This document contains the job announcement information at the top, and follows with more detailed background and Tasks information for the work to be completed by this position.

HSU Sponsored Programs Foundation
Job Announcement

This is not a state position

Job Title: Research Associate

Wage: $55,000/year; position will be eligible to participate in medical, dental, vision, and life benefits.

Position: This is a full-time, exempt, 2 year appointment. Continuation of this position is contingent upon satisfactory performance and available funding.

Project Name: Klamath Basin S3 Model (F2978)

Supervisor: Dr. Nicholas Som and Dr. Mark Henderson

Essential functions of the job: This two-year position will focus on topics associated with salmonid habitat and population dynamics models tailored to address management alternatives. The first task focuses on evaluating best practices for estimating flow-to-habitat relationships in unsampled locations of large river systems, and will result in methodological recommendations according to practitioner’s data types and simulation needs. The work will include extensive literature review and research development, followed by collaborative implementation and report or journal manuscript completion. Successful completion will also require computational implementation (i.e., computer software coding) to perform the evaluations and implement various habitat model methods. It is anticipated that this task will take approximately one year.

The second task focuses on generating a model to predict weekly waterborne spore concentrations for a parasite (Ceratonova shasta) endemic to the Klamath Basin. This parasite has been linked to population declines in native salmonids. A recently constructed population dynamics model for Klamath River salmonids, the Stream Salmonid Simulator (S3 model), includes a sub-model to simulate C. shasta disease and mortality risk for outmigrating juveniles. This sub-model currently requires concentrations of the waterborne spores as known physical inputs. However, spore concentrations are hypothesized to vary in response to potential management alternatives, are known to vary spatially and temporally within years, are known to vary over several orders of magnitude among years, and increasing concentrations of the parasite are known to cause increasing infection and mortality risk for juvenile salmonids.

Completion of these tasks be closely coordinated with Project PI’s, who will aid in data acquisition and collaborative discussions regarding all facets of task completion. Candidate will be responsible for participating in and providing updates in monthly research coordination calls with Project PI’s and will participate in technical meetings involving Klamath Basin scientists representing various agencies and tribes, and professional specialties as they relate to each task.
The position is sponsored by the US Fish and Wildlife Service Arcata Fisheries Program (USFWS AFWO) and the US Geological Survey California Cooperative Fish and Wildlife Research Unit (CACFWRU) at Humboldt State University in Arcata, California.

**Educational Component.** The assigned individual will be supervised primarily by Dr. Nicholas Som of the USFWS, Arcata Fish and Wildlife Office, and CA Cooperative Fish & Wildlife Research Unit. The individual will also receive mentorship from Dr. Mark Henderson from the USGS CA Cooperative Fish & Wildlife Research Unit, Dr. Russell Perry from the USGS Western Fisheries Research Center, Columbia River Research Laboratory, and Dr. Sascha Hallett from Oregon State University’s John L. Fryer Aquatic Animal Health Laboratory. Other educational and career development activities will include active mentoring regarding quantitative modeling tools for natural resource monitoring and research, development of report writing skills, journal manuscript preparation and preparation and delivery of research presentations at professional meetings. The assigned individual will receive strong educational exposure and mentorship regarding quantitative methods for modeling biological and physical processes in riverine environments.

**Minimum Qualifications:** Ph.D., Sc.D., or other earned research doctoral degree recognized in the U.S. academic circles as equivalent.

**Application Instructions:** To apply for this position please provide 1) a copy of graduate school transcripts, 2) a curriculum vitae, 3) a 1-page cover letter explaining interest and qualifications for the position, 4) the names and contact information for three references, when you might be available to start the position, and 5) the HSUSPF Employee Information Form for Applicants via email to Nicholas Som, Ph.D., U.S. Fish and Wildlife Service at: nicholas_som@fws.gov. Please direct any questions to Nicholas Som via the same email address. A more detailed scope of work describing the tasks can be found on the CACFWRU webpage: [http://www2.humboldt.edu/cuca](http://www2.humboldt.edu/cuca)

**Application review date:** Position is open until filled, with preferred start date in Fall 2018.

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For assistance with the application process, please submit an Accommodation Request Form, which can be found [here](http://www2.humboldt.edu/cuca) or call the SPF Interim Compliance Support Coordinator at (707) 826-5169.
GENERAL BACKGROUND

U. S. Fish and Wildlife Service (USFWS) has been working in close collaboration with the U.S. Geological Survey (USGS), Columbia River Research Laboratory, and Dr. Thomas Hardy from Watershed Systems Group, Inc. and Texas State University to develop the Stream Salmonid Simulator (S3) model. The S3 model currently under development for the Klamath River represents an integrated set of sub-models that predict the effects of water management alternatives on the production of juvenile Chinook salmon. This synchronized series of sub-models reflects the array of physical and biological processes that interact to affect the growth, movement, and survival of fish at a given lifestage. A benefit to this method of model construction lies in the ability to update sub-models as new data, new analyses, or new scientific discoveries arise.

One sub-model of particular interest for Klamath River management simulates mortality associated with Ceratonia shasta, which is a parasite known to negatively impact populations of juvenile salmonids in the Klamath River. This sub-model (hereafter: disease model), uses environmental variables including concentration of waterborne parasites, exposure duration, and water temperatures to predict the proportion of salmon infected with C. shasta, the proportion of those individuals that will succumb to their infection, and additionally the time and spatial location of mortality. A major driver of C. shasta infection is the concentration of waterborne parasites, which the disease model currently requires as pre-determined physical input values. Because C. shasta spore concentrations are provided as input, the disease model is insensitive to environmental conditions or management actions that directly affect waterborne parasite concentrations. However, spore concentrations are hypothesized to vary in response to potential management alternatives, are known to vary spatially and temporally within years, are known to vary over several orders of magnitude among years, and increasing concentrations of the parasite are known to cause increasing infection and mortality risk for juvenile salmonids.

Scientists from several agencies have studied various aspects of the C. shasta lifecycle over many years, but a successful analysis and resulting model to predict the concentration of waterborne parasites has not been undertaken. Given a predictive model of waterborne spore concentration of the parasite, Klamath Basin scientists would be able to assess potential management actions on parasite concentrations directly, and run the S3 model in a much more dynamic setting. This would allow the assessment of salmonid population impacts from the current range of potential management actions, as well as the exploration of more complex and realistic future scenarios, such as restoration of fish passage to Upper Klamath Lake and access to the upper Klamath Basin.

TASK 1

Objective. Evaluate best practices for assigning flow-to-habitat relationships for fish population dynamics models with applications to the Klamath Basin Stream Salmonid Simulator.

Background. A key element to any fish population dynamics model is the relationship between physical river characteristics and the amount of available fish habitat, such as the amount of available habitat for a given amount of river discharge (hereafter: flow-to-habitat relationship). There are numerous methods for assigning flow-to-habitat values to locations within a river basin. These include fine-scale field-measured values that are extrapolated to other locations within the basin having similar physical characteristics, or equation-driven values created by functions of model-predicted values of physical characteristics. In recent years, the array of data types and amounts available for creating these models has increased.
drastically with increased computational power, more affordable remotely-sensed data, and the synergy of
data collected via multiple agencies.

This task will evaluate the best practices for assigning flow-to-habitat relationships for large river
systems, and make methodological recommendations according to user’s data types and simulation needs.
The work will include extensive literature review and research development, followed by collaborative
implementation and journal manuscript submission. It is anticipated that this task will take approximately
one year.

Completion of the task be closely coordinated with Project PI’s, who will be responsible for providing
longitudinal mesohabitat and fish use data and GIS map layers to the candidate. Candidate will be
responsible for participating in and providing updates in monthly research coordination calls with Project
PI’s and will participate in an estimated four technical meetings involving Klamath Basin scientists
representing various agencies and tribes, three of which will require overnight travel.

TASK 2

Objective

Develop a model to predict the weekly concentration of C. shasta waterborne parasites in the Klamath
River.

Background

As noted above, the S3 model currently requires the concentration of waterborne parasites to be input as
deterministic values. There are many hypotheses relating to how environmental variables might relate to
concentrations of C. shasta waterborne parasites on an annual and weekly basis. Further, data on the
concentration of these parasites has been collected during the period of greatest concern for juvenile
salmonids, spring to early summer, for over a decade. Data quantity and quality has continued to improve
over this period of time, and this period also includes dramatic contrast in observed weekly parasite
concentrations, which range from 0 to over 1000 parasites per liter of water. This contrast improves the
likelihood that a suitable predictive model can be generated.

This task will generate a model to predict weekly waterborne spore concentrations for the Klamath River.
The selected individual will use currently available data, couple their own ecological knowledge with
hypotheses from Klamath Basin fish health experts, and apply quantitative ecological modeling tools to
build, evaluate, and demonstrate the utility of a model for predicting waterborne parasite concentrations.

Completion of the task will need to be closely coordinated with Project PI’s, who will be responsible for
providing all data necessary to investigate relationships, provide technical and mentoring support to the
selected candidate, and participate in the development and assessment of model progress. The candidate
will be responsible for participating in and providing updates in monthly research coordination calls with
Project PI’s, participate in Klamath Basin stakeholder technical meetings, and journal manuscript and/or
project report writing.

Educational Component

The assigned individual will be supervised primarily by Dr. Nicholas Som of the USFWS, Arcata Fish
and Wildlife Office, and CA Cooperative Fish & Wildlife Research Unit. The individual will also receive
mentorship from Dr. Mark Henderson from the USGS CA Cooperative Fish & Wildlife Research Unit,
Dr. Russell Perry from the USGS Western Fisheries Research Center, Columbia River Research Laboratory, and substantial mentorship from Dr. Sascha Hallett from Oregon State University’s John L. Fryer Aquatic Animal Health Laboratory. Dr. Sascha Hallett is responsible for managing the current waterborne parasite monitoring program in the Klamath River, has contributed largely to the development of molecular tools to detect the parasite in water samples, and continues to be an authority on *C. shasta* dynamics in the Klamath River. Other educational and career development activities will include active mentoring regarding quantitative modeling tools for natural resource monitoring and research, development of report writing skills, journal manuscript preparation and preparation and delivery of research presentations at professional meetings. The assigned individual will receive strong educational exposure and mentorship regarding quantitative methods for modeling biological and physical processes in riverine environments.