



Invasive Exotic Plants and River Regulation at Dinosaur National Monument

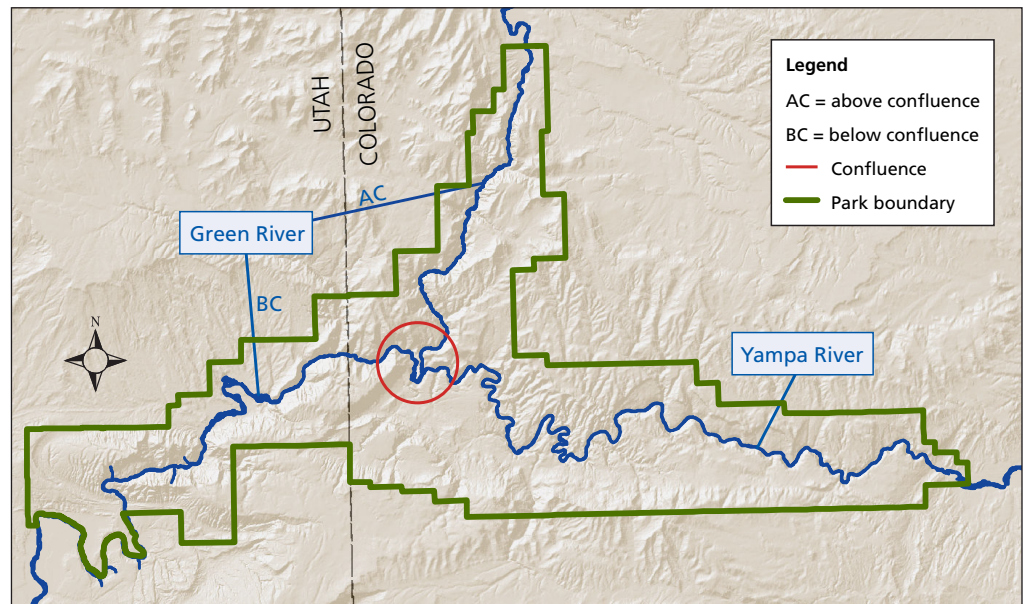
Background

A scientist could hardly dream up a more ideal place to study rivers than Dinosaur National Monument (NM), where the Green and Yampa rivers meet. About 100 miles upstream of the monument is Flaming Gorge Dam, which has regulated the Green River since 1962. From Flaming Gorge, the Green River travels south to Dinosaur NM. There, it meets the largest undammed tributary of the Colorado River—the Yampa, which enters the monument from the east. When the Yampa flows into the Green, it partially restores to it the functions and processes of a wild river. As a result, the Green River is significantly different below the confluence than it is above.

Study Question

This combination of highly regulated, wild, and partially restored waters makes Dinosaur NM the perfect place to study the effects of river regulation on aquatic systems. At the Northern Colorado Plateau Network (NCPN), we recently investigated the question of whether riparian areas of regulated rivers have more invasive plants than those of unregulated rivers.

On some regulated rivers, native riparian species have declined after being outcompeted by non-native, weedy species that thrive under the drier conditions and stable flows that can come with flow modification (Catford et al. 2011). However, research has also suggested that the life-history traits of the invading species, aspects of the flow regime, and local geomorphology are all important factors in riparian invasions



At Dinosaur National Monument, the highly regulated Green River and the wild Yampa meet. The inflow from the Yampa means that below the confluence, the functions and processes of a wild river are partially restored to the Green River. All three reaches are substantially different, making the monument a perfect place to study the effects of river regulation on aquatic systems.

(Mortenson and Weisberg 2010).

Methods

For this study, we used data accumulated through our [long-term monitoring of invasive exotic plants in NCPN parks](#). We compared plant densities and percent cover of several invasive species over two time periods (2002–2005 and 2010–2011) along three river reaches with different degrees of regulation: (1) the highly regulated Green River above the confluence (Green River–AC), (2) the wild Yampa River, and (3) the partially restored Green River below the confluence (Green River–BC) (see map).

Results

We found that while flow regulation does enhance invasion, it doesn't tell the whole story.

Patch density

The highly regulated Green River–AC had the highest density of invasive plant patches (10.1 patches per ha⁻¹), followed by the partially restored Green River–BC (4.4 per ha) and the wild Yampa (3.3 per ha). The species with the highest density of patches along the Green River–AC were tamarisk (*Tamarix* sp.), Canada thistle (*Cirsium arvense*), broadleaf pepperwort (*Lepidium*

latifolium), and yellow sweetclover (*Melilotus officinalis*). On the Green River–BC and Yampa River, tamarisk was the only species with patch densities greater than 1.0 per ha (see chart).

Timing

Although patch density was highest on the most-regulated reach, weeds became more widespread on the less-regulated reaches over the two sampling periods. From the first monitoring period (2002–2005) to the next (2010–2011), the total number of patches on the Green River–AC increased by 10%, while the Green–BC and Yampa rivers saw increases of 46% and 43%, respectively. This may be in part because the stable post-dam hydrograph of the Green River–AC had already led to the establishment of vegetation on most of the available post-dam surfaces by 2002–2005, leaving few spaces for invasive species to colonize. In contrast, dynamic fluvial disturbances and flow variability along the Yampa and Green–BC rivers continue to create new spaces and opportunities for spread and persistence of invasive species.

Conclusions

So if riparian areas of more-regulated reaches are more densely populated with invasive plants, but invasives are still spreading on less-regulated reaches, is the invasion process just slower on less-regulated reaches? Or will a wild river continue to maintain lower invasive plant populations than a regulated river?

This is where the issue of life-history traits bears examination. Using large, international datasets, Catford and Jansson (2014) indicated that successful non-native invaders of riparian zones generally have high seed availability and dispersal potential, often occupy high, dry locations within the riparian zone, and are adapted to or tolerant of flood disturbance—all of which may reduce competition with native plants. The life-history traits of many of the invasive, non-native herb species in this study are consistent with these findings. Because

many of them are associated with human activities that are common on river floodplains, such as grazing and agriculture (AKEPIC 2015), riparian zones are subject to continual inputs of propagules. These species are likely to continue to invade and persist to some degree in riparian settings regionally, regardless of the degree of flow regulation.

Flow regulation alone is likely not the only factor driving riparian invasion. Future monitoring and management of invasive species in riparian ecosystems would benefit by including knowledge of key life-history traits, hydrological variables, and site-scale distribution along physical environmental gradients (Mortenson and Weisberg 2010; Catford and Jansson 2014).

Article citation:

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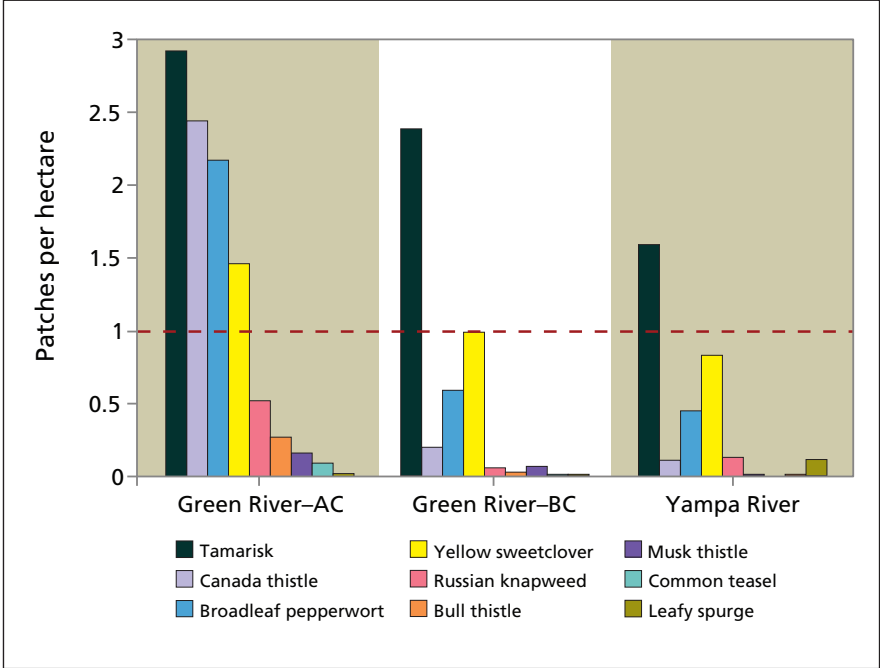
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