1 Why Plant Population Viability Assessment?

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1.1 Introduction

As Conservation Biology has matured into its role as an integral and applied branch of the Ecological Sciences, there are several topics that have fallen clearly under its umbrella. Assessing the likelihood that a population will persist, a population viability analysis (PVA) is one of several critical central questions of Conservation Biology. PVA has been a popular tool in research and management of populations since its inception. Recently, the number of PVAs performed for plants has increased radically (Menges 2000). Although there has been a long-standing interest in population dynamics in plants (e.g., Silvertown 1987), the issues involved in understanding the population dynamics of rare plants has acquired a recent urgency due to the large numbers of rare plants currently on the endangered species list and threatened worldwide.

Using PVA with plants presents a number of unique challenges. Many aspects of plant life histories present unique challenges to modeling viability (e.g., long-lived stages, hidden life stages). Furthermore, PVA requires an understanding of the threats to plant species and the effects of these threats on population dynamics. These data are unavailable for many endangered species.

This volume addresses three main themes in plant population viability. First, what are the threats and issues facing rare plant populations? Second, what are the modeling approaches available to model plant population viability? And third, what are the peculiarities of plant life histories that make plant models different from animal models and how can these life history attributes be addressed in a modeling framework? Throughout the book, contributing authors have sought to combine discussions of plant biology and natural history with modeling approaches and management considerations. This volume should be useful to those considering plant population viability from a purely theoretical context as well as those faced with managing rare plant populations and seeking guidance in modeling population dynamics.
One of the key concepts to emerge from the PVA literature in recent years is that PVAs may not be as reliable as we may have initially hoped (e.g. Beissinger and Westphal 1998; Doak and Morris 1999; Fieberg and Ellner 2000). As a consequence, researchers need to have a clearly defined suite of goals and objectives prior to investing the cost of data collection and analysis for a PVA (Beissinger and Westphal 1998). Not all projects will have the resources to conduct an adequate PVA. Not all plants at risk require a PVA before proceeding with either listing or recovery actions. Nonetheless, ecologists and environmental managers would like to support conservation decision-making with quantitative estimates of the likelihood of population persistence. Hence, a common decision process for endangered species management has been the decision whether to invest the resources in order to conduct a formal PVA. As PVA has entered the conservation biologists’ toolkit, it has become important to use the tool judiciously with specific goals in mind. With the general objective of providing guidance on when and how to conduct a PVA in mind, we offer this edited volume to aid researchers conducting research in support of plant species conservation.

1.1.1 Book Structure

The book is divided into three sections. The first section outlines threats to plant population viability and evaluates methods of addressing these threats by PVA. The second section discusses broad modeling approaches and how these approaches might be applied to plants. The final section addresses specific problems of modeling plant populations and how these might be dealt with within the framework of a PVA.

In this first chapter we discuss how plants differ from animals and the unique challenges ecologists and conservation biologists face in trying to understand and manage plant populations. This introductory chapter sets the stage for this edited volume by elucidating several reasons for a book dedicated to plant PVAs: differences in life history attributes; unique conservation challenges; and differences in data issues in plants. These overarching themes are carried through the volume and emerge repeatedly in the different chapters presented within the book. Chapter 2 is a broad overview of threats facing plant populations and includes a categorization of threats as well as a brief assessment of the interactions between threats and viability modeling. Chapter 3 takes an in-depth look at four specific threats, genetic effects, competition, pollination, and herbivory, and evaluates the evidence for their impacts on rare species and the necessity of including them in population viability models. Plant disease is an issue that has rarely been addressed in considerations of population viability but is one that is likely to become more important. This issue is addressed in Chapter 4. Chapter 5 addresses the specific