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Volume 13

Issue 1 *The Science and Practice of Managing
Forests in Cities*

Article 15

2020

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Recommended Citation

Bilden, Heather; McConnell, Steven; and Poulette, Megan (2020) "Riparian Cottonwood Forest Restoration Along the Yellowstone River: A Featured Natural Area in Billings, Montana," *Cities and the Environment (CATE)*: Vol. 13: Iss. 1, Article 15.

DOI: 10.15365/cate.2020.130115

Available at: <https://digitalcommons.lmu.edu/cate/vol13/iss1/15>

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Riparian Cottonwood Forest Restoration Along the Yellowstone River: A Featured Natural Area in Billings, Montana

Across Montana, dams curtail annual spring floods, depriving riparian cottonwood forests of the regenerative disturbance processes that sustain them. Invasive plant species further disrupt plant communities and ecosystem dynamics. Billings, MT lies along the undammed and iconic Yellowstone River. Spring floods still drive ecosystem change, but invasive species prevent a return to a fully functioning natural ecosystem. Restoring a highly visible natural area adjacent to Montana's largest city will provide abundant opportunities for education on disturbance regimes, invasive species, and ecosystem processes.

Keywords

urban forest management, urban riparian forest, urban natural area restoration

INTRODUCTION

Across Montana, dams curtail annual spring floods, depriving riparian cottonwood forests of the regenerative disturbance processes that sustain them. Invasive plant species further disrupt plant communities and ecosystem dynamics. Billings, MT lies along the undammed and iconic Yellowstone River. Spring floods still drive ecosystem change, but invasive species prevent a return to a fully functioning natural ecosystem. Restoring a highly visible natural area adjacent to Montana's largest city will provide abundant opportunities for education on disturbance regimes, invasive species, and ecosystem processes.



Image 1. The Yellowstone River nearing full flood stage. Note trees surrounded by water in both foreground and on the opposite bank. Photo credit: Steve McConnell

CONTEXT

Much of the economy of the arid, American West is derived from access to water and dams built to provide profit- and productivity-driven water distribution. An unintended consequence of dam building is the curtailment of natural disturbance processes, primarily spring flooding, causing a slow-motion decline of riparian cottonwood forests.

The river passing by Billings provides the only tall-tree forest in the area. When cottonwoods senesce and are replaced by short-statured invasive shrubs, the centerpiece of eastern Montana's valleys is ripped away. The incessant chirp of cicadas on cottonwoods on long, hot summer days; the magnificent yellow leaves heralding autumn's return; the deafening silence of monumental trees enduring below-zero temperatures alongside creaking ice-flows on a frozen river; and the burst of green, birdsong, and insects that welcomes the spring will all be gone if cottonwood forests disappear.

The Yellowstone River is the longest free-flowing river in the contiguous United States. While critical spring flooding still occurs, numerous invasive terrestrial plants disrupt ecosystem processes. Restoration efforts are therefore focused on removing invasive species and allowing natural flooding events to promote cottonwood regeneration and ecosystem renewal.

GOAL

Our primary management goals include reducing the influence of invasive species and restoring a river-driven natural disturbance process that will sustain riparian cottonwood forests into the future. More than just the technical how-to mechanics of restoration, we hope to educate the public on the need to actively manage ecosystems, incorporating innovative approaches and working alongside nature to get desired outcomes. A pilot study in the fall will examine monitoring and removal methods. Innovations we will try include using biocontrol agents, livestock grazing, volunteer events, and the judicious use of chainsaws and herbicides to achieve desired outcomes.

APPROACH USED

Because the Natural Areas program was initially established without a budget to support it, we rely heavily on grants and volunteers. The key partnerships are between the City of Billings, Rocky Mountain College (RMC), and the Montana Audubon Center (MAC), all of whom benefit from work on this project in tangible ways while providing an important service to students, volunteers, and the community as a whole.

RMC uses this project for hands-on learning for their students. The MAC generates abundant new educational opportunities. Both increase awareness of their work and the value they provide for the quality of life in the Billings area.

The city, for its part, increases its engagement with partner organizations and improves areas under its care by making those areas sites for knowledge and skill development, places where volunteers can do meaningful work while increasing their connection to nature, and provide a nature experience within a mainly urban prairie and agricultural setting.

A first step in this project is to conduct a pilot study examining invasive species removal. In the fall of 2019, RMC forest ecology students began establishing baseline monitoring plots prior to invasive species removal. A local arborist will work with the city to remove woody

invasive shrubs from the mid- and understory of the treatment area. In the spring of 2020, volunteers from MAC and RMC students will return to the site to monitor and remove woody invasive seedlings. This pilot study will allow the City Forester to establish an effective workflow, budget, and timeline for future restoration efforts. Pilot data will also allow the city forester to more effectively pursue grants in support of restoration efforts.

We will rely heavily on a Community Outreach Specialist, a city employee, for volunteers to sustain this project over time. Local environmental groups, area service organizations, churches, and community-action groups are frequent volunteers in city programs.

RESOURCES

Project funding is provided by the City of Billings in the form of salaries for the City Forester and Volunteer Coordinator. One small grant paid for initial work, but other funds will be required to sustain it. This project benefited from the previous work of researchers that studied and published work on similar riparian forests (Anderson 2013; Colorado State Forest Service 2015). Amply supplementing that research is an abundance of on-site data collected for this area by citizen scientists, in particular, Ralph Scott. Local professor Kayhan Ostovar and the Montana Department of Fish, Wildlife, and Parks' Biologist Mike Ruggles also provided data and information about this system, as did the MAC.

KEY RESULTS

As the result of sustained active management and focused restorative management, within two years Riverfront Park will become a “go-to” spot to see

- A healthy, functioning riparian cottonwood forest where people can learn about the structure and composition of riparian cottonwood forests, the processes that sustain them, and the ecosystem services they provide.
- Effective ways to control invasive weeds, in particular Russian olive, European buckthorn and leafy spurge.
- Native plants in a natural setting with information about their ecological role and uses by indigenous peoples.
- Active management and the ways innovation and applied ecology can transform impaired ecosystems to productive function by, for example, replacing buckthorn dominated understory stands with the grass and diverse short-stature shrub-dominated understories of natural stands.



Image 2. Plains cottonwood (*Populus deltoides monilifera*) trees after clearing common buckthorn (*Rhamnus cathartica*) away from the base of trees. Note dense buckthorn vegetations still surrounding trees in the distance where removal and control operations have not yet reached. Photo credit: Steve McConnell

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