SERDP Strategic Environmental Research and Development Program

Methods for Assessing the Impact of Fog Oil on Availability, Palatability, and Food Quality of Relevant Life Stages of Insect Food Sources for TES

Conservation
CS-1262

Background:

The generation of fog oil smoke and maneuvers under obscurant cover are important components of troop training exercises at military training installations. To comply with the Endangered Species Act, the impact of fog oil releases on avian threatened and endangered species (TES), or surrogates, have been evaluated in both field and laboratory studies. Although no direct acute effects on avian species have been observed, concern has been raised regarding a possible indirect impact via reduction in insect populations used as a food source for these species.

Objective:

The objective of this project is to develop a methodology for quantifying population dynamics and food source value of insect fauna in areas subjected to fog oil smoke. The method will provide reproducible exposures of insects to fog oil aerosols under various climatic and environmental conditions that duplicate chemical and droplet-size characteristics of field releases of the smoke. The responses measured will take into account reduction of food sources due to death and to changes in availability, palatability, and food quality of relevant life stages of insects that form the prey basis for the listed TES.

Summary of Process/Technology:

The study will employ an environmentally controlled, re-circulating wind tunnel outfitted with a high-heat vaporization and re-condensation fog oil generator that has been shown to produce aerosols of comparable chemistry and droplet size distribution to those of field releases. The wind tunnel also supports canopy conditions needed for exposure realism, post-exposure re-volatilization, and insect maintenance. Four species representative of major prey groups of the TES will be used. To address potential differences in susceptibility of insect taxa to fog oil, the species are selected from different orders and include a geometrid moth, wood roach, mosquito, and ant. The outcome of the tests will be an evaluation of the impact of fog oil aerosols on a food resource rather than simply the toxic response of a class of organisms to the oil; therefore, the endpoints measured will encompass those that reduce not only numbers of prey but also the consumption of prey. Accordingly, post-exposure measurements will assess the following: (1) reduction in prey numbers through mortality of the consumed life stage (larvae, adult); (2) reduced hatch or emergence of the consumed life state; (3) reduction in prey availability because of impaired flight or decreased movement (reduced conspicuousness); (4) reduced palatability of contaminated prey; and (5) reduction in nutritional quality of prey.

Benefit:

The study will provide a cost-effective method, as compared to field assessments, for quantifying the potential impact of fog oil on the food base of TES inhabiting Department of Defense lands where training activities are conducted. This will allow testing of prey species under relevant climatic and canopy conditions of specific TES. Because information on the effects of fog oil on important prey species of the red-cockaded woodpecker, several neotropical birds, and two endangered bat species are tested in this project, the exposure-response data from the study will directly benefit risk assessment/management efforts for these species.

PNNL Environmentally Controlled Wind Tunnel

Accomplishments:

This project began in FY 2002. Accomplishments will be noted upon completion of the project.

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