above is to be found on the first 100 pages of the book.

The above is followed by Appendix A which is comprised of 148 most interesting distribution maps in alphabetical order by scientific name which, with combined dot maps with range-limit maps, provide precise distributional data from the Hudson Bay Lowland and related areas, while still indicating the broader distribution of the species. Appendix B entitled "Catalogue of the Vascular Plants of the Hudson Bay Lowland" is a summary of individual data collection areas in the Hudson Bay Lowland. This catalogue follows the order of families in Dalla Torre (1958) and Verdoorn (1938), with the taxa organized alphabetically within families. Appendix C, Excluded Records, has an alphabetical list of scientific names that have been excluded because of redetermination or because relevant voucher material could not be found.

The author is to be congratulated for putting together this most informative study of the terrain, plants and historic literature related to this extremely interesting area.

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The War on Weeds in the Prairie West: An Environmental History

By Clinton L. Evans. 2002. University of Calgary Press. xvii + 309 pages. Paper $29.95.

During recent history, weed eradication has been a constant battle, with the balance usually tipped against the farmer. Evans documents this battle in the Canadian prairies between 1800 and the 1950s. His objective is to "highlight the shortcomings of the current noxious-weed legislation and crop production systems on the Prairies." He argues that the main result of legislation and its accompanying agricultural bureaucracy was to perpetuate an "ecologically unsound, weed-friendly style of farming." By identifying weeds as an "enemy", attention was diverted from the "true enemy", which Evans sees as "the extensive system of grain farming" entrenched in the agricultural system, encouraged by "a style of agriculture that actively cultivates weeds". Evans contends that hitherto little attention has been paid to weeds in the history of the Canadian west. Yet he believes that "weeds are important", not least because of the immense costs of weed control, the huge losses caused by weed infestations, and the enormous human effort directed to weed eradication. Evans comments that historians have exhaustively analyzed social and political activities of prairie farmers, while paying little attention to utilitarian issues, "mundane, practical activities" like weed control, that dominated their daily lives.

Evans demonstrates that weed definitions are not biologically based but are founded on utilitarian concepts. Crops are "useful" plants. Hence, any plant that competes with the crop is a "non-useful" plant or weed. Many weed plants are doubly "out of place" in western Canada because they are exotic. The main "villains" include Russian thistle (*Salsola pestifer),* tumble mustard (*Sisymbrium altissimum*), pennycress (*Thlapsi arvense*), and Canada thistle (*Cirsium arvensis*). Evans lists the biological attributes that contribute to "weediness" and make a plant a successful weed. These include good seed dispersal characteristics, an ability to spread vegetatively, morphological plasticity, profuse seed production, annual habit, broad ecological tolerance and, sometimes, perhaps phytotoxicity. He points out that farming activities have exerted evolutionary pressures on weeds, often enhancing their "weedy" characteristics. Weeds are, therefore, "cultural artifacts" just like the social and agricultural systems within which they flourish.

Next, Evans sets the historical context by examining farming practices and weed management in the UK, beginning in 1500, when most major components of the weed flora were already established in Britain. Subsequent generations of farmers developed and modified strategies, often labour-intensive, to deal with them, including late sowing, planting clean seed, crop rotation, manual weeding, hoeing and ploughing, and livestock pasturing. Summer fallowing and tillage, later widely applied in Canada, developed from medieval farming. Immigrant farmers brought this weed knowledge and control experience to North America. The weed battalions that British farmers battled are similar to those that plagued Canadian agriculture. Indeed, many weed species also traveled as inadvertent immigrants to North America.

European-derived settled agricultural communities first developed in eastern Canada. Evans concentrates on the development of weed control strategies and policies between 1800 and 1867 in what is now Ontario, a region that mainly looked to Britain for its knowledge of agriculture. Weeds were a problem by the 1830s, with increasingly strident and vociferous fulminations against them in newspapers and commentaries. Ontario's weed flora was dominated by European plants, especially Canada thistle. Eastern North America before European settlement was mostly forested. Therefore, imported weeds, adapted to open disturbed landscapes, had a competitive advantage over native forbs when land was cleared. Evans points out that for many settlers the "war on trees" was more important than the "war on weeds" in the early years. Perhaps more significantly and subtly, European weeds, having co-evolved with European agriculture for centuries, were preadapted to take advantage of the ecological niches offered in cleared agricultural landscapes. Evans observes that early 19th cen-

tury agriculture in Upper Canada was dominated by wheat production, driven by economic demand in Europe and the settlers' need to produce a cash crop quickly. The mode of production involved one year of cropping followed by a year of summer fallow with limited tillage. In Evans' view, this was inherently more "weed-friendly" than the longer four-course rotation then prevalent in Britain.

The war on weeds took a legalistic turn with the passage of the Canada Thistle Act in 1865, the first focused, noxious weed legislation. It attempted to control one weed by compelling landowners and managers to clear and eradicate it. Evans notes that the Act's efficacy was limited because landowners had little time or energy to undertake eradication and municipalities were unwilling or unable to enforce its provisions. Weed clearance was also predicated on an assumption of cheap and plentiful labour, a situation that did not prevail in Ontario. Evans sees this legislation as a clear break with the previously dominant British tradition. Interestingly, he sees it as an exemplar of "an emerging national identity."

Evans then shifts his attention westwards as agricultural settlement spread from Upper Canada to the prairies. Evans views this era (1867 – 1905) as a time of "paper diplomacy and intense propaganda" with "the entrenchment of a blindly oppositional view of weeds in response to the rapid advance of aggressive immigrant vegetation." New immigrant weeds, notably Russian thistle (*Salsola pestifer*), became important problems. When agriculture spread west, Evans records, the Ontario experience was repeated. The same pattern of "wheat mining" was established, with its concomitant spread of weeds, exacerbated by a government policy that saw prairie wheat production as essential for the national economy.

By 1906, Evans sees the war as fully engaged on the western front. He characterizes the next forty years (1906-1945) as an interval of increased bureaucratization in the battle against weeds, with a gradual shift from the goal of "eradication" to the more realistic one of "control". Evans draws parallels between the growth of military bureaucracy leading up to WWII and the expansion of agricultural bureaucracy with enhanced powers conferred through increasingly draconian legislation. These powers included seizure of infested land if landowners did not battle weeds sufficiently diligently. Weed inspections, enforcement campaigns, and educational programs formed part of the onslaught.

The transition to herbicides and chemical control began with postwar optimism when it looked as if science and technology could solve every problem. At first, 2,4-D, which became available in 1945, looked like the answer to the prairie weed problem. It was cheap, effective, and apparently safe. Farmers took to chemical control enthusiastically. However, Evans argues that herbicides merely postponed the inevitable consequences of "weed-friendly" agriculture by permitting prairie farmers to continue growing a limited range of predominantly grain crops, especially wheat, with short rotations and summer fallow. By the 1960s, widespread chemical use in agriculture had clearly produced new problems. Evans notes that chemical herbicides, while they did reduce broad-leafed weeds, exacerbated problems with grass-like weeds, such as wild oats. Evans also describes how by the 1970s, herbicide-resistant strains of some weeds were being reported, suggesting that weeds were modifying to cope with the chemical threat. With the recognition that chemicals were not the total answer came a change in language and rhetoric, with "weed management" becoming the objective by the 1980s, rather than "weed control".

Evans' discussion concentrates on the concept of "good husbandry", the totality of farming practice rather than maximization of crop production. Though he does not put it in these terms, this idea has much in common with the currently fashionable idea of "sustainability". Evans sees the "good husbandry" approach as perhaps the best solution to the weed problem. Quite how this could be implemented, in this era of agribusiness, he does not make clear. Evans' survey concentrates on the literature and experiences of British and English-speaking farmers, agricultural experts, and commentators. Yet the prairies became home to farmers from many different regions – including Ukraine, eastern Europe, and Scandinavia. Many weeds were familiar to these people as ones they had battled in "the old country". Did their approaches differ in any significant way from those of farmers raised in the British or Ontario tradition? Throughout, Evans' analysis focuses on arable (crop) farming, especially grain production, rather than ranching. Evans does not discuss range management in any depth, a curious omission given its importance in the Canadian west.

This book is absorbing and clearly written. Evans' arguments are provocative and well presented. They should be of interest to anyone concerned with recent landscape change and environmental history in western Canada.

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