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New Hampshire Fish and Game Department

11 Hazen Drive, Concord, NH 03301-6500
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Scott R. Mason
Executive Director

March 08, 2021

His Excellency Governor, Christopher T. Sununu
and the Honorable Council
State House
Concord, New Hampshire 03301

REQUESTED ACTION

Authorize the New Hampshire Fish and Game Department to enter into a **sole source** Cooperative Project Agreement with University of New Hampshire (vendor code 315187), under the terms and conditions of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire, to conduct a conservation genetic analysis for state endangered White Mountain fritillary, for a total of $16,996 from date of Governor and Council approval through January 31, 2022. Funds are 100% Federal.

Funds are available in the following account for Fiscal Year 2021, and are anticipated to be available in Fiscal Year 2022 upon the continued appropriation of funds in the future operating budget, with the authority to adjust encumbrances between fiscal years within the price limitation through the Budget Office, if needed and justified:

03-75-75-751520-2125 WILDLIFE PROGRAM – NONGAME MANAGEMENT

	FY21	FY22
20-07500-21250000-304-500841 Research and Management	$12,000	$4,996

EXPLANATION

This Cooperative Project Agreement is entered into by New Hampshire Fish and Game and University of New Hampshire, herein referred to as NHFG and UNH, respectively. The purpose of this agreement is to establish a baseline genetic profile for the state endangered White Mountain Fritillary.

Dr. Adrienne Kovach's genetics lab at the University of New Hampshire has successfully demonstrated support and the necessary skills for other wildlife conservation genetics projects in the state. Based on the lab's unique skills, NHFG would like to enter into a **sole source** cooperative project agreement to implement the development of genomic tools for the species.

Dr. Adrienne Kovach will provide research support through her molecular ecology laboratory for genetic analysis. Genetic results will be used to establish a profile for this rare butterfly that only lives in the White Mountains of New Hampshire. This Cooperative Project Agreement is offered sole source to the University of New Hampshire because of their specialized capabilities for combining field research with genetic analysis in order to understand how wildlife populations are functioning in the natural environment.

Since 2017, the NHFG has been working with partners to understand the status of White Mountain Fritillary in New Hampshire. Initial surveys have estimated the population size of the species, documented the current extent of their range and researched their unique food requirements. Genetic analysis will provide more in depth assessment of the movement between mountain peaks, and genetic exchange between years. The U.S. Fish and Wildlife Service will provide funds for all eligible activities.

Upon Governor and Council approval, the University of New Hampshire will be reimbursed according to completion of tasks that are detailed in exhibits A and B of the Cooperative Project Agreement.

Respectfully submitted,

Scott Mason
Executive Director

Kathy Ann LaBonte
Chief, Business Division

COOPERATIVE PROJECT AGREEMENT
between the
STATE OF NEW HAMPSHIRE, **Department of Fish and Game**
and the
University of New Hampshire of the UNIVERSITY SYSTEM OF NEW HAMPSHIRE

A. This Cooperative Project Agreement (hereinafter "Project Agreement") is entered into by the State of New Hampshire, **Department of Fish and Game**, (hereinafter "State"), and the University System of New Hampshire, acting through **University of New Hampshire**, (hereinafter "Campus"), for the purpose of undertaking a project of mutual interest. This Cooperative Project shall be carried out under the terms and conditions of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, except as may be modified herein.

B. This Project Agreement and all obligations of the parties hereunder shall become effective on the date the Governor and Executive Council of the State of New Hampshire approve this Project Agreement ("Effective date") and shall end on **1/31/22**. If the provision of services by Campus precedes the Effective date, all services performed by Campus shall be performed at the sole risk of Campus and in the event that this Project Agreement does not become effective, State shall be under no obligation to pay Campus for costs incurred or services performed; however, if this Project Agreement becomes effective, all costs incurred prior to the Effective date that would otherwise be allowable shall be paid under the terms of this Project Agreement.

C. The work to be performed under the terms of this Project Agreement is described in the proposal identified below and attached to this document as Exhibit A, the content of which is incorporated herein as a part of this Project Agreement.

Project Title: **Genomic Tools for Understanding Metapopulation Connectivity of the White Mountain Fritillary: a Pilot Study**

D. The Following Individuals are designated as Project Administrators. These Project Administrators shall be responsible for the business aspects of this Project Agreement and all invoices, payments, project amendments and related correspondence shall be directed to the individuals so designated.

State Project Administrator

Name: Kathy Ann LaBonte
Address: NH Fish and Game Department
11 Hazen Drive
Concord, NH 03301
Phone: 603-271-2741

Campus Project Administrator

Name: Karen Rooney
Address: University of New Hampshire
Sponsored Programs Administration
51 College Rd. Rm 116
Durham, NH 03824
Phone: 603-862-5412

E. The Following Individuals are designated as Project Directors. These Project Directors shall be responsible for the technical leadership and conduct of the project. All progress reports, completion reports and related correspondence shall be directed to the individuals so designated.

State Project Director

Name: Heidi Holman
Address: NH Fish and Game Department
11 Hazen Drive
Concord, NH 03301
Phone: 603-271-3018

Campus Project Director

Name: Adrienne Kovach
Address: University of New Hampshire
Natural Resources & Environment
James Hall, Rm 130
Durham, NH 03824
Phone: 603-862-1603

Campus Authorized Official *KJ*
Date 2/15/21

F. Total State funds in the amount of **$16,996** have been allotted and are available for payment of allowable costs incurred under this Project Agreement. State will not reimburse Campus for costs exceeding the amount specified in this paragraph.

Check if applicable

☐ Campus will cost-share % of total costs during the term of this Project Agreement.

☒ Federal funds paid to Campus under this Project Agreement are from Grant/Contract/Cooperative Agreement No. **F20AP10430-00** from **U.S. Fish & Wildlife Service** under CFDA# **15.660**. Federal regulations required to be passed through to Campus as part of this Project Agreement, and in accordance with the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, are attached to this document as Exhibit B, the content of which is incorporated herein as a part of this Project Agreement.

G. Check if applicable

☐ Article(s) of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002 is/are hereby amended to read:

H. ☒ State has chosen **not to take** possession of equipment purchased under this Project Agreement.

☐ State has chosen **to take** possession of equipment purchased under this Project Agreement and will issue instructions for the disposition of such equipment within 90 days of the Project Agreement's end-date. Any expenses incurred by Campus in carrying out State's requested disposition will be fully reimbursed by State.

This Project Agreement and the Master Agreement constitute the entire agreement between State and Campus regarding this Cooperative Project, and supersede and replace any previously existing arrangements, oral or written; all changes herein must be made by written amendment and executed for the parties by their authorized officials.

IN WITNESS WHEREOF, the University System of New Hampshire, acting through the **University of New Hampshire** and the State of New Hampshire, **Department of Fish and Game** have executed this Project Agreement.

By An Authorized Official of:
University of New Hampshire
Name: Karen M. Jensen
Title: Director, Pre-Award
Signature and Date: Karen Jensen 2/15/21

By An Authorized Official of:
NHFG, NH Attorney General, G&EC
Name: Scott Mason
Title: Executive Director
Signature and Date: 3/17/21

By An Authorized Official of: the New Hampshire Office of the Attorney General
Name: Joshua Harrison
Title: Assistant Attorney General
Signature and Date: 4/5/2021

By An Authorized Official of: the New Hampshire Governor & Executive Council
Name:
Title:
Signature and Date:

Campus Authorized Official KJ
Date 2/15/21

EXHIBIT A

A. Project Title: Genomic Tools for Understanding Metapopulation Connectivity of the White Mountain Fritillary: a Pilot Study

B. Project Period: February 1, 2021 – January 31, 2022

C. Objectives: To facilitate studies of metapopulation connectivity, this pilot study will develop and ground truth the methodology for population genomic analyses of the White Mountain Fritillary, as follows: 1) use existing leg tissue and adult and caterpillar samples held by NHFG partners to optimize DNA extraction for high yielding genomic libraries; 2) optimize double digest restriction-site associated DNA (ddRAD) sequencing library protocol; 3) obtain the first single nucleotide polymorphism (SNP) dataset of the White Mountain Fritillary for a preliminary subset of samples; 4) establish bioinformatics and analytical pipeline for resulting SNP data.

D. Scope of Work: Campus will work together with the State in this collaborative project. State partners will provide tissue samples from their archived collection for this pilot genetic study. Campus will conduct genetic analyses, according to the specific objectives of this contract. DNA extractions will be conducted initially using the Omega EZNA Tissue DNA Kit (Omega Bio-tech Inc, Norcross, GA), with varying elution volumes to achieve optimal yield. DNA concentrations will be assessed using a Quibit fluorometer. As needed, additional commercial kits may be trialed to obtain suitable yield for RAD Sequencing (target of 50 ul of 25 ng/ul DNA). ddRAD sequencing libraries will be prepared following the Peterson et al. (2012) protocol, with modifications performed previously in the Kovach lab (e.g., Maxwell et al. in press). Appropriate restriction enzymes will be explored form the literature, (e.g., Nadeau et al. [2013]) and via virtual digests with the R package SimRAD (Lepais and Weir 2014). Samples will be submitted to Novogene (Sacramento, CA) for 150-bp paired-end sequencing on an Illumina Hi Seq 2500 sequencer. Resulting sequence reads will be evaluated for quality control, using appropriate pipelines (e.g., FastQC, FASTX-Toolkit) and bioinformatics performed using the STACKS pipeline. This pipeline will be optimized using the most appropriate reference genome and also with a de novo alignment. Optimal filtering criteria (e.g., minor alleles, missing data per locus/individual, etc.) will be established, following suggestions of Diaz-Arce and Rodriguez-Ezpeleta 2019). The resulting SNPs will be evaluated for coverage and total number of polymorphic variants recovered. As needed, the library protocol may be modified until a robust SNP dataset is obtained. For the preliminary SNP dataset, genetic diversity will be evaluated.

Literature Cited

Diaz-Arce, N. and N. Rodriguez-Ezpeleta. 2019. Selecting RAD-Seq Data Analysis Parameters for Population Genetics: The More the Better? Frontiers in Genetics Vol 10 Article 533; doi: 10.3389/fgene.2019.00533

Lepais, O. and J.T. Weir. 2014. SimRAD: an R package for simulation-based prediction of the number of loci expected in RADseq and similar genotyping by sequencing approaches. Molecular Ecology Resources 14: 1314-1321.

Maxwell, L.M., J. Walsh, B.J. Olsen, A.I. Kovach. In Press. Patterns of Introgression Vary Within an Avian Hybrid Zone. BMC Evolutionary Biology (accepted).

Nadeua, et al. 2013. Genome-wide patterns of divergence and gene flow across a butterfly radiation. Molecular Ecology 22: 814-826.

Campus Authorized Official *KJ*

Date 2/15/21

Peterson, BK, Weber, JN, Kay, EH, Fisher, HS, Hoekstra, HE. Double digest RADseq: An inexpensive method for de novo SNP discovery and genotyping in model and non-model species. PLoS ONE, 2012; 7(5): e37135. doi:10.1371/journal.pone.003713

E. Deliverables Schedule: The Campus will submit a final report by February 28, 2022.

F. Budget and Invoicing Instructions: Campus will submit invoices to State on regular Campus invoice forms no more frequently than monthly and no less frequently than quarterly. Invoices will be based on actual project expenses incurred during the invoicing period, and shall show current and cumulative expenses by major cost categories, and shall document any cumulative cost sharing through the end of the invoicing period. State will pay Campus within 30 days of receipt of each invoice. Campus will submit its final invoice not later than 75 days after the Project Period end date. (note – this is copied from the 2015 agreement)
Final payment is contingent upon receipt of final report.

	Budget Items	State
1.	Salary and Wages	$4770
2.	Employee Fringe Benefits	$2089
3.	Travel	0
4.	Supplies & Services	$6630
5.	Equipment	0
6.	Facilities & Admin Costs (26%)	$3507
TOTAL PROJECT COSTS:		$16,996

Budget Narrative (internal)
Personnel: 5 weeks (1.25 mo) salary with fringe for research scientist
Supplies: $6630 for DNA extraction kits, disposable lab supplies, ddRAD library preparation reagents (including restriction enzymes, PCR master mix, Illumina sequencing adapters and primers, tape station reagents, Ampure beads), and DNA 150 base-pair paired-end sequencing costs at Novogene (~$1500 per lane).

G. Other: Any publications or publicity regarding these projects shall recognize funding sources and cooperative arrangements with the New Hampshire Fish and Game Department Nongame and Endangered Wildlife Program and the U.S. Fish and Wildlife Service.

Campus Authorized Official *KJ*
Date 2/15/21

EXHIBIT B

This Project Agreement is funded under a Grant/Contract/Cooperative Agreement to State from the Federal sponsor specified in Project Agreement article F. All applicable requirements, regulations, provisions, terms and conditions of this Federal Grant/Contract/Cooperative Agreement are hereby adopted in full force and effect to the relationship between State and Campus, except that wherever such requirements, regulations, provisions and terms and conditions differ for INSTITUTIONS OF HIGHER EDUCATION, the appropriate requirements should be substituted (e.g., OMB Circulars A-21 and A-110, rather than OMB Circulars A-87 and A-102). References to Contractor or Recipient in the Federal language will be taken to mean Campus; references to the Government or Federal Awarding Agency will be taken to mean Government/Federal Awarding Agency or State or both, as appropriate.

Special Federal provisions are listed here: ☐ None or **Uniform Guidance issued by the U.S. Fish and Wildlife Service Financial Award Terms and Conditions, as applicable, are available at this address: https://www.fws.gov/grants/atc.html** .

Campus Authorized Official *KJ*
Date 2/15/21