

FWS Agreement # \_\_\_\_\_  
FWS Requisition # \_\_\_\_\_  
USDA Agreement # \_\_\_\_\_

**SCOPE OF WORK/BUDGET  
BETWEEN  
UNITED STATES DEPARTMENT OF INTERIOR  
FISH AND WILDLIFE SERVICE  
at  
FARALLON NATIONAL WILDLIFE REFUGE  
and  
UNITED STATES DEPARTMENT OF AGRICULTURE  
ANIMAL AND PLANT HEALTH INSPECTION SERVICE  
NATIONAL WILDLIFE RESEARCH CENTER  
9/1/2016 – 6/30/2017**

**PROJECT TITLE:** An assessment of the potential hazards of the anticoagulants diphacinone and brodifacoum to arboreal salamanders

**OBJECTIVE**

The objective of this project is to determine if exposure to the anticoagulants diphacinone and brodifacoum is lethal to Farallon arboreal salamanders (*Aneides lugubris farallonensis*). This information will be used in analyses of potential impacts to arboreal salamanders in the Environmental Impact Statement (EIS) for the South Farallon Islands House Mouse Eradication Project.

**SCOPE OF WORK**

Invasive rodents cause much damage to island ecosystems and anticoagulant rodenticides are an essential tool for the eradication of invasive rodents on islands. The anticoagulants brodifacoum and diphacinone have been proposed as alternatives in a draft Environmental Impact Statement (EIS) by the U.S. Fish and Wildlife Service (USFWS) to eradicate invasive house mice from the Farallon National Wildlife Refuge. However, anticoagulant rodenticides may pose hazards to non-target animals. This can occur through the direct consumption of the rodenticide material or from indirect exposure in which case the non-target animal consumes prey (rodents or insects) or scavenges on dead mice that have previously consumed the anticoagulant bait.

For this study, the U.S. Department of Agriculture (USDA) will use live-captured or purchased captive-raised salamanders to do an assessment of the potential hazards of the anticoagulants

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brodifacoum and diphacinone to those animals. Three routes of exposure will be examined: 1) allowing salamanders to feed on crushed anticoagulant pellets (direct internal exposure), 2) allow the salamanders to consume insects that have fed upon anticoagulant pellets (indirect internal exposure), and 3) spraying salamanders with water that has been used to soak anticoagulant pellets (direct external exposure). After exposure, animals that die or are euthanized will be tested for rodenticide residue levels in the whole body using high performance liquid chromatography or mass spectrometry. We will also assess some sub-lethal parameters such as changes in food consumption and weight loss. These studies will be conducted at the USDA National Wildlife Research Center in Fort Collins, Colorado, under an IACUC-approved study protocol.

Currently, this study is planned to be conducted mainly with wild-caught *Ensatina* salamanders (*Ensatina eschscholtzii*) as a surrogate species for the less common arboreal salamander, with a smaller sample of wild-caught arboreal salamanders for comparison, all captured on the central California mainland. Salamanders will be captured and shipped to USDA by a separate USFWS contractor. However, if wild-caught salamanders cannot be provided in a timely manner, the study may be conducted with purchased or provided, captive-reared salamanders (species to be determined) after consultation and agreement between USFWS and USDA.

*Reporting:* USDA will provide to USFWS a preliminary report detailing the study and findings, due December 15, 2016 with a final report to follow by June 30, 2017. The report will include the names and affiliations of all authors, introduction, description of methods, results, discussion, literature cited, acknowledgements, and suggested citation. The USFWS Interagency Agreement Number will be included on the cover page.

## **Budget**

The budget needed for the study would be \$108,274.58 to fund staff, provide equipment and supplies, support animal care staff and needs, perform residue analyses, and indirect costs.