

# Biodiversity Benchmarks – Identifying Indicators and Trend Analysis

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## Key Points

- Multi-component project including applied research to determine the linkages between an indicator of biodiversity (breeding birds) and the health of riparian areas, and how that relates to grazing productivity (forage production).
- Examined riparian health parameters (many vegetation and physical features) to identify indicators that are linked to biological diversity (using breeding birds) and forage.
- Riparian sites of varying health (healthy, healthy but with problems, and unhealthy) from 6 streams in south western and central Alberta, were examined in pasture land.
- Healthier riparian sites had more shrub cover and significantly more woody plant cover (trees and shrubs) than unhealthy sites. Alterations to streambanks were significantly greater at unhealthy riparian sites.
- More breeding birds used the healthy sites, and this in combination with greater woody plant community cover, suggests structural habitat components were likely greater at the healthy sites. Vegetative parameters related to the tree and shrub community may pose the greatest potential as indicators of biodiversity, in the form of breeding bird communities.
- Combined with other project components, including knowledge evaluation and testing of extension messages, these applied research results will help farmers and ranchers through improved extension messages that provided targeted details on means to improve and enhance biodiversity on farms and ranches.

## Body

The aim of this applied research was to identify indicators of biodiversity that could be applied to broader riparian health management, incorporating findings into extension messages and activities. Identifying linkages between vegetative or physical features of riparian areas, biodiversity measures (i.e. breeding birds) and primary productivity (i.e. forage production) will allow for modifications to extension messages and tools. Such extension messages and tools will make use of identified linkages to simplify and target management practices that promote and enhance biodiversity on farms and ranches.

Essentially, the project attempted to determine the riparian health assessment and inventory components that could be used as surrogates (indicators) for biological biodiversity (e.g. bird diversity and abundance) and productivity (e.g. forage production). This was achieved by examining six streams, each with three sites. Sites included healthy, healthy but with problems and unhealthy riparian areas along small stream.

Modified point counts for breeding birds were completed during spring and early summer on portions of the sites. Forage production was determined using standard clipping techniques on plots within the breeding bird count areas. A riparian health inventory was completed for each site, including area around both the forage and bird sampling; following derivation of that data, riparian health assessment results were generated. Analysis of data, including treatment (health) effects, correlation, cluster and discriminant analyses were completed.

Research and experience have shown that riparian areas with certain characteristics are more likely to perform a suite of ecological functions, characterizing the site as healthy. Management decisions will influence the health of a riparian area and its ability to perform those functions (Adams and Fitch 1998; Tucker Shulz and Leininger 1990).

### **Vegetation**

Combined tree and shrub cover significantly positively influenced the health of the sites. The amount of tree cover less than 1.5 ft (45 cm) tall was significantly different between the health categories ( $P > 0.05$ ), with more small trees present at healthy riparian sites. More shrubs were generally present on healthier sites and healthy sites had significantly more shrubs over 6 ft than either unhealthy or healthy but with problems sites ( $P > 0.05$ ). Over the 18 sites, 22 species of shrubs were found, with only flat-leaved willow (*Salix planifolia*) unique to the healthy category.

Graminoids, grass and grass-like plants, were diverse, with 43 species identified, and the most diverse sites were those in the healthy but with problems category. 77% of graminoid species were native, with many of the non-native species being listed as disturbance-caused species, typically tame forage species. Cover of graminoids over 1.5 ft was significantly greater at the healthy sites than the unhealthy sites ( $P < 0.05$ ). Although not significant, grass less than 1.5 ft showed a similar trend. Forb coverage was generally greater at unhealthy sites.

### **Riparian Forage**

Riparian forage production was not influenced by the health of the riparian area, with extremely high variability in forage production, across all health categories. However, the lowest forage production was found at the unhealthy sites, and a similar trend was seen in the litter accumulation.

### **Physical Features**

The proportion of banks altered structurally, by human activities (including livestock) was significantly greater at unhealthy sites, compared to both healthy and healthy but with problem sites. Although not significant, there was generally more bare ground at unhealthy sites compared to sites in the other two health categories.

## **Breeding Birds**

There were significantly more confirmed breeding birds found at the healthy sites, compared to the unhealthy riparian sites, as well as more individual species using the healthy sites. Sixty-three bird species were observed during the bird surveys. The number of species of birds using riparian areas was positively correlated to the cover of shrubs over 6 ft tall, as well as the cover of graminoids.

## **Conclusion**

Numerous riparian vegetative features were significantly different between health categories, namely, more taller woody vegetation at healthy sites, compared with unhealthy sites. Breeding bird surveys indicate more abundant and diverse bird communities associated with healthier sites; this suggests that shrub parameters in the riparian health inventory methods may provide suitable indicators for breeding bird biodiversity measures. Other work has repeatedly emphasized the importance of structural diversity in tree and shrub communities as a key determinant of breeding bird communities in riparian areas (Hurly and Saunders 1998, Saunders 2001, Tucker Shulz and Leininger 1990).

The primary physical feature that was significantly different between health categories was alterations to the streambank. This feature, along with some of the tree and shrub parameters, may prove to be a useful indicators of both riparian health overall, and of the breeding bird communities, which represent the biodiversity in riparian areas. Management that minimizes structural alterations and maximizes tree and shrub communities will result in a healthier, more biologically diverse riparian area.

## **References**

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