APPENDIX ES-10

ASSESSMENT OF THE SHORT AND LONG-TERM STABILITY GOALS FOR ENDANGERED HAWAIIAN FLORA MANAGED BY OAHU ARMY NATURAL RESOURCE PROGRAM

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The primary activities that were conducted last quarter are:

1. I installed twenty-five tracking tunnels (50 cm x 10 cm x 10 cm; Connovation Limited, Auckland, New Zealand), with tracking cards inserted (The Black Trakka Gotcha Traps LTD, Warkworth, New Zealand), throughout the *D. waianaeensis* study site to calculate the percentage of *D. waianaeensis* fruit consumed by black rats (*Rattus rattus*). These data will be used to assess the effect of rodent control on *D. waianaeensis* population dynamics.

2. I collected the *D. waianaeensis* Kal-C demographic data (i.e., survival, growth, and reproduction) for the 2015-2016 growing season.

3. I developed predictive models to quantify the synergistic effects of climate change and invasive species on *Schiedea obovata* population dynamics, which is a rare species managed by the Oahu Army Natural Resources Program.

4. I started writing an advanced draft of my third manuscript for this project. Following completion of this manuscript and comments/revisions by my co-authors, this paper will be submitted for review in a peer-reviewed journal, such as Conservation Biology. For a brief overview of this manuscript, refer to the below title and abstract.

Drought and herbivory influence the population dynamics of an island endemic shrub, *Schiedea obovata*

Abstract: Climate projections suggest environmental conditions will increase in inter-annual variability over time, with an increase in the severity and duration of extreme drought and rainfall events. Based on bioclimatic envelope models, it is projected that changing precipitation patterns will drastically alter the spatial distributions and density of plants and be a primary driver of biodiversity loss. However, many other underlying mechanisms, such as boom-and-bust cycles of

herbivory pressure, can impact plant vital rates (i.e., survival, growth, and reproduction) and population dynamics. In this study, we combined a classical drought tolerance experiment with a size-structured population projection model to elucidate how changing precipitation patterns and temporal variability in herbivory pressure will likely impact the persistence of a rare plant population reintroduction. For this study, we used a Hawaii endemic short-lived shrub, *S. obovata.* To isolate the influence of changing precipitation patterns on plant vital rates, we conducted a control greenhouse experiment. For this experiment, we manipulated gravimetric soil water content (GSWC) and drought intensity. To mimic realistic field GSWC for our 'control' greenhouse treatment, we used the mean field GSWC during the dry season. To evaluate the influence of temporal variability in herbivory pressure on plant dynamics, we used data from a previous field experiment. Preliminary results suggest that prolonged drought will have a greater impact on seedling survival, relative to a proportional decrease in daily precipitation. Furthermore, the synergistic impacts of severe drought and herbivory on plant dynamics will be greater than their independent effects. Directly linking complex interactions of multiple environmental stressors will become increasingly important as ecosystems are continually degraded by human induced changes in the environment (e.g. climate change and biological invasion).