To: Incoming TCBES Students 3 July 2015

From: CBES Core Course Instructors – Drs. Elizabeth Stacy, Becky Ostertag, and Jason Adolf

RE: Preparation for CBES 600 & 601

Congratulations on your admission to the Tropical Conservation Biology and Environmental Science (TCBES) Graduate Program at UH Hilo. This memo is intended to provide you with introductory information that will help you transition into the program this fall.

TCBES is a flexible, multi-disciplinary program that attracts students with a broad range of backgrounds. As such, there are no specific course-work requirements for admittance. Nevertheless, a degree in conservation biology and environmental science requires rigorous understanding of relevant science.

Conservation biologists are first biologists, and they should have, at a minimum, a foundation in biology comparable to that of a holder of a baccalaureate degree in general biology. Environmental scientists should be familiar with fundamental concepts in biology and conservation, as well as those in the discipline of their specialty, such as environmental chemistry, geology, or geography. The TCBES Program does not involve a comprehensive, formal education in biology or environmental science. Rather, students in this program develop their scientific knowledge and skills in a range of ways, including academic course work, independent study, interaction with their committee members, and research/life experience.

CBES 600 is the introductory lecture and discussion portion of the core courses for TCBES students. This course places the science of biology into the context of conservation, a largely social-political endeavor. The conservation biology content of this course presents material from the perspective of conservation biology as science applied to the value-laden goal of maintaining and conserving global biodiversity. Conservation biology, as an academic discipline, is most closely related to the pure sciences of ecology and evolution. Lectures, discussions and projects will assume that students have a working knowledge of these topics comparable to that covered in undergraduate courses in general ecology and evolution for biology majors, such as BIOL 281 (General Ecology) and BIOL 357 (Evolution) at UH Hilo. The environmental science content of this course provides a focused review of primary concepts and issues that environmental scientists address. Course content in both areas should be viewed as starting points from which more in-depth study outside of class can and should be done. The readings for the class will include: **Conservation Biology for All** (http://www.mongabay.com/conservation-biology-for-all.html).

Conservation of nature also occurs through human interaction with the environment and organisms. This is especially important in places like Hawai`i where many people have direct relationships with natural resources as food sources, building materials, cultural activities, and familial ties. The TCBES Program is collaborating with the Edith Kanakaʻole Foundation through experiential learning opportunities to allow students to learn about Native Hawaiian worldviews where people are part of the natural system. This knowledge of Native Hawaiian worldviews will be useful for students in developing research projects and future work in the conservation field in Hawaii and other places where conservation efforts are facilitated by collaborations with local communities.

Students enrolling in CBES 600 in Fall 2015 are strongly encouraged to prepare by examining the topics below drawn from general ecology, biology, and environmental science texts. We understand that students in the program are from diverse backgrounds and will therefore have taken different paths before admittance into the TCBES Program. If you are not comfortable with these topics, you are urged to begin serious review. Please arrive in August familiar with these topics.

Environment and Environmental Science

- Environment, habitat, ecosystem
- Energy, matter, thermodynamics
- Atmosphere, soil, water, marine composition and chemistry
- Sustainability, stewardship, ethics
- Stability, resilience, persistence, recovery, restoration, uncertainty

Biogeography

- Biomes, ecoregions, life zones
- Climatic indices, such as potential evapo-transpiration, to designate life zones

Populations, Communities, and Ecosystems

- Populations, metapopulations, assemblages, and ecotones
- Logistic growth and density-dependent population regulation
- Keystone and dominant species
- Ecosystem structure and ecosystem function
- Community interactions, especially inter- and intraspecific competition and predation
- Habitat, niche, and range
- Biogeochemical (nutrient) cycles and productivity

Spatial and Temporal Variation or Heterogeneity

- Microhabitats, habitats, and landscapes
- Temporal cycles, fluctuations, and disturbances or perturbations
- Primary and secondary succession

Theory

- Individualistic vs. super-organismic model of communities
- Equilibrium vs. non-equilibrium models

Anthropogenic Pollution

- Anthropogenic
- Accumulation and bio-magnification of pollutants
- Cultural eutrophication
- Relationships among major biogeochemical cycles (especially carbon and other greenhouse gases) and climate change

Genetics and Evolution

- Mitosis and meiosis
- Genome, chromosome, haploidy, and diploidy
- Mendelian genetics
- Gene expression, transcription, and translation
- Allele, gene, and locus
- Hardy-Weinberg equation, including its utility and assumptions
- Species concepts
- Natural selection, random genetic drift, mutation, and gene flow

Note: to prepare for the partner course CBES 601 (Field and Laboratory Methods in Tropical Conservation Biology and Environmental Science) the following will be helpful:

Research Design

- Be familiar with the following terms used in data analysis: sample size, normal distribution, mean, median, variance, standard error, standard deviation, histogram, test statistic, parametric vs. non-parametric statistics, descriptive statistics, power, and power analysis.
- Be familiar with basic statistical tests (regression, t-tests, analysis of variance, chi-square).
- Be comfortable with data manipulation, making tables and graphs, and writing papers in scientific writing style similar to what is published in a journal such as *Conservation Biology*.
- Be comfortable with giving oral presentations on scientific topics.