

# Kill the Aliens: Controlling Leafy Spurge

by

Mary Ann L. McLean and Gary T. Grothman  
Natural and Mathematical Sciences  
St. Mary's University, Calgary, AB, Canada

## Introduction

In this case study you and your fellow students will play the roles of committee members organized to select the best strategy to reduce the infestation of leafy spurge (*Euphorbia esula* L.), an invasive weed that has infested Fish Creek Provincial Park in Calgary, Canada. There are two main parts to this activity. In the first classroom session we will cover general background information, and each student will be assigned to a group researching a control strategy (e.g., grazing, herbicide, biocontrol, or mechanical/physical/fire). Other groups will research the other possible strategies. You will obtain information about your strategy for use in the next class. Many of your sources will likely be from the “grey literature” (explained below). You will evaluate sources of information about your strategy and document them in an annotated bibliography (Assignment 1 below).

In the second class session, your group will have time to confer, then one expert (that's you) from each research group will be assigned to a committee and inform the other committee members about the benefits and shortcomings of your particular strategy. Other group members will be assigned to other committees. Note that you are not to act as a biased advocate for your strategy, but to present a balanced summary of its pros and cons. Collectively, each committee will come to a decision as to the best weed control strategy for the park and then present that selection to the class along with the reasoning behind the choice.

Finally, each committee will prepare a letter to your boss, the park ecologist, outlining your strategy and the evidence for it (Assignment 2). The letter will also include any warnings about pitfalls or special concerns.

## Background

### *Leafy Spurge*

Leafy spurge is a broadleaf (i.e., not a grass) plant which is considered a noxious weed in many parts of North America. Noxious weeds are plants that can cause agricultural, environmental or public health damage (US Plant Protection Act, 2000). Leafy spurge originated in Europe, probably arriving in North America as a contaminant among other seeds.

Leafy spurge is a hardy perennial, returning year after year from extensive root systems (up to 9 m deep and 5 m wide!). It also uses this root system to reproduce, spreading underground and establishing new plants. Even small root remnants are able to continue growing and develop into new plants. While root spreading is the primary mode of reproduction, leafy spurge can



Figure 1. Leafy spurge flowers. Photo by Mary Ann McLean.

also spread through seeds. Since a single plant can produce up to 130,000 seeds in a year and these seeds have a high germination rate, this potentially allows explosive population growth under the right conditions (Alberta Invasive Species Council, 2014). Leafy spurge seeds can remain viable in the soil for seven years (Thunhorst and Swearingen, 2005). This establishes what is known as a seed bank, an accumulation of seeds in the soil awaiting good germination conditions. When conditions are appropriate, some of these seeds germinate and the rest remain in the seed bank for germination later. This makes complete eradication very difficult.

In grassland habitats, leafy spurge forms dense stands and competes aggressively with other plants for water, nutrients and sunlight, displacing native species (Lym et al., 1998). It may also produce toxins to inhibit the growth of other species (Thunhorst and Swearingen, 2005).

Since this species is not native to North America, there are few local herbivores (insects or mammals) to eat it and help limit its growth. Similarly, there are few pathogens present in its new environment that could control it. As well, the latex produced by this species is a poison or irritant to some animals. This can result in scours or other digestive tract issues or skin irritation. Cattle often refuse to eat leafy spurge (Lym et al., 1998).

### *Fish Creek Provincial Park*

Fish Creek Provincial Park (FCPP) is one of the largest urban parks in North America (13.5 km<sup>2</sup>). Situated entirely within the city of Calgary, the park is heavily used (about 3 million visitors each year) by bicyclists, joggers, pedestrians, bird watchers and dog walkers. In spite of the high traffic, it is home to a wide range of wildlife including deer, coyotes, snakes, various birds (including osprey, hawks and eagles), and rarely, moose, black bears and cougars.

The park includes Fish Creek itself and a roughly 1 km wide valley surrounding the creek, as well as part of the nearby Bow River. Since the park is surrounded by neighbourhoods, horticultural species can easily invade the park. FCPP has a long history of agricultural and ranching uses that have been the source of many non-native plants. Over 90 years, much of the native grassland in this valley was replaced with European grass and grain crops, which were inevitably contaminated with weed seeds including leafy spurge.

Some native species remain, and the park ecologist and park staff are encouraging the recovery of these species through a range of invasive species control programs. Control of invasive weeds in urban parks such as FCPP is complicated by numerous factors. Desired native plant species are often susceptible to the same control measures, such as pesticides, as weeds. The impacts of weed control measures on park wildlife, such as large mammals and birds, should be minimized. Many regulations restrict activities along waterways such as those in FCPP. Use of certain chemicals, or other activities that cause contamination of aquatic ecosystems by chemicals, runoff or sediment and have negative effects on fish and other organisms, may be prohibited or require permits. Due to the need for maintaining public use of the park during weed control operations, safety and park aesthetics must also be considered.

In this case study you will assist with the recovery project by investigating control measures for leafy spurge and advising the park ecologist on the most appropriate methods to use.

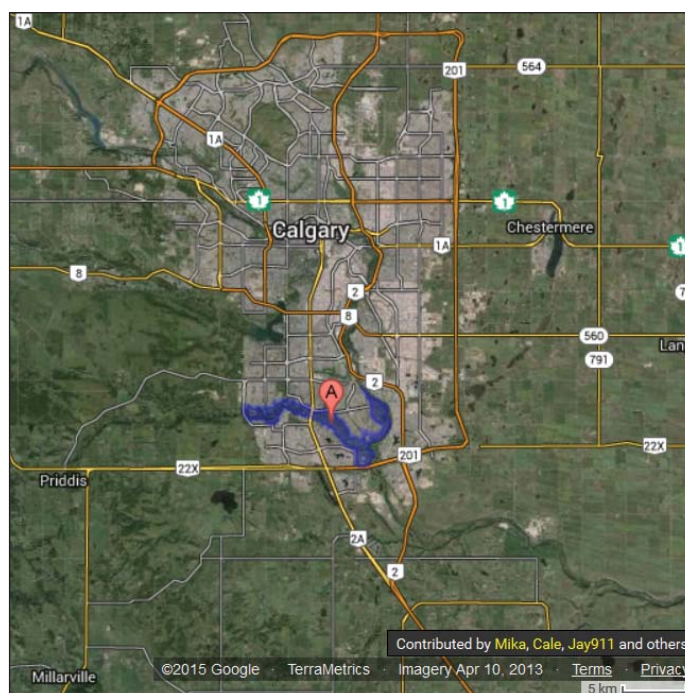


Figure 2. Satellite image of Calgary. The blue region around pin A indicates the location of Fish Creek Provincial Park (FCPP) surrounded by neighbourhoods.

## Grey Literature

While the “gold standard” for communication among scientists is generally the peer-reviewed journal article, there are many situations where such literature does not meet the particular needs of a researcher. This is often the case, for example, when searching out particular methods or details found in a patent, for historical data on species distribution within a particular area of interest, for such things as temperature and other records from remote weather stations, and so on. For this, the researcher often has to turn to alternate sources; in particular, the “grey literature” may be invaluable.

Grey literature is often produced by official or quasi-official bodies such as government agencies, think tanks, conservation organizations, corporations specializing in a particular area of interest, or other bodies normally long-established and with a certain record of rigour. However, such material is generally peer reviewed only internally within the originating organization, if at all. In some cases the group may have no obvious bias or motivation to misrepresent the information it presents, but in others such a bias may be obvious. As such, grey literature resides in the grey zone between the heights of peer-reviewed journals and the depths of self-published screeds on the internet.

At one time, grey literature was marked by its method of publication; grey literature was not published by publishing companies per se, rather the producing organizations were able to publish the material themselves, primarily for internal consumption. The material would typically be archived, perhaps in university or other libraries. However, with the rise of the internet, grey literature is often distributed just like any other self-published material found on the web, complicating the definition and recognition of this source material.

Examples of grey literature include the documents cited in this case study. Other relevant examples might include reports from conservation organizations, private and governmental organizations tracking invasive species, agricultural extension agencies and pesticide manufacturers, government regulations controlling park activities, and reviews of the efficacy of specific weed control strategies or products.

## Assignments

### *Assignment 1: Annotated Bibliography*

Since part of this case study involves accessing and using grey literature, this assignment addresses the question of how to determine whether your grey literature sources are good ones. You will individually develop an annotated bibliography of six sources on your topic.

Unlike an abstract or a précis, which are descriptive summaries of an article or a database, an annotated bibliography is descriptive and critical. Annotated bibliographies summarize the central ideas and scope of the source and indicate its relevance, accuracy and quality.

### *Tips on How to Evaluate Grey Literature*

Evaluation of any web source depends on assessment of its authority, reliability and timeliness. The following questions will help determine the quality of a particular website.

#### *Authority*

- Who is the creator or author?
- Is contact information given for the creators or webmaster?
- What institution or organization sponsors the site, if any?

#### *Reliability*

- What evidence indicates that the information is accurate?
- Is an agenda or bias apparent?
- Does it include the weaknesses as well as the strengths of the ideas presented?
- Are sources provided for statistical information or methodologies?
- Note that non-profit websites often have domain names ending in .edu, .gov, or .org and these sites can be very useful.
- Note also that websites with domain names ending in .com are usually commercial websites and may have a marketing agenda.

#### *Timeliness*

- When was the site created or last updated?
- How many of the links work?
- Does this subject require frequent updates to be useful?

In an annotated bibliography works are listed in alphabetical order by the citation. Each entry in your annotated bibliography should include:

- A citation of the source using the appropriate format (check with your instructor).
- A short paragraph of about 150 words including:
  - a brief summary of the central ideas and scope of the information in the source,
  - a short statement of the relevance, accuracy and quality of the source, and
  - a brief comparison of the quality of this work with that of another in your list of citations.

### *Participation and Peer Review*

Since each student brings different expertise to the committee, it is essential that all students participate in the discussions so that committees arrive at the best recommendation for the park. Participation will be assessed during discussions by the instructor and each student will evaluate the contributions of themselves and the others in their committee.

Peer evaluations will be based on the following criteria:

- Preparation of information for the discussion.
- Participation in a positive manner during discussion.
- Contribution to the writing of the letter.

### *Assignment 2: Letter to the Park Ecologist*

Following deliberations, your committee will prepare a letter outlining your recommended weed control strategy or strategies for the park, supporting evidence for your recommendation and appropriate cautions about potential problems or special concerns and how they might be addressed. Don't forget to include economic and social considerations affecting your recommendations. The letter must be written clearly, with correct grammar, sentence structure and spelling, in a maximum of two pages, single-spaced, with 2.5 cm (1 inch) margins, and 10–12 pt font.

## Literature Cited

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