

THE VALUE OF BIODIVERSITY TO RANCHING ON THE PRAIRIES

Saskatchewan



Ranchers integrate environmental and economic concerns on a daily basis. Agricultural productivity depends on and benefits from **biodiversity***. As a result, ranchers are, and need to be, stewards of Saskatchewan's **natural capital***. Diverse **agroecosystems*** can contribute to a healthy environment and improve agricultural productivity.

We have seen what happens when biodiversity is reduced. The consequences are most apparent with increased pest problems as crop monocultures expand, replacing the diversity of natural vegetation. The natural predators of these pests decline as local habitats decrease. Maintaining biodiversity is an excellent way for producers to achieve a healthy landscape.

The Agriculture & Biodiversity series includes the fact sheets 'The Value of Biodiversity to Ranching on the Prairies', 'The Value of Biodiversity to Farming on the Prairies' and 'Biodiversity Benefits - Companion Sheet'. Words and phrases in green with an * are defined in the glossary in the Companion Sheet.

Biodiversity and the Ranching Industry

Biodiversity is of great importance to ranchers. It is the source of all livestock, crops, pollinators, biological agents that control pests, and many agricultural pesticides and pharmaceuticals. Numerous ecosystem services essential to agriculture, including the creation of soils, establishment of forage, and sources of clean water are enhanced by biodiversity.

The first aspect of biodiversity, genetic variability within a species, is vital to the long-term health and economic feasibility of ranching as well as the world's food supply. For example, variability within and between livestock breeds is essential for meat yield and quality, hybrid vigour, and the development of tolerance to stresses such as heat and cold.

Encouraging different species is the second aspect of biodiversity. Currently, only 14 bird and mammal species provide 90% of the meat consumption worldwide. Yet in Saskatchewan alone, there are over 400 species of birds, fish and mammals from which new food sources could be derived. Availability and knowledge of a wide variety of species gives the individual producer the flexibility to react to environmental changes, such as climate shifts, diseases or new market pressures. It is essential to maintain both levels of biodiversity to ensure the sustainability of the world's food supply.

Ranchers have long depended on nature and the land for their livelihood and lifestyle. Ranches play a vital role in the maintenance of biodiversity and healthy ecosystems. Ranchers have the

opportunity to make great contributions to biodiversity without making major changes in their practices.

Rangeland acts as a buffer between urban or industrial use of the land and nature itself. As human activity increases, the long-term sustainability, production and stability of agriculture and ultimately society is threatened. Ranchers can reduce these risks by retaining natural vegetation and establishing permanent cover to encourage biodiversity.

Producers may be surprised by the subtle changes that can be made to improve biodiversity. These changes have the potential to reduce inputs and increase outputs. Research and resources are available to anyone interested in learning how ranching practices can be adapted to further promote biodiversity.



Biodiversity and Ranching Go Hand in Hand

“High biodiversity is a key indicator of healthy rangeland which indicates proper ranch management. Ranchers who can demonstrate environmental sustainability may find themselves in a better position to market their product.”

Michael Burgess, Rancher and Chair, Prairie Conservation Action Plan

It is difficult to find a land use more compatible with the prairies' natural biodiversity than ranching. Most of Saskatchewan's remaining native prairie supports livestock. On healthy rangelands native plants and animals thrive, including many endangered species such as the burrowing owl, swift fox and small white lady's slipper. Perennial grasslands provide food and homes for thousands of species besides livestock.

Although less visible, most biological activity on rangelands occurs below ground where 60-90% of the energy is created and stored by plant matter. Micro-organisms such as nematodes, earthworms, bacteria, fungi, protozoa, arthropods, and algae constitute a large part of rangeland biodiversity.

Insects such as ants and grasshoppers are also significant contributors to rangeland biodiversity. They recycle nutrients and provide a source of food for many birds and other insects. Of the hundreds of species of grasshoppers in North America, only a dozen or so are agricultural pests and most of these are not native to the Canadian prairies.

Small mammals such as Richardson's ground squirrels and white-tailed jackrabbits contribute significantly to rangeland biodiversity and biomass.

Although small mammals can remove 30-50% of net primary production from rangelands, they do increase soil aeration, improve water holding capacity, recycle nutrients, and enhance plant germination. In addition to being a source of food for other animals, burrowing mammals provide critical nesting and denning sites for other species such as the burrowing owl and swift fox.

Sustainable grazing on native or tame pastures uses very low amounts of man-made energy, requires little to no agrochemical inputs, utilizes a resource (forage) that humans cannot consume, and supports a wide range of natural biodiversity.

Plant-based human diets are sometimes promoted as being more environmentally friendly than diets that include meat because of the energy used to produce an equivalent calorie of each. However, meat production only requires more energy if the meat is produced in an intensive operation where all food provided to the animal has to be grown, harvested and fed using high energy inputs.

The long term viability and profitability of agriculture depends on maintaining diversity within livestock and their wild relatives, within natural ecosystems and within the agricultural landscape.

World View – Biodiversity Saves Money

The city of New York provides approximately 1.2 billion gallons of safe drinking water daily to over 9 million people. The source of that water is a 2000 square mile watershed. In 1997, the quality of the drinking water began to decline and the city needed to take action. A conventional water treatment plant would cost \$8 billion US to construct and would require ongoing substantial maintenance costs. The city chose to improve the quality of the water by investing in the quality of land conservation upstream within the watershed.

As part of the overall initiative, more than 85% of the farms in the watershed have joined the voluntary Watershed Agriculture Program. This program promotes beneficial management practices to reduce agricultural pollution, manage woodlots, enhance the economic viability of participating farms and minimize new residential development in rural areas. Financial incentives are provided for riparian buffer establishment, reducing agricultural production on environmentally sensitive lands, and other beneficial practices. These initiatives combined with the city's initial investment of \$1.8 billion US in

Only about 17% of Saskatchewan's native prairie remains. Most of this land supports livestock and nearly half is privately owned.

The Critical Soil Food Web

The energy base in all soils is organic matter. Decomposers are those critters that feed directly on organic matter. Predators in turn feed on the decomposers. Larger predators then feed on smaller predators and so on up the chain. When predators die, decomposers then feed on the dead predators. A number of nutrients are made available to nourish plants as all this decomposition occurs.

Since all soil food webs depend on organic matter as the primary food source, and efficient nutrient cycling depends on these webs, soil organic matter can be compared to an insurance policy for plant nutrients. To maintain healthy functioning populations of soil organisms, organic matter must be renewed from plants growing on the soil, or from other plant and animal materials such as animal manure, urine and compost.

Of the more than 400 species of native mammals, birds and fish in Saskatchewan, nearly all of those that occur naturally on prairie rangelands thrive alongside livestock.

Low-cost Ways Ranchers Can Help Biodiversity

1. Retain natural habitat
2. Delay haying until after July 1st
3. Feed livestock a balanced diet
4. Delay grazing of wetlands and riparian areas until late summer or fall
5. Manage grazing to maintain structural heterogeneity across the landscape



World View – continued

key lands and conservation easements quickly improved the quality of the city's water. New York City also continues to invest annually in stewardship programs to remediate failing septic systems and safely store road de-icing materials.

The Watershed Agricultural Program also helps promote and market local agricultural

Riparian and Wetland Areas: Biodiversity and Range “Hot Spots”

Riparian areas are zones where land meets water, and include stream banks, lakeshores and wetland fringes. Through the seasons they can vary from wet to dry, and biological communities evolve from the interactions between water, soil and vegetation. While riparian areas represent only 5% of Canada's prairie landscape, they are important sources of biological diversity. As much as 80% of Saskatchewan's wildlife relies in whole or in part on the shelter and food found in healthy riparian areas to survive.

Clean water systems are greatly benefited by healthy riparian zones. These areas help control the flow and volume of water and also help store water during floods. They reduce erosion and help filter chemicals and sediment out of runoff.

Riparian zones provide significant benefits to people, yet are highly vulnerable to the influence of human activities. Riparian areas produce more green forage for a longer period than uplands because of the high water table. Water, forage quality and shade attract cattle to the riparian zone. Without management strategies to compensate, heavy localized grazing pressure can result in trampling and elimination of riparian vegetation. Soil compaction and faster run-off after precipitation can lead to increasing erosion and sediment loads. Such damage can impair the proper functioning of both flowing and non-flowing riparian systems.

Sediment in water can reduce drinking water quality, as well as cover fish spawning beds and alter habitat for aquatic organisms.

produce for farm participants in the program, most of whom are meat, dairy, honey or maple syrup producers or woodlot owners. Their slogan says it best :

“Local farms and forests keep our water clean, and protect wildlife habitat and open space”.

Although recent research from the University of Calgary has shown that cattle do not carry or shed the bacteria that causes ‘beaver fever’ in humans, fecal matter in surface water reduces water quality for humans, livestock and wildlife.

Proper management of riparian areas can benefit the producer both environmentally and economically. Clean drinking water for livestock and high quality forage production can increase the annual weight gain in livestock resulting in a net economic gain. Off-site watering may also reduce diseases such as footrot in cattle.

The costs associated with implementing new riparian management strategies vary significantly. Some scenarios, such as changes to salt and mineral placement to draw livestock to the uplands, are very low in cost and the economic gain from increased weight in livestock is quickly recovered. However, when riparian zones are in poor range condition the cost of adopting new management strategies can be high. In some cases where off-site watering systems or fences are being installed, ranchers may wish to work with conservation organizations who may provide financial assistance to complete the management changes.

The initial cost of these changes may appear high, yet studies have shown that strategies which improve the distribution of cattle can increase a producer's margin by up to \$50/cow on an annual basis. The riparian area can respond quickly to management changes with increased biomass production meaning capital costs for stewardship projects are often recovered in as little as a single year.

Potential Benefits

Recent research by the University of Saskatchewan shows that Saskatchewan consumers, particularly current conservation supporters, would pay 15 to 25% more for food produced by farmers and ranchers who were conserving riparian health and water quality.

The Land Conservancy of British Columbia has developed the “Conservation Partners” label for agricultural producers who participate in conservation projects to use to help market their products. Some wine and cheese products are already commanding a premium as consumers begin to understand and recognize the label.

Biodiversity – it's not just about numbers.

Ranching practices that increase invasive, non-native species can harm biodiversity. Though sometimes touted as contributing to biodiversity by adding species, weeds such as downy brome or invasive tame grasses like smooth brome grass and crested wheatgrass invade native grassland and crowd out native species. The result can be devastating to natural biodiversity.



Photo courtesy of Agriculture and Agri-Food Canada

This tiny wasp (*Trichomalopsis sarcophagae*), native to Saskatchewan, parasitizes non-native filth flies such as the stable fly and the house fly which are pests of livestock.

A Saskatchewan View – Jondaryan Station



Mathew, Emily, Jaime and Dwane Morvik
Photo by Dwane Morvik

Jondaryan is an Australian aboriginal word meaning 'waterhole on the creek'. This is an appropriate name since the owners, Dwane and Jaime Morvik, live beside the Frenchman River in southwest Saskatchewan near Eastend where they raise sheep.

The Frenchman River Valley has often been described as the lifeblood of southwest Saskatchewan's biodiversity. It flows through Saskatchewan's largest area of native prairie, which remains intact due to a predominance of ranches. These large tracts of native prairie also support the largest remnant populations of terrestrial species at risk in the province.



Riparian area at the time of pump installation.
Photo by Dwane Morvik

Dwane and Jaime's philosophy is to maintain and enhance as much biodiversity as possible when it benefits the sheep operation. For example, in 2002 they entered into a conservation easement agreement with the Nature Conservancy of Canada. They were reimbursed for agreeing to several restrictions on land use including giving up the option to ever convert their grass to annual cropland.

Previously, the Morviks had partnered with the Saskatchewan Watershed Authority (SWA) to develop an off-site watering system. For years the river was the only source of water for their sheep. Although they have over 300 acres of tame grass on the uplands above the valley escarpment, their sheep rarely made the steep climb out of the valley away from the water to utilize it. The riparian area and native grassland along the river was heavily utilized by the sheep and the health of the riparian area was declining. SWA's goal was to help improve the health of the native prairie, thereby benefiting habitat for species at risk such as Sprague's pipit.

The Morviks installed a floating pump to move water out of the river and up the valley in a pipeline to a set of troughs on the upland grass. The project cost \$8500, with 50% paid by SWA. The benefits were immediate. Increased utilization of the upland grass allowed the Morviks to increase their flock by 10 to 15%, and lamb weaning weights increased by 7 to 8 lbs per lamb. Dwane estimates that their investment was recouped in three years. The riparian area along the river recovered quickly, benefiting the river ecosystem as well as providing quality forage for the sheep during times when weather conditions confine them to the valley. The result – a healthier river and a more profitable agricultural operation.



Riparian area one year after installation of water system – health significantly improved.
Photo by Dwane Morvik

How Ranching Practices Can Benefit Biodiversity

Range Management

- **Maintain heterogeneity* across the landscape** using a grazing rotation that results in large areas of **differing grass heights**. This provides a variety of habitat that supports diverse species. For example, the burrowing owl requires short, sparse vegetation in its nesting area while the western meadowlark prefers tall, dense vegetation. To maintain range health, areas grazed short one year can be allowed to grow long the next. A variety of livestock distribution tools can be used to achieve heterogeneity across the landscape resulting in healthy range and high natural biodiversity.
- **Retain adequate carryover and litter** in pastures to catch snow, insulate the soil and plants, and reduce erosion.
- **Delay haying** until after ground-nesting wildlife have finished reproducing. This is July 1st or later in most areas of Saskatchewan.

Riparian and Wetland Management

- **Maintain wetlands** as these biodiversity “hot spots” serve to recharge groundwater and moderate drought and flooding.
- **Control access to water** by providing off-site water systems and/or exclusion fences in high risk or problem areas or gravel pads at crossings.
- **Avoid grazing wet and soft streambanks or shorelines** during periods when the soil is vulnerable to compaction. Grazing is usually recommended during late summer through winter.
- **Maximize the rest period between grazing** so the vegetation can recover from defoliation. At least 50% carryover should be left to allow for proper regrowth and to protect against erosion.

Livestock Management

- **Ensure livestock have a balanced diet** with adequate, but not excessive, nutrition and protein. With a balanced diet, livestock will utilize less forage, leaving adequate forage reserves to benefit biodiversity and minimize the reliance on supplemental feed. Methane (a greenhouse gas) emissions from cattle increase by nearly 50% when cattle are moved from good quality pastures to poor quality pastures.
- **Add fats**, such as whole sunflower seeds or canola oil, to reduce methane production in ruminants by up to 33%. Including a legume improves digestion efficiency, significantly reducing methane production.

Nutrient (Manure and Urine) Management

- A very small amount of greenhouse gases are emitted from manure produced by livestock on pastures. **Swath or bale graze in the winter or extend the pasture grazing season as much as possible** without reducing range health to decrease greenhouse gas emissions from livestock and machinery. These strategies are also economically beneficial as they reduce fuel requirements.
- **Eliminate fall and winter manure spreading** to reduce nitrous oxide greenhouse gas emissions. Manure spread in spring and summer when plants are able to use it is helpful as soil organic matter is increased, and water quality problems related to manure storage are reduced.
- **Site and design all livestock handling facilities for adequate drainage and away from watercourses and waterbodies.** Run-off of pollutants into water is reduced and nitrous oxide emissions are minimized.
- **Cover manure storage areas with straw** to reduce odours and greenhouse gas emissions. Greenhouse gas emissions are nearly eliminated by using a bottom-loading manure storage system and maintaining pH levels at 4.5.

Climate change is being driven by an increase of greenhouse gases (GHG) in our atmosphere. Livestock are one source of GHG, although contributions are much lower than sources such as the burning of fossil fuels. 50% of the GHGs produced by livestock comes from manure.

Global climate change from GHG emissions could seriously impact biodiversity, and therefore ranching operations, by changing the local climatic conditions to which both have adapted. Some potential impacts to agriculture include more frequent and extreme droughts, decreased area and duration of snow cover, and longer growing seasons.

Natural Habitat and Wildlife Management

- **Seed cultivated land to perennial grass**, thus eliminating the use of agrochemicals, tillage and the energy and cost associated with annual cropping. Hay and pasture land prevent soil erosion, protect water quality, and are more efficient at storing carbon in the soil than annual crops.
- **Use long-lived native grasses and forbs** to eliminate the need for periodic maintenance of pasture, and to provide new habitat for native plants and animals.
- **Retain any natural habitat** remaining on your ranch. Studies have repeatedly shown that natural habitat supports a greater amount of biodiversity than any altered habitat.



Resources

Literature

- A Land Manager's Guide to Grassland Birds of Saskatchewan.** 2002. Saskatchewan Watershed Authority.
- Benefits of Biodiversity.** 1999. U.S. Council for Agriculture Science & Technology. Task Force Report.
- Biodiversity in Agroecosystems.** 1999. W.W. Collins and C.O. Qualset (eds). CRC Press. Washington D.C.
- Canadian Cattle Producers and the Protection of Species.** 1998. Canadian Cattleman's Association.
- Conservation of Canadian Prairie Grasslands: A Landowner's Guide.** 1992. Canadian Wildlife Service.
- Global Warming and Agriculture.** 2003. Best Management Practices Series. Soil Conservation Council of Canada.
- Grazing: A Natural Component of Grassland Ecozone Riparian Systems.** 2004. K. LaForge. Prairie Farm Rehabilitation Administration.
- Landowner's Toolkit Series.** Alberta Conservation Association.
- Managing Saskatchewan Wetlands.** Saskatchewan Watershed Authority.
- Managing Your Native Prairie Parcels.** 1998. Saskatchewan Wetland Conservation Corporation.
- Prairie Agricultural Landscapes: A Land Resource Review.** 2000. Prairie Farm Rehabilitation Administration.
- Prairie Conservation Action Plan 2003 - 2008.** 2003. PCAP Partnership. Canadian Plains Research Centre.
- Preserving Working Ranches in the Canadian West.** 2000. Southern Alberta Land Trust, The Land Conservancy of British Columbia and The Sonoran Institute.
- Ranching Along the Stream.** Saskatchewan Watershed Authority.
- Saskatchewan's Native Prairie.** 2001. Native Plant Society of Saskatchewan and Canadian Plains Research Centre.
- The Diversity of Life.** 1992. E.O. Wilson. Harvard University Press.
- The Future of Life.** 2002. E.O. Wilson. Vintage Books.

Websites

- Bill Moyers Reports Earth on Edge – www.pbs.org/earthonedge/ecosystems/value.html
- Ducks Unlimited Canada – www.ducks.ca and www.prairieagriculture.ca/index.html
- Environment Canada – Canadian Biodiversity Information Network – www.cbin.ec.gc.ca/index.cfm?lang=e
- Living Soils – www.sciences.une.edu.au/livingsoils/index.htm
- National Environmental Farm Plan Initiative – www.agr.ec.ca/env/efp-pfa/index_e.php
- National Sustainable Agriculture Information Service – attra.ncat.org
- Nature Conservancy of Canada – www.natureconservancy.ca
- Nature Saskatchewan – www.naturesask.ca
- Prairie Conservation Action Plan – www.pcap.ca
- Prairie Farm Rehabilitation Administration – Beneficial Management Practices for Biodiversity – www.rural-gc.agr.ca/pfra/biodiversity/practices_e.htm
- Saskatchewan Agriculture and Food – www.agr.gov.sk.ca
- Saskatchewan Environment – www.se.gov.sk.ca
- Saskatchewan Soil Conservation Association – scca.usask.ca
- Saskatchewan Watershed Authority – www.swa.ca
- Wetkit – www.wetkit.net
- WormWatch – www.naturewatch.ca/english/wormwatch/index.html



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SASKATCHEWAN

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