Hayden Mattingly and 17.65% for Carla Hurt, yielding an amount of **\$900**. Tuition and fees for Brooke Grubb in the first semester of her assistantship will be **\$3,946**; after the first semester, Tennessee Tech's Water Center will cover tuition and fees with a matching amount of **\$17,027**. Tuition and fees for Kendell Hamm will total **\$14,364**. Benefits Summary: **\$19,210** is requested from U.S. Fish and Wildlife Service and **\$17,027** will be provided in matching funds from Tennessee Tech.

*Travel.* Travel to field sites in Hardin and McNairy counties (Hardin Crayfish) and Cumberland County (Pristine Crayfish) will be required to gather the scientific information for the project. Approximately five week-long trips, one in each season of the year and two in the summer, will be made to Hardin and McNairy counties, yielding a total of 3,000 miles. Two reconnaissance trips will be needed to obtain landowner permission to sample on private lands, for a total of 1,200 miles. Multiplying by the mileage reimbursement rate of \$0.55/mile yields an amount of **\$2,310**. Lodging and per diem for field work is estimated to be \$300/day for five days for three workers, multiplied by five trips yields an amount of **\$7,500**. Lodging and per diem for reconnaissance trips is estimated to be \$200/day for three days for

two workers, multiplied by two trips yields an amount of **\$1,200**. Travel to Cumberland County field sites for Pristine Crayfish sampling will occur once per month for 12 months, plus four reconnaissance trips, yielding a total of 2,400 miles. Multiplying by the mileage reimbursement rate of \$0.55/mile yields an amount of **\$1,320**. Overnight stays will not be required for the Pristine Crayfish sampling trips. Travel to one or more scientific conferences to make presentations on the project results will occur in the second year for Brooke Grubb, Kendell Hamm, Carla Hurt, and Hayden Mattingly. A formal presentation of preliminary findings to the funding agency can also be arranged during the first and second years. Receiving peer feedback during presentations will improve the overall quality of the final report. Conference travel expenses are estimated to be **\$3,670**, which includes registration, lodging, per diem, and transportation expenses for four personnel. Travel Summary: **\$16,000** is requested from U.S. Fish and Wildlife Service.

*Supplies.* The genetic analyses detailed above will total **\$14,000**. Also, in the first year we will purchase a computer for Brooke Grubb to use for data entry, data analyses, spatial analyses, word processing, and related duties for the project (**\$2,200**). Finally, we will need approximately **\$1,396** for field and laboratory supplies and consumables. Supplies Summary: **\$17,596** is requested from U.S. Fish and Wildlife Service.

*Total Direct Costs.* Summing the values for personnel, benefits, travel, and supplies yields a total direct cost of **\$85,106** to U.S. Fish and Wildlife Service and **\$48,527** to Tennessee Tech. No pre-project costs are included in the project costs.

*Indirect Costs.* Tennessee Technological University is a State Controlled Institution of Higher Education that is submitting this proposal for consideration under the Cooperative Ecosystem Studies Unit Network, which has a Department of the Interior-approved indirect cost rate cap of 17.5%. If we have an approved indirect cost rate with our cognizant agency, we understand that we must apply this reduced rate against the same direct cost base as identified in our approved indirect cost rate agreement. If we do not have an approved indirect cost rate with our cognizant agency, we understand that we must charge indirect costs against the modified total direct cost base defined in 2 CFR 200.68 "Modified Total Direct Cost (MTDC)". We understand that we must request prior approval from the Service to use the 2 CFR 200 MTDC base instead of the base identified in our approved indirect cost rate agreement. We understand that Service approval of such a request will be based on: 1) a determination that our approved base is only a subset of the MTDC (such as salaries and wages); and 2) that use of the MTDC base will still result in a reduction of the total indirect costs to be charged to the award. In accordance with 2 CFR 200.405, we understand that indirect costs not recovered due to a voluntary reduction to our federally negotiated rate are not allowable for recovery via any other means. Indirect costs are calculated at 17.5% of modified total direct costs per the CESU agreement. Indirect costs requested from the agency are **\$14,894**. TTU utilizes an on-campus rate of 42.0% of total direct costs excluding capital expenditures (buildings, individual items of equipment, alterations and renovations), that portion of each subaward in excess of \$25,000 and flow-through funds. The rate was set by the Department of Health and Human Services in an agreement signed March 23, 2017 and effective through June 30, 2021. Tennessee Tech University defines a year as July 1 to June 30. As a match to the

project, Tennessee Tech will waive indirect costs of **\$20,851** and absorb contributed indirect costs of **\$20,381**. Indirect Costs Summary: **\$14,894** is requested from U.S. Fish and Wildlife Service and **\$41,232** will be provided by Tennessee Tech.

*Total Costs.* Adding the total direct costs, \$85,106, and indirect costs, \$14,894, yields a total of **\$100,000** requested from U.S. Fish and Wildlife Service. Tennessee Tech's total contributions sum to **\$89,759**, thereby yielding a total project cost of **\$189,759**.

## Detailed Budget

	9/1/2021-8/31/2022	TTU/WC MATCH	9/1/2022-8/31/2023	TTU/WC MATCH	AGENCY	TTU/WC MATCH
	<u>Year 1</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 2</u>	<u>TOTAL</u>	<u>TOTAL</u>
<b>SALARIES</b>						
Hayden Mattingly (Summer Pay)	\$ 2,500	\$ -	\$ -	\$ -	\$ 2,500	\$ -
Carla Hurt (Summer Pay)	\$ 2,500	\$ -	\$ -	\$ -	\$ 2,500	\$ -
Graduate Research Assistant (PhD--Brooke Grubb)	\$ 7,000	\$ 14,000	\$ -	\$ 17,500	\$ 7,000	\$ 31,500
Graduate Research Assistant (MS--Kendell Hamm)	\$ 15,400	\$ -	\$ 4,900	\$ -	\$ 20,300	\$ -
<b>TOTAL SALARIES</b>	\$ 27,400	\$ 14,000	\$ 4,900	\$ 17,500	\$ 32,300	\$ 31,500
<b>EMPLOYEE BENEFITS</b>						
Summer Pay (Hayden Mattingly--18.36%)	\$ 459	\$ -	\$ -		\$ 459	
Summer Pay (Carla Hurt--17.65%)	\$ 441	\$ -	\$ -		\$ 441	
Tuition and Fees (Brooke Grubb)	\$ 3,946	\$ 10,418	\$ -	\$ 6,609	\$ 3,946	\$ 17,027
Tuition and Fees (Kendell Hamm)	\$ 10,181	\$ -	\$ 4,183		\$ 14,364	
<b>TOTAL EMPLOYEE BENEFITS</b>	\$ 15,027	\$ 10,418	\$ 4,183	\$ 6,609	\$ 19,210	\$ 17,027
Travel	\$ 8,000	\$ -	\$ 8,000		\$ 16,000	
Supplies	\$ 5,798	\$ -	\$ 11,798		\$ 17,596	
<i>Subtotal of Direct Costs</i>	\$ 56,225	\$ 24,418	\$ 28,881	\$ 24,109	\$ 85,106	\$ 48,527
Indirect Costs (17.5%)	\$ 9,840		\$ 5,054		\$ 14,894	
Waived Indirect Costs (24.5%)		\$ 13,775		\$ 7,076		\$ 20,851
Contributed Indirect Costs (42%)		\$ 10,256		\$ 10,125		\$ 20,381
<b>TOTAL</b>	\$ 66,065	\$ 48,449	\$ 33,935	\$ 41,310	\$ 100,000	\$ 89,759

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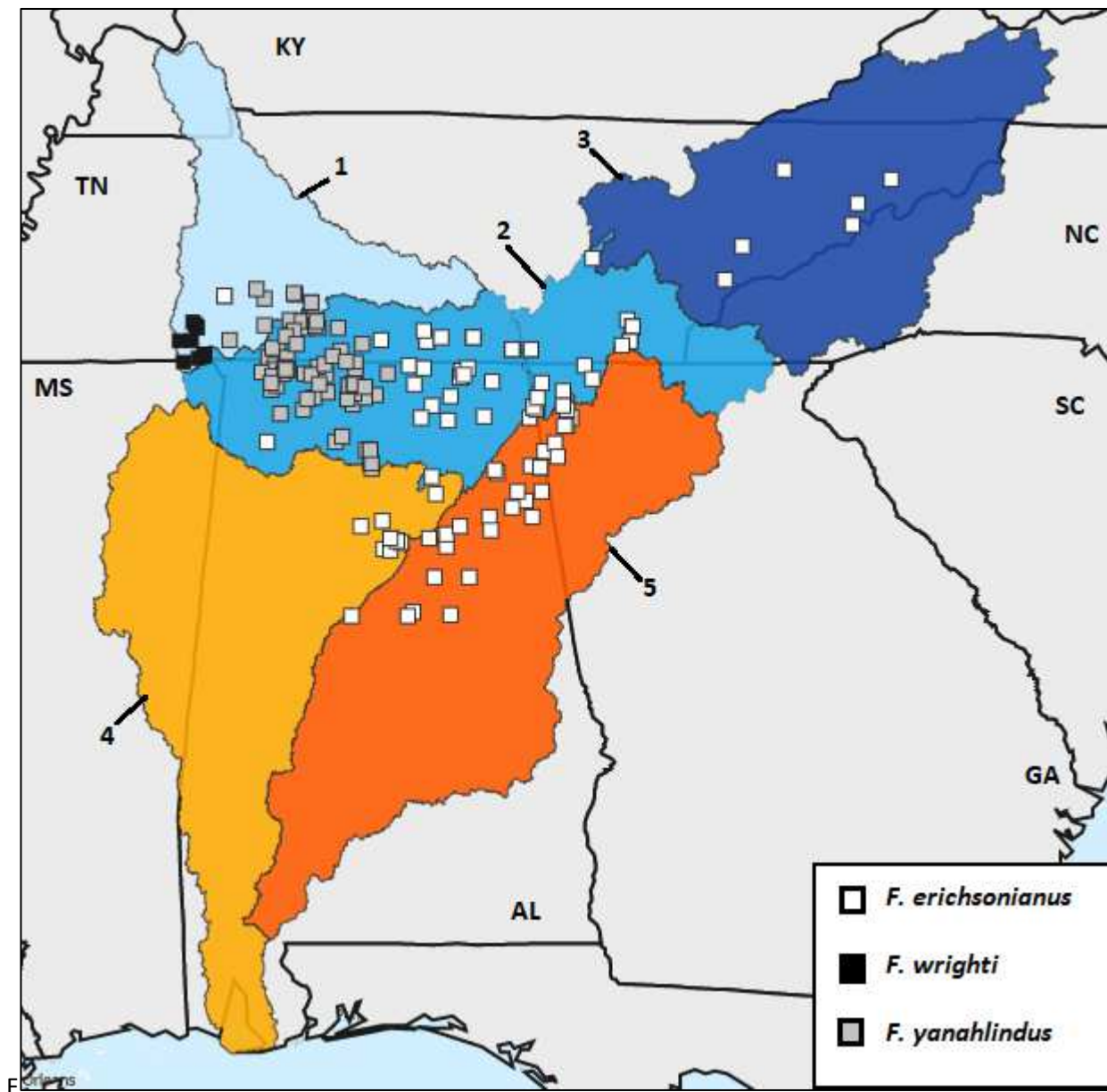
## Tables

**Table 1.** Proposed sampling drainages and number of populations for the Hardin Crayfish (*Faxonius wrighti*), the Reticulate Crayfish (*F. erichsonianus*), and the Spinywrist Crayfish (*F. yanahindus*).

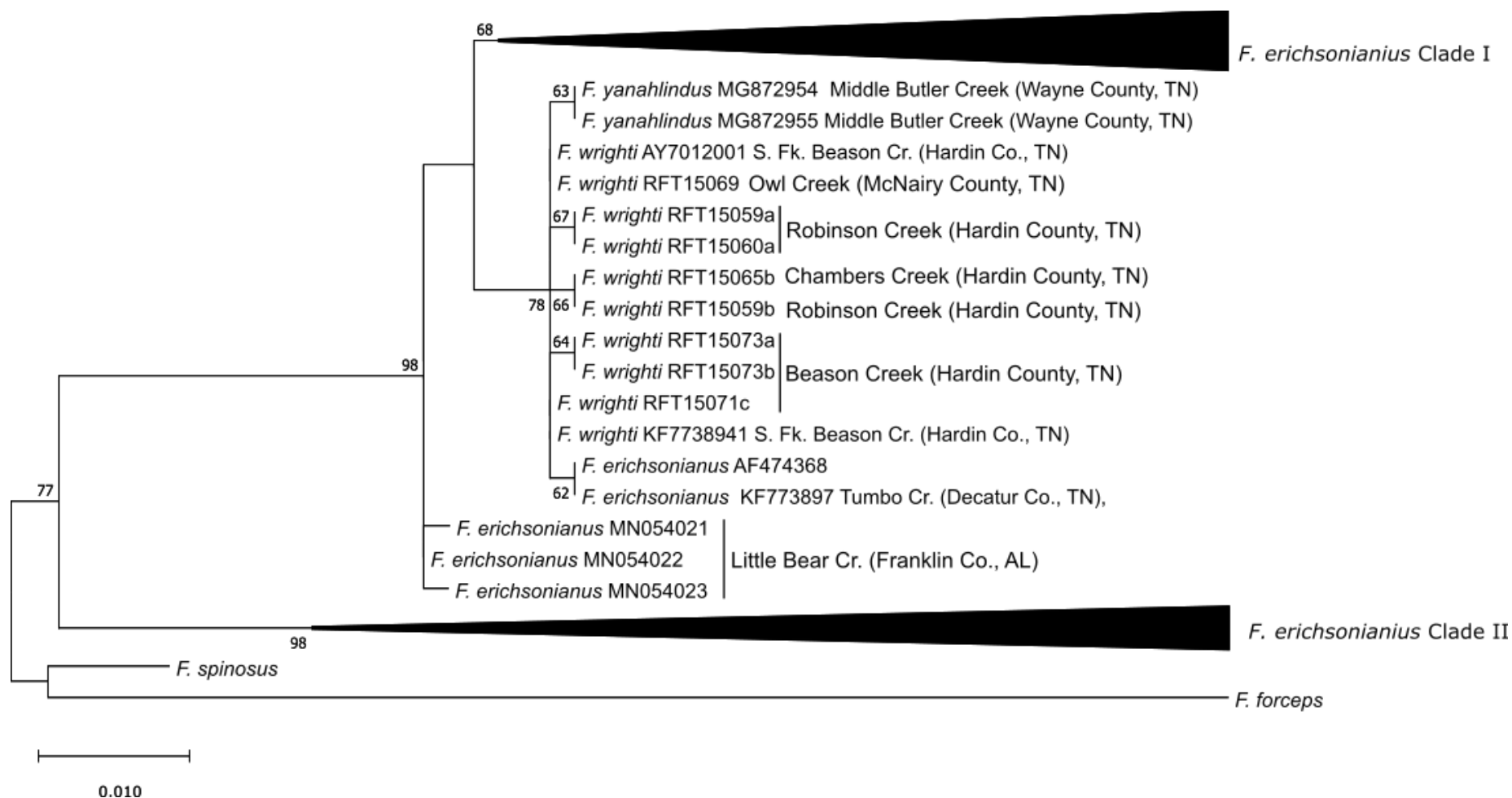
Species	Major Drainage	Minor Drainage	Number of Populations
Hardin Crayfish	Tennessee River (Lower)	Beason Creek	10
Hardin Crayfish	Tennessee River (Lower)	Robinson Creek	4
Hardin Crayfish	Tennessee River (Lower)	Snake Creek	3
Hardin Crayfish	Tennessee River (Lower)	Chambers Creek	2
Hardin Crayfish	Tennessee River (Lower)	Owl Creek	7
Reticulate Crayfish	Tennessee River (Upper)	Elk River	2
Reticulate Crayfish	Tennessee River (Lower)	Bear Creek	1
Reticulate Crayfish	Tennessee River (Lower)	Turnbo Creek	1
Reticulate Crayfish	Tennessee River (Upper)	Hiwassee River	1
Reticulate Crayfish	Tennessee River (Upper)	Sequatchie River	1
Reticulate Crayfish	Tennessee River (Upper)	Chickamauga Creek	2
Spinywrist Crayfish	Tennessee River (Middle)	Flint Creek	1
Spinywrist Crayfish	Tennessee River (Middle)	Cypress Creek	2
Spinywrist Crayfish	Tennessee River (Middle)	Shoal Creek	2
Spinywrist Crayfish	Tennessee River (Middle)	Buffalo River	2



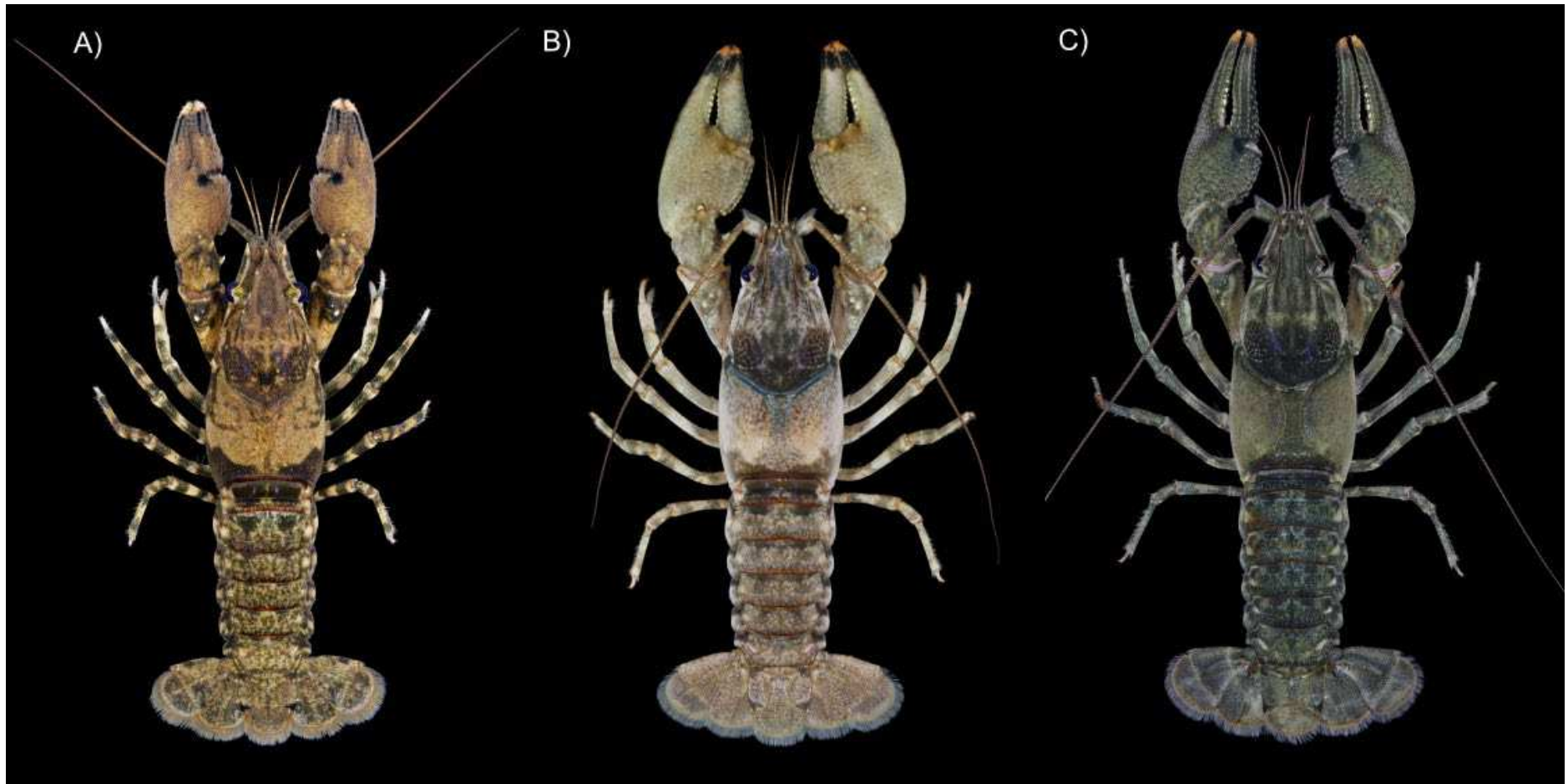
## Figures



**Figure 1.** Known localities for the Hardin Crayfish (*Faxonius wrighti*; black squares), the Spinywrist Crayfish (*F. yanahllindus*; gray squares), and the Reticulate Crayfish (*F. erichsonianus*; white squares). Watersheds are represented by colored polygons: 1- Lower Tennessee River, 2- Middle Tennessee River, 3- Upper Tennessee River, 4-Coosa/Alabama River, 5-Mobile/Tombigbee River.

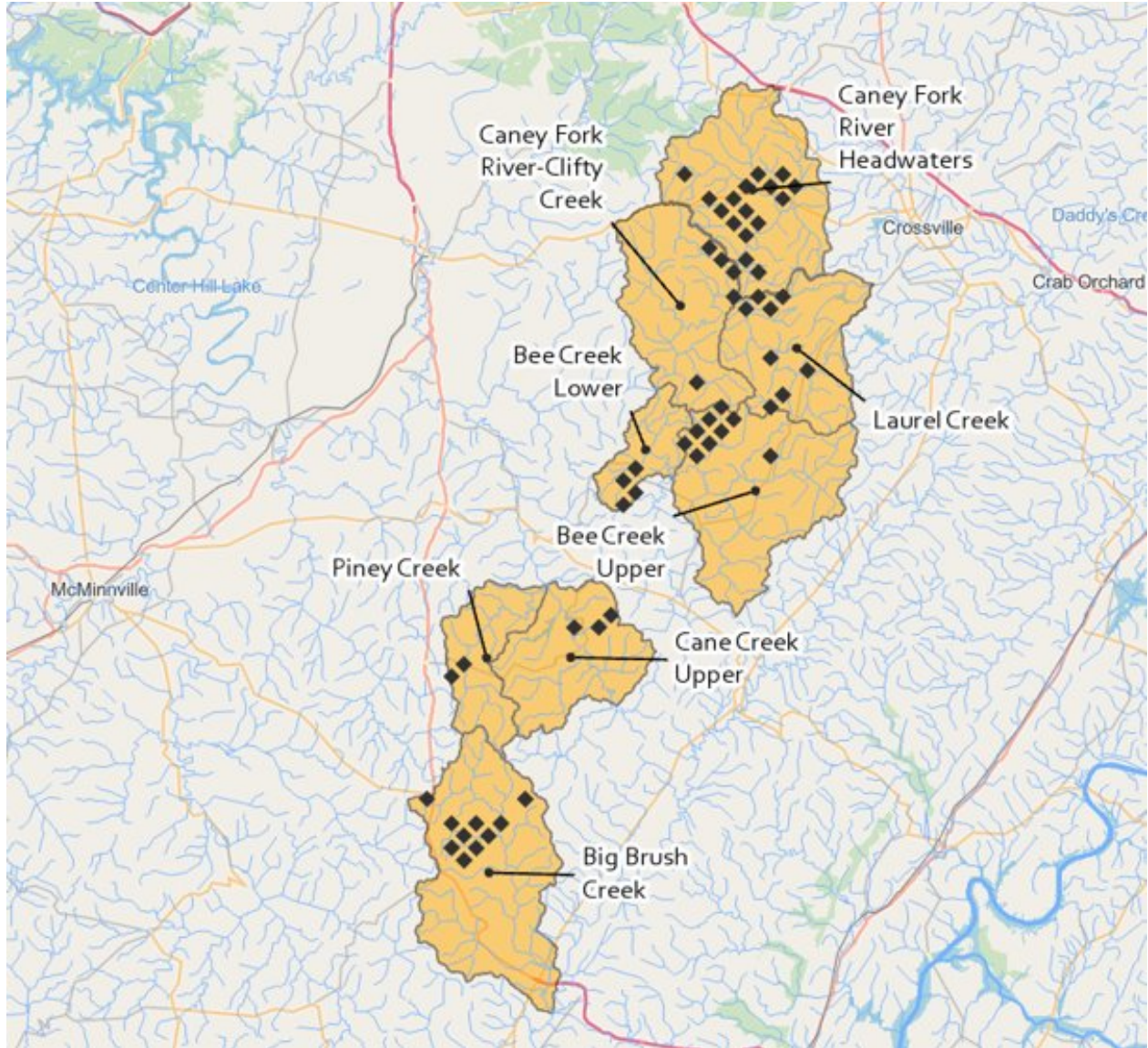


**Figure 2.** Maximum likelihood phylogenetic reconstruction of mitochondrial COI haplotypes from the Hardin Crayfish (*Faxonius wrighti*), the Spinywrist Crayfish (*F. yanahindus*), and the Reticulate Crayfish (*F. erichsonianus*). Numbers at nodes indicate bootstrap support values (1000 replicates). Numbers after species names indicate Genbank ID or collection ID.



**Figure 3.** Images of (A) Hardin Crayfish, (B) Spinywrist Crayfish and (C) Reticulate Crayfish showing similarities in color patterns across the three species. Photos by Carl Williams.





**Figure 4.** Pristine Crayfish (*Cambarus pristinus*) distribution map from Pristine Crayfish SSA expert elicitation meeting in April 2021. The map boundaries are located in central Tennessee, with the cities of McMinnville and Crossville shown as reference points. The yellow-shaded polygons represent HUC-12 watersheds occupied by Pristine Crayfish, with black diamonds indicating known localities. The Sequatchie form of Pristine Crayfish is found in the Big Brush Creek watershed (southernmost HUC-12 watershed) and all other HUC-12 watersheds to the north are occupied by the Caney Fork form of Pristine Crayfish. Map created by Santiago Martin; used with permission.