



WEED INVASION IN ALBERTA'S RIVER VALLEY CORRIDORS

By Stewart B. Rood and Andrea R. Kalischuk

Rivers and creeks represent linear landscape features that flow through watersheds and provide vibrant corridors for fish and aquatic ecosystems. Flanking these streams, riparian zones include floodplains and other low-lying environments that provide interfaces between land and water. In Alberta and throughout the Northern Hemisphere, riparian ecosystems are commonly dominated by cottonwood trees and willow shrubs; these floodplain forests provide exceptionally rich wildlife habitats and are favoured zones for human development and for recreation.

Disturbance and Development

River valleys are characterized by two processes: disturbance and development. Disturbance refers to abrupt change, and physical disturbance is a natural and common process in river valleys. Swift-flowing flood waters erode and transport gravels, sands, and silts, and scour vegetation. Ice events, especially the spring break-up, provide another natural physical disturbance that characterizes river valleys across Canada.

Floods or ice events produce barren riparian zones that are scoured of vegetation and covered with moist sediments. These conditions are ideal for the seedling establishment of new plants, including native plants as well as deliberately or accidentally introduced foreign, or exotic, species. The flood and ice events also sever established vegetation and shear shoot and root fragments, which are deposited along with the moist sediments. This provides ideal conditions for clonal reproduction, which is common for the native willows and cottonwoods, and for some of the foreign species.

Of the foreign plants, "weeds" are undesirable species that are often characterized by the capacity for prolific seed production and subsequent vigorous colonization. The natural physical disturbances that characterize riparian

zones make these areas especially vulnerable to weed invasion.

Compounding this natural vulnerability, the abundant human developments in river valleys further introduce weed seeds and vegetative fragments. River valleys have long provided preferred human transportation routes, commencing with the navigable corridors that allowed the European exploration of western North America. Due to their gradual slopes through mountains and hilly regions, river valleys remain as favoured transportation routes for roadways and rail lines.

The development of these transportation corridors involves mechanical excavation that creates additional barren areas, enabling even more weed expansion. The excavation machinery can even transport weed seeds and fragments, compounding the problem. In addition, all-terrain vehicle recreation provides another artificial disturbance that disperses weeds,

particularly along Alberta's headwater streams in the public lands of the Rocky Mountains and foothills.

Being relatively flat and adjacent to water, the fertile floodplain zones and river valley terraces are also preferred areas for agricultural production. Riparian woodlands are cleared for crop production, and the land is cultivated and seeded. Weed seeds are commonly introduced by agricultural equipment and the vehicles that transport the agricultural inputs and products.

In Alberta, as elsewhere, riparian areas are also chosen for livestock production, especially cattle. The cattle trampling provides yet another disturbance that can further weed invasion. Cattle browsing can amplify weed problems since cattle preferentially graze some species, often native plants, while weeds such as thistles are unpalatable, providing a competitive advantage.



Remnant trunks beside the St. Mary River near Lethbridge provide evidence of a narrowleaf cottonwood grove prior to the 1951 implementation of the St. Mary Dam, which led to severe reductions in the summer flows below the dam. While the cottonwoods and willows collapsed, leafy spurge invaded and is now the dominant plant in many locations below the dam. PHOTO: S. ROOD

Riparian Weeds in Alberta

It's tragic that perhaps the single most useful plant identification guide for riparian zones in western North America is *Weeds of the West*. In many river valleys in the western U.S., and in some in southern Alberta, the riparian plant communities have become dominated by exotic weeds over the twentieth century. The specific weeds vary somewhat across rivers and regions, and two particular species are especially troublesome in southern Alberta.

Leafy Spurge – Chemical Warfare and Biocontrol

Leafy spurge (*Euphorbia esula*) is an introduced perennial weed that has infested large areas of riparian zones and rangelands in western North America. It was first reported in Alberta in 1933, and by 1995 it covered more than 6,000 hectares in the central and southern parts of the province. Leafy spurge further expanded along many riparian areas following the major 1995 flood of many of Alberta's southern streams.

The success of leafy spurge is partly due to the production of toxic, milky latex in its stems. The latex contains a number of alkaloids that discourage browsing by native herbivores and by cattle. The plant produces numerous seeds, can propagate from fragments, and spreads aggressively from a very resilient root system.

Leafy spurge weed-control exemplifies the fight that has been undertaken with many riparian weeds in Alberta. With its initial introduction to an area, early attempts to control it involved pulling the plants, but the removal was rarely complete and the plant expanded further. Subsequently, two strategies were attempted to reduce seed production and subsequent expansion: mowing and sheep grazing. However, these assaults on the leafy spurge stems were insufficient as the root systems remained intact and regrowth was often vigorous.

Another attempt to control leafy spurge was through herbicides. However, chemical control is especially difficult in riparian zones since these are adjacent to surface waters that shouldn't be polluted. The irregular terrain of riparian zones precludes the use of large spray machinery, and the use of backpack-mounted herbicide sprays is very expensive and prone to chemical drift



Russian olive near the junction of the St. Mary and Oldman rivers, near Lethbridge. This drought-hardy, introduced tree is popular for landscape plantings in Alberta's prairie regions but can subsequently expand along river valleys as the large seeds are dispersed by birds. PHOTO: S. ROOD

with the ubiquitous winds of southern Alberta.

In its native settings of Eurasia, leafy spurge has abundant natural enemies, including a broad range of insect herbivores. No natural insect enemies exist in Canada, but since 1970, 18 European insects have been released for biological control of leafy spurge. Each insect species is screened prior to its release to avoid impacts on native or crop plants.

The most successful insects for controlling leafy spurge have been the flea beetles, *Aphthona* species. The larvae of these beetles feed on the roots, and the adult beetles feed on stems.

In Alberta, two species have provided some success. The black dot spurge beetle tends to prefer dry, sandy soils and has been relatively successful in the Edmonton area and in riparian zones along Lee Creek, near Cardston. The brown-legged spurge beetle prefers moist, loamy sites and has been successful at controlling small patches of spurge at sites around Millarville, Fort Macleod, Taber, and Bow Island.

While some successes have been achieved, biological control in river valleys is often difficult because of

natural microclimates. Substrates vary substantially in texture and moisture, and sun or shade can produce dramatically different habitats. In many cases, biocontrol is not achieved, even with multiple species of insects.

Reed Canary Grass – A Superior Competitor

While leafy spurge is a concern in both upland and riparian zones of Alberta, reed canary grass (*Phalaris arundinacea*) is generally limited to riparian areas. This vigorous grass was deliberately planted in many areas of western North America as forage for livestock or for protection against bank erosion. It is probably native to some regions of North America, but cultivars from Eurasia have been introduced and subsequent hybridization has probably produced more invasive lines.

Along streams in southern and central Alberta, reed canary grass can form extremely dense bands and stretch through the riparian area right to the water's edge; this excludes subsequent colonization of native plants such as willows and cottonwoods. The control of reed canary grass is very difficult due to its vigorous growth and its capacity for



Reed canary grass along the Crownsnest River in southwestern Alberta. High flows scour riparian vegetation, sometimes removing riparian weeds, but the seeds, shoots, and roots of many weeds are also flushed downstream, allowing expansion along the river corridor. PHOTO: S. ROOD

rapid clonal expansion, which allows it to quickly dominate an area. While cattle or native ungulate grazing pressure may restrict reed canary grass expansion, it often alters the plant community of riparian zones, producing a number of ecological impacts.

Saltcedar and Russian Olive – Weed Trees

Woody plants, shrubs, and trees are especially important in defining riparian woodlands and providing the “structure,” or vertical distribution, that is critical for many birds and other organisms. While riparian areas generally benefit from trees, invasive trees are threats to riparian ecosystem health and function.

Throughout the American southwest, the introduced saltcedar, or tamarisk (*Tamarix* spp.), is widely regarded as the most serious riparian threat in that region. Unfortunately, saltcedar is progressively moving northward and has already invaded reservoir fringes and some riparian zones in northern Montana. Its further northward expansion into Alberta is almost inevitable.

While saltcedar is a future concern, another weed tree, Russian olive (*Elaeagnus angustifolia*), is a current concern for a few provincial river reaches such as the Milk River, Alberta’s southernmost river. Russian olive is an

attractive, drought-tolerant, hardy species that is often favoured for ornamental plantings in Lethbridge and Medicine Hat. It produces large seeds that are dispersed by birds and often result in “volunteer” trees, which can commonly be found along the fringes of ponds and wetlands as well as in some riparian areas.

Russian olive is closely related to a prominent native shrub of Alberta, wolf-willow or silverberry (*Elaeagnus commutate*). Wolf-willow is a facultative riparian plant – that is, one that is common in streamside zones but also occurs, generally more sparsely, in upland areas. With the taxonomic relatedness, Russian olive is more likely to provide habitat and ecological value than more “foreign” species such as saltcedar and might thus be of a lower concern than saltcedar with regard to control.

Integrated Pest Management and the Natural River Regime

While biocontrol may offer a promising current strategy for the control of leafy spurge and some other riparian weeds, it is only one part of the appropriate solution. The best control of riparian weeds involves an integrated pest management approach, which involves multiple approaches that seek to restrict initial invasion and minimize subsequent

expansion. Control measures should be implemented within a broader management strategy that promotes the conservation and even restoration of the natural plant community.

For example, the lower St. Mary River valley may provide the most severely spurge-infested riverscape in Alberta, and the problem resulted in part from the extreme alteration to the instream flow pattern that led to the collapse of the native cottonwoods and willows (see photo, p. 16). In contrast, instream flow regimes were more favourable along the adjacent Belly and Waterton rivers, and with the reasonable health of the willow and cottonwood groves, weed invasion has been much less severe than along the St. Mary River.

The “natural flow regime” provides a current paradigm for river resource management in which managers seek to provide an instream flow regime that mimics the natural pattern. This includes variations within and across years, as well as aspects such as gradual flow reductions, which permit the survival of new seedlings of cottonwoods, willows, and other native plants.

Given the natural importance of physical disturbances, it may be appropriate to broaden this strategy to allow the “natural river regime,” in which floods and ice events are also recognized as part of the natural system. Native plants are generally tolerant of these natural disturbance events while some non-native weeds may be much more vulnerable. As with the implementation of biocontrol, there should be cautious re-establishment of the natural river regime; careful study is essential to analyze the consequences to native species and invasive weeds. The war on riparian weeds will extend for decades and better knowledge may be our ultimate weapon. 🐾

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