Title: Garden isles or ghost forests: disease-driven death of the dominant tree in native Hawaiian forests.

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2 pages total (assume single spaced) INCLUDING budget:

1. Introduction and Questions
   1. Hook (Problem)
      1. What would the peninsula look like without live oak trees, covered with the skeletons of recently dead ones? And the animals that depend on them
         1. Potential, with SOD
   2. Issue (Problem)
      1. Ohia is the dominant tree in Hawaii
      2. A new disease is killing ohia
   3. **Questions**
      1. Two questions our research addresses:
         1. **Question 1 – How bad will it be for trees?**
            1. **Can we predict the speed and extent of spread?**
            2. What are the impacts on trees and forests
         2. **Question 2 – How bad will it be for other species?**
            1. **How is the community responding?**

**Birds, insects**

* + - * 1. How does species loss/decline affect communities

diversity leads to… stability, productivity, services

But what follows loss of certain species…

Still an unresolved question in ecology (IMO)

* 1. Background (So what)
     1. Q1 - Disease Spread
        1. Ohia – dominant tree
           1. distribution
        2. Ceratocystis –
           1. A little biology

Known extent and spread

unknowns

* + - * 1. Other new fungal diseases that cause declines (removals)
      1. Forest changes –
         1. how much has been impacted?
    1. Q2 – Community Effects
       1. Some species are ‘important’
          1. But not all…
       2. Trees are important because they are trees
          1. Keystone / foundation species

Like coral reefs

* + - 1. Lose foundation species, lose other species

Arthropods

Honeycreepers

* + 1. Opportunity
       1. Natural experiment – a manipulation at a scale that could not be created by researchers
       2. Disease as a ‘press’ disturbance, tree loss as a press disturbance
       3. Species loss is hard to isolate –
          1. disease outbreaks simulate single, non-random species removals
       4. BACI – need before, before its unavailable.

1. Significance and output
   1. Broader Impacts (Benefit)
      1. Science
         1. Addresses fundamental ecological concepts
            1. Importance of species
            2. Consequences of species declines
      2. Non-Science
         1. Lay ground work for interagency cooperation
         2. Educational opportunities for field techs and lab students
         3. Public involvement in monitoring – existing awareness and vigilance
         4. Ohia are important in culture, understanding decline and its effects…
   2. Output/Products (Solution)
      1. Science
         1. Contributions to literature about
            1. the emergence of fungal diseases
            2. the importance of species and the consequences of species loss
      2. Non-science
         1. Recommendations for disinfection protocols, disease dispersal risks, responses
2. Proposed Work (Solution)
   1. Question 1 – spread
      1. Mechanistic modeling to predict spread
         1. Develop model to specify parameters for which we need data
         2. Collecting existing data to parameterize: where trees infected, which individuals infected, when individuals/patches became infected, etc. Data exists in…
            1. Maps of location and onset of ROD
            2. Ongoing monitoring plots
   2. Question 2 – effects
      1. Develop a community ‘web’ model based on literature that can be used to make predictions.
      2. Use model to locate “before” sites that are likely to become infected in next 1-2 years
         1. Controls are areas that could become infected farther into future
         2. Describe ohia and other vegetation at “before” sites
         3. Describe terrestrial arthropods and birds at “before” sites.
      3. Locate die-off sites or “after” sites,
         1. describe ohia, vegetation, arthropods at “after” sites
      4. Compare communities at before and after sites
3. Budget
   1. <$40,000 for 2016-2017 academic year
   2. Field tech
      1. Pay
      2. Travel
      3. Housing
   3. PI
      1. Travel
      2. Housing
   4. Stuff
      1. Multiple sets of field gear for infected/uninfected
      2. Disinfectants
         1. Virkon, Quat (does anyone do this yet?)
         2. What was used for SOD?
      3. Tools for measuring trees
         1. % cover thingees
         2. Leaf litter collectors (sheets, baskets)
         3. Measuring tapes
      4. Invertebrate tools
         1. Traps
         2. Sample bottles, ethanol
      5. Bird tools
         1. Binoculars