



## Invasive plants of eastern Canada: history, impacts, management, and stories

Claude Lavoie: 50 Plantes envahissantes, Les Publications du Québec, Québec, Canada, 2019, 415 pp, Can\$29.95, paperback, ISBN: 978-2-551-26390-5

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Received: 8 September 2019 / Accepted: 18 September 2019  
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Announced as the “much awaited first guide to the invasive plants of eastern Canada” (my translation), *50 Plantes envahissantes* is that, but considerably more. Lavoie, a professor at Laval University and longtime researcher on invasive plants, begins his book with a 75-page primer on plant invasion biology and management, in the course of which he discusses many more than fifty non-native species. Although he specifically addresses invasions of eastern Canada (Ontario, Quebec, and the Maritime provinces), all of the 50 featured species and virtually all of the others discussed are found at least in the northeastern United States and many are distributed more widely in North America. The great majority, though not all, were first introduced to the United States before reaching Canada.

Most of the book is devoted to substantial treatments of the 50 species. These resulted from winnowing an initial list of 900 species, subspecies, and hybrids down to 87 particularly impactful species through a Delphic process, among which Lavoie selected the 42 he felt were most invasive and damaging. To these he added two species not chosen by his expert panel, the dog-strangling vines (swallowworts), *Vincetoxicum rossicum* and *V. nigrum*, which are of enormous concern in

Ontario, as well as species that are human health hazards. The latter include three native species [poison ivy (*Toxicodendron radicans*), common ragweed (*Ambrosia artemisiifolia*), and giant ragweed (*Ambrosia trifida*)]. The fifty include not only environmental pests but also several agricultural weeds, some of which [e.g., Canada thistle (*Cirsium arvense*)] also have environmental impacts. Lawn weeds are excluded.

Lavoie treats each of the fifty chosen species in great detail (up to 16 pages for *Phragmites australis*), beginning with both the global and North American native and introduced ranges (including a range map for eastern Canada) and the history of how and when the species first got into eastern Canada and then spread among the provinces. Next follows a description of relevant and interesting biology of the species. A discussion of impacts is thorough and critical. Lavoie is frank about cases in which a species is reputed to have environmental impacts but evidence is scarce. The impact section is generally well documented; each species account has a list of sources, and the reference list includes 2000 entries. The impact sections of various species accounts also contain examples and discussions of more general invasion phenomena, most of which are also treated in the opening primer. Among these topics are the passenger-driver metaphor (MacDougall and Turkington 2005); for garlic mustard (*Alliaria petiolata*), Lavoie

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describes how it is simultaneously both a driver and a passenger. For the concept of invasional meltdown (Simberloff 2006), Lavoie details how interactions of common buckthorn (*Rhamnus cathartica*) with introduced earthworms, the multicolored lady beetle (*Harmonia axyridis*) introduced for biological control, and an Asian fungus (*Puccinia coronata*) exacerbate its impacts. Lag effects occurred with the invasion into Canada of *Galinsoga quadriradiata* and common buckthorn; in both instances, the reasons for the lag and its termination are unknown, a point that Lavoie notes in repeating a frequent call for more research. After an initial discussion in the primer of the occasional mysterious collapse of a major invader, Lavoie points to Eurasian watermilfoil (*Myriophyllum spicatum*) as a species characterized by such population crashes. For both the enemy release hypothesis and the EICA (evolution of increased competitive ability) hypothesis (Blossey and Notzold 1995), he uses wild parsnip (*Pastinaca sativa*). Purple loosestrife (*Lythrum salicaria*) exemplifies the “treadmill effect,” whereby removal of one non-native is followed by invasion by another (Thomas and Reid 2007).

For each featured species, Lavoie has a substantial section on management (“lutte,” literally “struggle”). Herbicides are frequently suggested as most likely to be effective controls, although he does not minimize issues of expense, health, and non-target impacts. Rather the reason appears to be that for most species, the physical/mechanical methods and biological control, both of which are treated in detail in the primer, do not adequately control the target plant over the long term. In the primer, Lavoie discusses successes of biological control, non-target impacts, and the highly variable results of the same natural enemy on the same target plant in different locations—a tempered discussion of a controversial topic. On the more general topic of whether an invasive plant should be targeted at all without very clear evidence of an inimical impact, he describes the arguments of the critics and the controversy surrounding whether they should be termed “denialists,” but he is clearly usually in favor of a precautionary approach entailing management. For *Phragmites*, he tends towards a more limited attack on the invasive non-native form only in limited wetlands where it has just arrived and where the chances of limiting it are good, on the grounds that available technology and resources do not permit a wider effort.

An unusual, final feature of each species treatment is “une autre perspective” (another perspective). These are a heterogeneous group, each consisting of some aspect of the invasion or of the species not covered in the earlier account. For *Phragmites*, this consists of the discussion about whether and where to manage it. For wild parsnip, it is how it exemplifies the enemy release hypothesis and appears to accord in North America with the EICA hypothesis. For glossy buckthorn (*Frangula alnus*), it is about how varieties of this and other plants peddled by horticulturists as non-invasive because of greatly reduced numbers of viable seeds might nevertheless become invasive in the future. For other featured species, the other perspective is further afield from the invasion per se but nonetheless interesting. For green pigweed (*Amaranthus powellii*), it consists of a short account of the remarkable life of the explorer John Wesley Powell. For the European genotypes of reed canary-grass (*Phalaris arundinacea*), it is a discussion of whether this and other invasive plants should be cultivated as biofuel feedstocks despite the risk of causing new invasions. For Norway maple (*Acer platanoides*), it is the tale of how the Canadian mint depicted a Norway maple leaf instead of that of the native sugar maple (*A. saccharum*) on its banknotes, then claimed to skeptical botanists that this was a deliberate aesthetic decision. For the dog-strangling vines and Canada thistle (*Cirsium arvense*), it is about the history of their odd scientific or common names. For wild oat (*Avena fatua*), it is about the origin of the English expression “sowing wild oats” and a research paper using the term in its title that explored the sexual satisfaction of over 2600 married couples.

Who should read this book? It seems to target a well-educated lay audience, but it is bound to interest any invasion scientist, with many interesting facts not known to most of us: who knew that kudzu is well-ensconced in one area of the Ontario Peninsula, about 100 km from the nearest other population, in Ohio? This is also probably the most beautiful book to date on invasive species, with myriad excellent photographs that forcefully illustrate the points Lavoie seeks to make. Because of the scientific nature of the subject plus the ready availability of Google Translate, the French will not generally be a problem. Perhaps the greatest linguistic difficulty is posed by the fact that, although Lavoie gives the common English names of each featured plant, he does so only at the

beginning of the account of that plant, and the text usually uses common French or Québécois names, most of which will be unknown even to an anglophone competent in French. One must then go to the very complete index and seek the starred page number for the French common name, which indicates the first page of the account where the English and scientific names are given.

## References

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