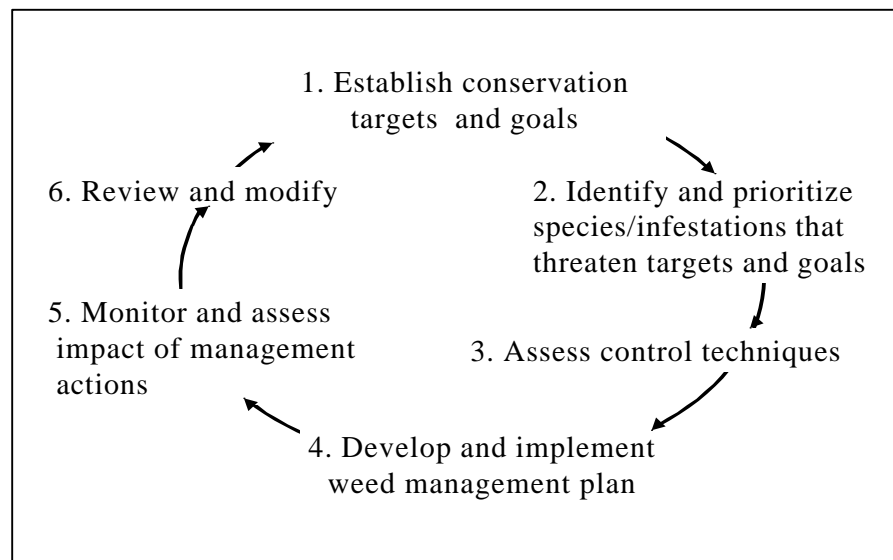


INTRODUCTION

Invasive non-native plants are a serious threat to native species, communities, and ecosystems in many areas around the world. They can compete with and displace native plants, animals, and other organisms that depend on them, alter ecosystem functions and cycles significantly, hybridize with native species, and promote other invaders. The good news is that many plant invasions can be reversed, halted or slowed, and in certain situations, even badly infested areas can be restored to healthy systems dominated by native species. In most instances this requires taking action to control and manage those invasive plants. This handbook provides you with detailed information about the tools and techniques available for controlling invasive plants, or weeds, in natural areas. Whenever possible, language familiar to natural area managers is used, and unfamiliar terms and jargon borrowed from other fields are defined.

Before embarking on a weed management program, it is important to develop a straightforward rationale for the actions you plan to take. We believe this is best accomplished using an adaptive management approach as follows (see Figure 1): (1) establish management goals and objectives for the site; (2) determine which plant species or populations, if any, block or have potential to block attainment of the management goals and objectives; (3) determine which methods are available to control the weed(s); (4) develop and implement a management plan designed to move conditions toward management goals and objectives; (5) monitor and assess the impacts of management actions in terms of their effectiveness in moving conditions toward these goals and objectives; and (6) reevaluate, modify, and start the cycle again. Note that control activities are not begun until the first three steps have been taken. A weed control program is best viewed as part of an overall restoration program, so focus on what you want in place of the weed, rather than simply eliminating the weed. When selecting control methods, keep in mind that the ultimate purpose of the work is to preserve native species, communities, and/or functioning ecosystems.

Figure 1.
Adaptive Weed
Management
Approach



This Handbook is divided into eight chapters, covering a range of different control methods. More often than not, however, successful weed control requires the combination or sequential use of several methods (called integrated weed management). For example, cutting followed by herbicide applications has been used successfully in many programs, and prescribed fires followed by spot-applications of herbicides have been used well in others. Consider all available control options: manual, mechanical, promoting competition from native plants, grazing, biocontrol, herbicides, prescribed fire, solarization, flooding, and other, more novel, techniques. Each has advantages and disadvantages in terms of its effects against the target weed(s), impacts to untargeted plants and animals, risks to human health and safety, and costs. The chapters that follow discuss the advantages and disadvantages for each method and provide examples of their successful (and in some cases unsuccessful) use in natural areas.

Chapter 1 describes a variety of manual and mechanical techniques. Chapter 2 covers the use of grazing for weed control in natural areas including the types of animals that can be used and how to time grazing for best effect. Chapter 3 briefly discusses the use of prescribed fire to control invasive plants. TNC has specific guidelines and regulations for using prescribed fire that must be adhered to. See TNC's Fire Management Manual and contact TNC's Fire Initiative (<http://www.tncfire.org>) for details on the steps required to develop and implement a Site Fire Management Plan.

Chapter 4 covers biological control of invasive plants. Biocontrol agents typically have the capacity to persist, to spread to areas far from release sites, and may undergo genetic or behavioral changes that allow them to feed on new hosts. In spite of these risks, the use of biocontrol has the potential to be one of the most powerful tools available for invasive species control. TNC's policy is to not allow intentional releases of biocontrol agents on land it owns and manages, unless permission to do so has been granted by the Executive Director of TNC's Invasive Species Initiative. TNC's biocontrol release policy and standard operating procedures for requesting permission for releases are contained in this chapter.

Chapters 5 through 7 provide information on the use of herbicides to control invasive plants in natural areas. Chapter 5 discusses factors to consider when deciding whether to use herbicides or not, provides guidelines for herbicide use, and describes different application methods, who may apply herbicides and when they are most effectively applied. TNC staff should read the "Standard Operating Procedures & Guidelines" and "Herbicide Health & Safety Guidelines" in this chapter **PRIOR** to purchasing or using herbicides. Chapter 6 discusses general properties of herbicides, different types of herbicide formulations, their behavior in the environment, and human and environmental safety concerns. Chapter 7 provides detailed information for eleven herbicides that have been used in natural areas. It contains a table that summarizes important characteristics of each of the 11 herbicides, followed by detailed information about each one. Finally, Chapter 8 discusses the addition and use of adjuvants in herbicide tank mixes. Adjuvants are often added into a tank mix to improve herbicide penetration and/or to facilitate the mixing, application and effectiveness of that herbicide formulation.

Information on the biology and control of specific invasive plants are available from <http://tncweeds.ucdavis.edu> and other sites on the web. TNC staff that would like additional assistance are encouraged to contact TNC's Wildland Invasive Species Team. John Randall (530-754-8890 or jarandall@ucdavis.edu), Barry Rice (530-754-8891 or bamrice@ucdavis.edu) or Mandy Tu (503-230-1221 or imtu@tnc.org) are available to answer questions and provide advice, information and referrals regarding specific weed problems.

ACKNOWLEDGEMENTS

The authors would like to thank Ramona Robison, Dr. Joe DiTomaso and Dr. Tom Lanini for valuable contributions and substantial comments on this book. Dr. Barry Rice was instrumental in making this handbook web-accessible.

Date Authored: April 2001

Updated: June 2003