

INTERMOUNTAIN WEST JOINT VENTURE

INTERMOUNTAIN INSIGHTS: *Inspiring Conservation Action Through Science*

THE RIPPLE EFFECT

FLOOD-IRRIGATED GRASS HAY BENEFITS WATERSHEDS FROM THE TOP DOWN

The creeks and rivers that snake through the arid landscape of the West are conduits of life, providing water to animals, plants, and humans. But these waterways are not just vessels for carrying water from one point to another: Riparian floodplains, especially in higher parts of a watershed, function a little like sponges. Snowmelt in the spring spills over creek banks and spreads across low-lying areas, perhaps helped by beaver dams or other obstructions, and percolates down into the ground. Later in the season, when flows are low and the watershed needs it the most, the water that wasn't used to sustain riparian plants through their growing season returns to the main channel, helping keep these waterways functional.

These high-value areas have been used and sustained by people throughout history. More recently, during and after Euro-American colonization, the ranching families of the West were quick to settle in and rely on the "green ribbons" created by riparian corridors. Fertile floodplain soils and ready access to water for irrigation make riparian corridors ideal for growing grass hay for livestock. In turn, the traditional flood irrigation practices used by ranchers to produce grass hay often mimic the flooding that naturally occurs along riparian corridors, helping water pool in lower channels, sloughs, and swales and be available for plant and wildlife use longer into the summer season.

As a result, ranching in many parts of the West has become intertwined with ecosystem function. <u>A new study from</u> researchers with the Intermountain West Joint Venture, the

Drying these fields up would mean the end of a viable agricultural operation and that would mean the end of a lot of this habitat."



University of Montana, and other key science partners shows that flood irrigation on these grass hay meadows plays an important watershed role, providing the majority of temporary wetland habitat in the region. The research also highlights the threats posed by the application of more efficient irrigation approaches, like center-pivot sprinkler systems, which can unintentionally increase the impact of climate change and drought by breaking down the processes that keep these "sponges" sustaining riparian systems. Keeping flood-irrigated grass hay meadows green and growing for as long as possible by applying water in the late spring and early summer helps livestock and ranchers, but it also helps myriad other species that depend on rivers and their floodplains for habitat during the driest parts of the year. Adrian Hunolt, a rancher in southwest Wyoming, said that the loss of flood irrigation practices could have significant consequences for wildlife habitat as well as ranchers.

"Drying these fields up would mean the end of a viable agricultural operation and that would mean the end of a lot of this habitat," he said.

TEMPORARY WETLANDS & GRASS HAY

In the study, researchers identified key areas that provide major wetland benefits for the entire region. By and large, these areas are flood-irrigated grass hay meadows located within riparian footprints. The research shows that flood-irrigated grass hay meadows account for only 2.5 percent of irrigated agricultural land in the Intermountain West. However, despite occupying such a small footprint, these areas make up a large amount of the region's short-lived wetlands during the peak May-June



irrigation season—58 percent of temporary wetlands and 23 percent of seasonal wetlands. Because water application is timed with spring runoff, flood irrigation mimics the natural hydrology of the riparian wetlands that historically made up these areas. Ninety-three percent of flood-irrigated grass hay meadows occur in historical riparian ecosystems.

The habitat provided by flood-irrigated grass hay is predominantly privately owned and operated by ranchers producing livestock (primarily cattle) for human consumption. These areas are also typically located in upper watersheds. The research shows that the highest concentration of these places are in Colorado, Wyoming, Montana, Idaho, and Oregon headwaters areas that affect water quantity and quality for everyone downstream.

The ranchers who manage these areas often have high-priority water rights due to the long tenure of their operation—many are fourth- or fifth-generation operations. Furthermore, these operations often rely on public-land grazing permits held by the U.S. Forest Service or the Bureau of Land Management to supplement the grass hay produced in these riparian corridors. As a result, the resilience of this habitat is closely intertwined not only with private land management actions, but the decisions made at state, regional, and national levels about the management of public lands and water.



Figure: Intermountain West irrigated agriculture shown as flood-irrigated grass hay (top photo) and other irrigated lands (bottom photo). Delineations represent mean conditions from 2013 to 2022.

HIGH-QUALITY, LOW QUANTITY HABITAT WITH MULTIPLE BENEFITS

To identify where these places are throughout the Intermountain West, researchers interpreted satellite images to delineate grass hay meadows, looking for distinguishing features like irrigation ditches and other infrastructure. They then marked these areas by creating polygons to use in further modeling. Using the methods that power the <u>Wetland Evaluation Tool (WET)</u>, they overlaid surface water and associated wetland data on the established polygons to track the extent of seasonal flooding and the type of wetland provided by the grass hay meadows. Finally, they compared the types of wetlands found in these areas with historical ecological settings by intersecting these polygons with the <u>LANDFIRE Biophysical Settings layer</u>, data that represents vegetation systems that were dominant on the landscape before Euro-American settlement.

By linking to other studies, researchers connected the dots between the wetland footprints provided by flood-irrigated grass hay meadows and how they benefit plant and wildlife communities. Past science from the IWJV and partners has shown a strong linkage between this habitat type and the seasonal needs of migratory birds like greater sandhill cranes, which can serve as umbrella species for other wildlife that use the habitat. Plus, these meadows also support wildlife-sustaining riparian plants from willows and cottonwood to wildflowers and grasses. In some locations, flood-irrigated grass hay supports mesic habitat for sage grouse. This is especially true during drought, when smaller, more isolated mesic areas can dry up.

Although flood irrigation delivers water to plants less efficiently than center-pivot sprinklers, in historical riparian ecosystems, this "inefficiency" can provide multiple ecosystem benefits absent from other forms of irrigation. <u>Emerging research</u> suggests the presence of flood irrigation in key locations can lead to increased in-stream flows during late summer in some watersheds in the West. Although there is much to learn about how surface and groundwater are connected in different areas of the region, it is becoming clearer that flood irrigation in riparian floodplains influences groundwater recharge and return flows at multiple scales. Conversion to more efficient forms of irrigation like drip or pivot, meanwhile, can decrease water availability at a watershed and basin scale due to the loss of these return flows and sometimes even an increased amount of consumption enabled by the more efficient infrastructure.

A FUTURE THAT SUSTAINS WILDLIFE AND WORKING LANDS

As climate change continues to dry the Intermountain West, it becomes more important than ever to identify water management strategies that support watershed health and provide benefits to people and wildlife. The flood irrigation of grass hay meadows helps sustain wildlife habitat and rural economies.

WHO USES FLOOD-IRRIGATED GRASS HAY MEADOWS?

WETLAND-DEPENDANT BIRDS



Waterbirds like dabbling ducks, sandhill cranes, and shorebirds that rely on temporary wetlands to meet life cycle needs like breeding and foraging frequently use grass hay meadows during the irrigation season in late spring and early summer.

SAGEBRUSH WILDLIFE

Sage grouse, mule deer, and pronghorn antelope, among other sagebrush obligates, use flood-irrigated grass hay meadows for late season foraging. Plants growing in these wetter areas stay green and nutritious long after upland forage has dried up in the summer heat. Insects abound here, too!



OTHER WILDLIFE



Big game animals like moose and elk can be found in grass hay meadows and riparian corridors, eating the succulent plants that grow here. Hawks, eagles and other birds of prey survive off the rodents and other small animals that live in these diverse wet areas. Spatial modeling as used in this study is increasingly essential for the conservation of these areas. These models show the large-scale impacts of management practices like flood irrigation and link land managers' actions to important wildlife habitat and benefits to western communities. Because flood-irrigated grass hay meadows are relatively rare on the landscape, this science is particularly powerful as a tool that shows where strategic conservation can have large effects. Actions that preserve and support the practice of grass hay flood irrigation in the right places can sustain vast amounts of temporary and seasonal wetland habitat used by migratory birds and other wildlife.

4

NM

3

This research also highlights the importance of providing a suite of resources that support private landowners in these key landscapes. A number of programs available through state and federal agencies, like the <u>Natural Resources Conservation Service</u>, provide landowners with tools to continue agricultural practices that benefit wildlife habitat and water availability. Programs that support the modernization of flood irrigation infrastructure are essential for keeping ranchers in business and flood-irrigated grass hay meadows intact; often, projects that <u>update irrigation</u> infrastructure can be combined with riparian restoration and fish and wildlife habitat improvement projects. Private entities like

SOURCE

1

ID

-1

Study area

Donnelly, J.P., Jensco, K., Kimball, J.S., Ketchum, D., Collins, D.P., and Naugle, D.E. (2024). "Beneficial 'inefficiencies' of western ranching: Flood-irrigated hay production sustains wetland systems by mimicking historic hydrologic processes." *Agriculture, Ecosystems, and Environment https://doi.org/10.1016/j.agee.2024.109051*

Figure (left): Study area map defined by the Intermountain West, USA. Images characterize agroecological settings associated with regional flood-irrigated grass-hay production: 1) Warner Valley, Oregon; 2) Marsh Valley, Idaho; 3) Star Valley, Wyoming; 4) San Luis Valley, Colorado.



Flood-irrigated grass hay meadows often retain water until late in the summer or fall, providing an oasis in an otherwise dry landscape.

land trusts also offer options for landowners to conserve their land while keeping an agricultural operation in business.

Of the utmost importance is continued and increased collaboration across fencelines—among private and public land managers as well as agencies and organizations, and from local to national scales. Ensuring wetland resources will be sustained into the future requires an investment in the people, practices, and partnerships needed to address current and future water-related challenges while being nimble in response to a changing landscape.

WORKING WETLANDS EXPLORER

Access and explore the spatial data associated with this research through the IWJV's <u>Working Wetlands</u> <u>Explorer app</u>. For more information about how to apply this data to conservation, reach out to the IWJV's <u>Science to Implementation team</u>.

Intermountain West Joint Venture | iwjv.org 3