



Biodiversity and Riparian Areas with Special Reference to the Effects of Livestock Grazing and Alberta Ecoregions. A Literature Search and Summary.

Cows and Fish

Alberta Riparian Habitat Management Program Report No. 007

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## **About Cows and Fish**

Riparian areas are those areas along rivers, streams, lakes, wetlands, springs, and ponds that are strongly influenced by water and are recognized by water-loving vegetation. Cows and Fish is striving to foster a better understanding of how riparian areas function and how improvements in management strategies in riparian areas can enhance landscape health and productivity for the benefit of livestock producers, their communities and others who value these landscapes.

Cows and Fish Partners: Producers and community groups, Alberta Beef Producers, Trout Unlimited Canada, Canadian Cattlemen's Association, Alberta Agriculture, Food and Rural Development, Alberta Sustainable Resource Development, Alberta Environment, Department of Fisheries and Oceans, Prairie Farm Rehabilitation Administration, Alberta Conservation Association

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# **Biodiversity & Riparian Areas**

**With Special Reference to the Effects of Livestock Grazing  
& Alberta Ecoregions**

## **A Literature Search & Summary**



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The Riparian Initiative - Northern Alberta  
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## **Introduction**

The purpose of this literature search was to compile a list of available resources on the topic of riparian biodiversity with special emphasis on the influences of livestock grazing. ***An emphasis was placed on finding current research (within the last 10 years)***, as well as resources that relate to the prairie, parkland and boreal forest regions of Alberta. This list of available resources may be used to promote research where gaps are identified as well as to develop extension materials that promote stewardship of riparian areas in Alberta.

## **Search Methods**

Four tools were employed to find available resources:

- Internet Searches
- Bibliographic Database Searches
- Personal Contacts & Resources
- Other Literature Reviews

## **Internet Searches**

The primary search engine used was Infoseek (<http://www.infoseek.go.com>). The key words used in internet searches were:

biodiversity • riparian • grazing • cattle • sustainable agriculture • wildlife • birds • bats • aspen • cottonwoods • parkland • boreal forest • Alberta

Any relevant sites resulting from the searches were visited and useful resources were recorded. In an attempt to capture current and in-progress research that is not yet published, the web sites of a number of western Canadian research institutions were visited (e.g University of Alberta, Alberta Research Council, University of British Columbia).

## **Bibliographic Database Searches**

The following databases were searched:

***Biological and Agricultural Index (1983 - 2000)***. This database includes a broad range of biological and ecological abstracts with an agricultural focus.

**Current Contents (1996 - 2000).** This database is one of the most thorough and includes more than 6,000 research journals.

The following search words, and combinations thereof, were used:

riparian • grazing • boreal • biodiversity • avian • aspen • bird • parkland • mammal • Alberta • cattle • amphibian • livestock • cottonwood • wildlife

### **Personal Contacts & Other Resources**

As time was restricted, this part of the search was limited to the following:

1. Discussions with the following individuals; Lorne Fitch (Alberta Environment), Norine Ambrose (Cows & Fish Program), Therese Tompkins (Alberta Agriculture, Food & Rural Development), Ed Korpela (Alberta Research Council), Kris Kendall (Alberta Conservation Association), T. Andrew Hurly (University of Lethbridge)
2. Conference proceedings from Western Canada with an ecological and/or agricultural flavour.
3. Bibliographies from a variety of related research papers and documents.

### **Other Literature Reviews**

The following existing literature reviews were examined:

Alberta Ecological InfoService, Land Stewardship Centre of Canada. 1997. **General Analysis of Recent Prairie Natural Resource Information and Research to Determine Future Direction and Need.** Prepared for the Prairie Ecology Research Committee, Prairie Conservation Forum

Ehrhart, R.C. and P.L. Hansen. 1997. **Effective cattle management in riparian zones: A field survey and literature review.** Montana BLM Riparian Technical Bulletin No. 3. USDI Bureau of Land Management, Montana State Office.

Grisley, Kerry. 1997. **The Application of Economic Theory to the Sustainability of Wildlife Resources: A Bibliography & Report.** Prepared for Alberta Agriculture, Food and Rural Development by the Land Stewardship Centre of Canada.

Grisley, Kerry, 1997. **Riparian Bibliography.** Compiled for the Riparian Support Team as part of the Riparian Habitat Project by the Land Stewardship Centre of Canada.

Manci, Karen, M. 1989. **Riparian ecosystem creation and restoration: A literature summary.** U.S. Fish and Wildlife Service Biological Report 89(2):1-59, Northern Prairie

Wildlife Research Centre Home Page:

<http://www.npwrc.usgs.gov/resource/litertr/ripareco/ripareco.htm> (Version 16Jul97).

Riparian references from: Riparian Topics Bibliography for Riparian Reserve Technical Team, Interagency Watershed Analysis Center, USA

[http://glinda.cnrs.humboldt.edu/wmc/rip\\_bib/rip\\_index.html](http://glinda.cnrs.humboldt.edu/wmc/rip_bib/rip_index.html)

Bibliography of ecological indicators with a section on riparian zones from Greatplains.org.

[http://www.greatplains.org/resource/ecobib/t\\_ripzones.htm](http://www.greatplains.org/resource/ecobib/t_ripzones.htm)

## **Period & Geographic Area Searched**

An attempt was made to keep the search as current as possible (primarily 1990 - 2000).

However, some pre-1990 references have been included, particularly when it was in an area where very little had been published subsequently or if it appeared to be a "key" or "milestone" resource.

As much as possible only North American references were included. A few international references have been included where they cover topics that are poorly covered in North America. A special emphasis was placed on finding resources from Alberta and provinces/states that have similar ecoregions as those found in Alberta.

## **Results**

### **Scientific Literature**

The scientific references have been divided into two sections:

1. **Riparian Areas and Biodiversity (Appendix 1)**. This section focuses on the importance of riparian areas to various aspects of biodiversity.
2. **Livestock Grazing & Riparian Areas (Appendix 2)**. This section focuses on the relationships between livestock grazing and various aspects of riparian biodiversity.

Each section is further sub-divided for easier use (e.g. birds, vegetation, general conservation, etc.). Table 1 shows a summary of the number of references found for each sub-division within the "Riparian Areas and Biodiversity" section as well as indicates the number of these references that represent Alberta-based research.

**Table 1: Results for Riparian Areas and Biodiversity**

<b>Category</b>	<b>Number of References</b>	<b>Alberta-based</b>
Fish	3	0
Mammals	11	0
Birds	60	5
Reptiles & Amphibians	1	0
Invertebrates	6	0
Vegetation	5	2
Overall biodiversity / Ecological integrity	16	0
General riparian conservation & management	13	1
Inventory and classification	3	0
Hydrology, geomorphology & soils	5	0
<b>TOTAL</b>	<b>123</b>	<b>8</b>

Table 2 shows a summary of the number of references found in each sub-division for the "Livestock Grazing and Riparian Biodiversity" related references.

**Table 2: Results for Livestock Grazing and Riparian Biodiversity**

<b>Category</b>	<b>Number of References</b>	<b>Alberta-based</b>
Fish	14	2
Mammals	8	1
Birds	22	5
Reptiles & Amphibians	1	0
Invertebrates	7	2
Vegetation	25	4
General Wildlife	3	1
Soils and Streambanks	6	0
Grazing management & influences in riparian zones	29	2
Cattle behaviour and riparian areas	5	0
<b>TOTAL</b>	<b>117</b>	<b>17</b>

Table 3 summarizes the nature of the Alberta-based research references.

**Table 3: Summary of Alberta-based research references**

<b>Focus</b>	<b>Region</b>	<b># of references</b>	<b>Type of references</b>
Riparian birds & buffer strips	Boreal forest	1	Scientific paper
General bird communities	Aspen parkland	3	3 NAWMP documents
Riparian bird communities	Cottonwood forest in prairies	1	MS Thesis
Riparian vegetation	Cottonwood forest in prairies	2	1 govt. report, 1 scientific paper
General management	Cottonwood forest in prairies	1	1 govt./NGO report
Fish and grazing	River in central Alberta	2	2 govt reports
Riparian mammals & grazing (deer)	Foothills	1	Scientific paper
Riparian birds & grazing	Cottonwood forest in prairies	3	2 conf. Proceeding, 1 unpub. report
Riparian birds & grazing	Poplar forest in foothills	1	1 unpub. report
Riparian birds & grazing	Prairie creek	1	1 unpub. report
Riparian birds/amphibs & grazing	Sloughs in aspen parkland	1	1 poster & MSC thesis in progress
Riparian insects & grazing	Cottonwood forest in prairies	2	1 unpub. report, 1 poster at conference
Vegetation & grazing	Aspen parkland	4	Scientific papers
Grazing management	Foothills / prairie	2	1 extension document 1 scientific paper
<b>TOTAL</b>		<b>25</b>	

**Unpublished / In Progress Research**

Research that is currently in-progress, or is not yet available as a report or paper, is listed in Appendix 3. Only research that pertains to biodiversity in Alberta was included in this section. As limited time was spent on this portion of the resource search there may be some in-progress or recently started projects that were missed. Of the ten in-progress projects listed, one is directly related to riparian biodiversity along prairie rivers (bats) and two are directly related to the influence of cattle grazing on riparian systems (one in Cypress Hills streams, one in aspen parkland potholes).

**Internet Sites**

The results of the internet searches are given in Appendix 4. They are divided into; Research Sites, United States Government Riparian Sites, United States Non-Government Sites, Canada Government Riparian Sites, Canada Non-Government Sites, Bibliographies, and Educational/interpretive sites. A list of the searches conducted and the number of matches found are also listed in Appendix 4.

The majority of the relevant sites were from the United States, however some of the U.S. sites contained some Canadian resources and information (e.g. [Greatplains.org](http://Greatplains.org)).

## **Discussion**

As demonstrated by the literature review and Tables 1, 2 and 3, a fairly considerable amount of work has been done on riparian biodiversity and livestock grazing in general. However, the majority of this work has been conducted in the United States, especially in the drier, desert regions. Six percent of the references about overall riparian biodiversity are Alberta-based. About 14% of the references about livestock grazing and riparian areas are Alberta-based. It should be remembered that considerably more effort was made to "dig" for the Alberta references versus finding additional United States references. Many of the Alberta references are unpublished reports. Also several of the Alberta references are different presentations of the same research (e.g. Saunders & Hurly 2000 and Hurly & Saunders 1998).

Of the Alberta-based references, those relating to livestock grazing consist primarily of two areas; research on birds and insects in cottonwood forests in the prairie region and vegetation research in aspen parkland. There is also currently unpublished work on the effects of different grazing regimes on birds, insects and amphibians in parkland potholes.

Although a considerable amount of work is being done on birds and other groups in the boreal forest region of Alberta, the primary focus is on the effects of forestry practices and, in some cases, fire. No research was found on the influence of livestock grazing on the biodiversity of riparian areas in northern forests. In addition, no research was found on the biodiversity of riparian zones along rivers and creeks in aspen parkland regions, although there has been some work done around aspen parkland potholes and on fish in the North Raven River. The majority of the prairie-based research has been in cottonwood forests along large rivers. There has been very little work looking at riparian areas along smaller creeks and streams in prairie regions.

Much of the research surrounding the influence of livestock grazing is centered around grassland habitats (e.g. fescue grasslands, mixed-grass prairie). There is far less information available on livestock grazing in riparian areas or wooded areas in general.

Of the studies that look at the effect of grazing on biodiversity in riparian areas, the majority of them look at the influence on breeding bird populations (e.g. Medin and Clary 1991, Taylor 1986). There are some studies that look at small mammals (Jones and Longland 1999, Rosenstock 1996) and a few that look at invertebrates (Lek-Ang et al. 1999, Strand and Merritt 1999). There are very few studies that look at the influence of grazing on fall bird populations (Saunders and Hurly 1999) or winter bird use of riparian areas. This is likely because breeding bird populations are easier to measure than invertebrate, mammal and fall/winter bird populations. Also, breeding birds have been shown to be a good indicator of overall biodiversity (Bock & Webb 1984).

Of those studies that look at relationships between grazing and riparian biodiversity, most of them appear to concentrate on comparisons between grazed and un-grazed sites (Schulz and Leininger 1991, Medin and Clary 1991) or the results of removing livestock grazing from an ecosystem (Rickard and Cushing 1982, Dobkin et al. 1998). There appear to be far fewer investigations that compare the effects of different grazing strategies on riparian biodiversity (Ambrose 1999, Popolizio et al. 1994). Almost non-existent are studies that incorporate controlled experimental manipulation of grazing strategies. This is likely because of the large investments of time, money and land that would be required for the latter.

Most of the work that investigates relationships between livestock grazing and riparian biodiversity focuses on effects. There is extremely limited information available on how these effects can be minimized by modifying grazing strategies. This is an important area of research that should ultimately enable livestock producers to manage their riparian areas for both production and biodiversity. Along these same lines, there appears to be only a small handful of studies that look at cattle grazing behaviour in riparian areas. Most of this research seems to have been done in mountain and foothills environments. As the vegetation species found in riparian zones vary widely depending on ecoregion, it is important to conduct this future research in a variety of riparian ecosystems. Again, this

information would help create tools and grazing strategies than producers could use to maintain healthy riparian areas. There is also a lack of studies that measure the benefits to livestock producers of biodiversity of riparian areas (e.g. cattle health, weight gains etc.). A study underway in the Cypress Hills may attempt to address this question in a foothills-type environment.

## **Summary**

From an Alberta perspective, the following key gaps were identified in the available resource and research information:

1. Investigations of the relationships between livestock grazing and riparian areas in ***northern boreal forest regions***.
2. Investigations of the relationships between livestock grazing and riparian areas in ***aspen parkland riparian zones*** along creeks and streams.
3. Investigations of the relationships between livestock grazing and riparian areas along ***prairie creeks and streams***.
4. Research on the ***effects of different grazing strategies*** on the biodiversity of riparian areas in Alberta.
5. Research that looks at ***grazing strategies that can be employed to enhance the biodiversity*** of riparian areas (i.e. that focus on improved management rather than negative impacts).
6. Investigations into ***cattle behaviour*** in different riparian zones found in Alberta.
7. Studies that monitor changes in biodiversity and measure ***livestock production*** with alterations in grazing strategies in riparian areas.
8. Research into the influence of grazing on ***all aspects of Alberta's riparian biodiversity***, such as invertebrates, amphibians, small mammals, plants and winter/fall wildlife use.
9. Studies that assess the ***importance of riparian areas to overall biodiversity*** in Alberta's ecoregions (especially in the boreal forest and aspen parkland regions).
10. ***Publication of results*** of Alberta-based research in the scientific literature (most of the Alberta-based research is "hiding" in unpublished reports, abstracts of poster presentations etc. and is not readily available for researchers, landowners and others).

## **APPENDIX 1: Scientific Literature on Riparian Areas and Biodiversity**

The numbers after each subtitle indicate the total number of publications followed by the number that are Alberta-based. All known Alberta-based publications are marked with an "AB".

### **Fish (3,0)**

Barton, D.R., W.D. Taylor and R.M. Beitte. 1985. *Dimensions of riparian buffer strips required to maintain trout habitat in southern Ontario streams*. North American Journal of Fish Management 5: 364-378.

Burns, J.E. 1970. *The importance of streamside vegetation to trout and salmon in British Columbia*. British Columbia Fish and Wildlife Branch, Fisheries Technical Report Circular 1: 1-12. Vancouver Island Region, Nanaimo.

Glova, G and P. Sagar. 1990. *Riparian willows - are they important to fish?* Freshwater Catch 42:8.

### **Mammals (11,0)**

Andersen, D.C. 1994. *Demographics of small mammals using anthropogenic desert riparian habitat in Arizona*. The Journal of Wildlife Management 58: 445-54.

DE: Population-biology-Mammals; Streamside-fauna-Arizona; Desert-ecology-Arizona

Barnes, W.J. and E. Dipple. 1988. *The effects of beaver in riverbank forest succession*. Canadian Journal of Botany 66:40-44.

Best, L.B. and A.R. Geier. 1980. *Habitat selection of small mammals of riparian communities: Evaluation of the effects of habitat alterations*. Journal of Wildlife Management 44(1):16.

Compton, B.B., R.J. Mackie and G.L. Dusek. 1988. *Factors influencing distribution of White-tailed Deer in riparian habitats*. Journal of Wildlife Management 52(3):544-548.

Doyle, A.T. 1990. *Use of riparian and upland habitats by small mammals*. Journal of Mammalogy 71: 14-23.

DE: Mammals-Geographical-distribution-of-Oregon; Mammals-Ecology

Ellison, L.E. and C. Van-Riper. 1998. *A comparison of small-mammal communities in a desert riparian floodplain*. Journal of Mammalogy 79 (3): 972-85.

DE: Rodents-Ecology; Ecology-Communities; Streamside-ecology

Geir, A.R. and L.B. Best. 1980. *Habitat selection by small mammals of riparian communities: Evaluating effects of habitat alterations*. Journal of Wildlife Management 44(1): 16-24.

Grindal, S.D, J.L. Morissette and R.M. Brigham. 1999. *Concentration of bat activity in riparian habitats over an elevational gradient*. Canadian Journal of Zoology 77(6): 972-7.

DE: Bats-Food-and-feeding; Streamside-ecology-British-Columbia; Bats-Ecology

Kaufman, D.W., M.E. Peak and G.A. Kaufman. 1985. ***Peromyscus leucopus in riparian woodlands: use of trees and shrubs***. Journal of Mammalogy 66: 139-43.  
DE: Deer mice-; Rodents-Ecology

Olson, T.E. and F.L. Knopf. 1988. ***Patterns of relative diversity within riparian small mammal communities***. Platte River watershed, CO. IN: R.C. Szaro et al., (tech. Coord) Management of amphibians, reptiles, and small mammals in North America. General Technical Report RM-166. U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. pp. 379-386.

Smith, B.H. 1980. ***Not all beaver are bad; or, an ecosystem approach to stream habitat management, with possible software applications***. Proceedings of the 15th Annual Meeting, Colorado-Wyoming Chapter, American Fisheries Society February 27-28, 1980. Fort Collins, CO, 6 Pp.

## **Birds (60,5)**

Best, L.B. and D.F. Stauffer. 1980. ***Habitat selection by birds of riparian communities. Evaluation of effects of habitat alterations***. Journal of Wildlife Management 44(1): 1.

Blakesley, J.A. and K.P. Reese. 1988. ***Avian use of campground and non-campground sites in riparian zones***. Journal of Wildlife Management 52(3): 399-402.

Bock, C.E., A. Cruz, Jr., M.C. Grant, C.S. Aid and T.R. Strong. 1992. ***Field experimental evidence for diffuse competition among southwestern riparian birds***. American Naturalist 140: 815-828.

Bull, E.L. and J.M. Skovlin. 1982. ***Relationship between avifauna and streamside vegetation***. Transactions of the North American Wildlife and Natural Resources Conference: 469-506.

Carothers, W.W., R.R. Johnson and S.W. Aitchison 1974. ***Population and social organization of southwestern riparian birds***. American Zoologist 14: 97-108.

Commision for Environmental Cooperation 1999. ***Ribbon of life: an agenda for preserving transboundary migratory bird habitat on the Upper San Pedro River***, 31 pp. Available from the Commission for Environmental Cooperation.

[www.cec.org/english/resources/publications/sanped-e.cfm?format=1](http://www.cec.org/english/resources/publications/sanped-e.cfm?format=1)

Croonquist, M.J. and R.P. Brooks. 1993. ***Effects of habitat disturbance on bird communities in riparian corridors***. Journal of Soil and Water Conservation 48: 65-70.  
DE: Streamside-ecology-Pennsylvania; Birds-Ecology

Darveau, M., P. Beauchesne, L. Belanger, J. Huot and P. Larue 1995. ***Riparian forest strips as habitat for breeding birds in boreal forest***. Journal of Wildlife Management 59(1): 67-78.

Delphey, P.J. and J.J. Dinsmore. 1993. ***Breeding bird communities of recently restored and natural prairie potholes***. Wetlands 13(3): 200-6.

Dobkin, D.S., A.C. Rich, J.A. Pretare, and W.H. Pyle. 1995. ***Nest-site relationships among cavity-nesting birds of riparian and snowpocket aspen woodlands in the northwestern Great Basin***. The Condor 97: 694-707.

Finch, D.M. 1989. ***Habitat use and habitat overlap of riparian birds in three elevational zones.*** Ecology 70(4): 866-880.

Finch, D.M. 1991. ***Positive associations among riparian bird species correspond to elevational changes in plant communities.*** Canadian Journal of Zoology 69: 951-963.

Franzueb, K.E. 1987. ***Perspectives on managing riparian ecosystems for endangered bird species.*** Western Birds 18: 3-9.

Gray, L.J. 1993. ***Response of insectivorous birds to emerging aquatic insects in riparian habitats of a tallgrass prairie stream.*** The American Midland Naturalist 129: 288-300.  
DE: Aquatic-insects; Birds-Insectivorous; Streamside-fauna

Guinan, D.M., and S.G. Sealy. 1989. ***Foraging-substrate use by house wrens nesting in natural cavities in a riparian habitat.*** Canadian Journal of Zoology 67: 61-7.  
DE: Birds-Food-and-feeding; Northern-house-wren; Birds-Nesting; Streamside-fauna-Manitoba

Gutzwiller, K.J. and S.H. Anderson. 1987 ***Short-term dynamics of cavity-nesting bird communities in disjunct floodplain habitats.*** The Condor 89: 710-720.

Hagar, J.C. 1999. ***Influence of riparian buffer width on bird assemblages in western Oregon.*** The Journal of Wildlife Management 63(2): 484-96.  
Streamside-ecology-Oregon; Birds-Ecology; Forest-ecology-Oregon; Lumbering-Oregon

Hunter, W.C., R.D. Ohmart and B.W. Anderson. 1988. ***Use of exotic saltcedar (Tamarix chinensis) by birds in arid riparian systems.*** The Condor 90: 113-23.  
DE: Tamarisk-; Birds-Ecology

Hutto, R.L. 1998. ***On the importance of stopover sites to migrating birds.*** The Auk 115(4): 823-825.  
DE: Birds-Migration; Birds-Ecology

Johns, B.W. 1993. ***The Influence of grove size on bird species richness in aspen parklands.*** Wilson Bulletin 105(2): 256-264.

Knopf, F.L. and F.B. Samson, 1994. ***Scale perspectives of avian diversity in western riparian ecosystems.*** Conservation Biology 8: 669-676.

Kroodsma, R.L. 1973. ***Breeding bird populations of riverine forests in eastern Montana.*** Prairie Naturalist 5(3): 40-48.

Laymon, S. A. 1987. ***Brown-headed Cowbirds in California: historical perspectives and management opportunities in riparian habitats.*** Western Birds 18: 63-70.

Layman, S. A., and P. A. Williams. 1997. ***Avifauna in California riparian systems. A report to National Fish and Wildlife Foundation.*** Kern River Research Center. Weldon CA.

Loegering J.P. and R.G. Anthony. 1999. ***Distribution, abundance, and habitat association of riparian-obligate and associated birds in the Oregon Coast Range.*** Northwest Science 73 (3): 168-185.

Lynn, S., M.L. Morrison, A.J. Kuenzi, J.C.C. Neale, B.N. Sacks, R. Hamlin and L.S. Hall. 1998. ***Bird use of riparian vegetation along the Truckee River, California and Nevada.*** Great Basin Naturalist 58(4): 328-343.

Machtans, C.S., M.A. Villard and S.J. Hannon. 1996. ***Use of riparian buffer strips as movement corridors by forest birds.*** Conservation Biology 10: 1366-79.

DE: Streamside-ecology; Forest-ecology; Landscape-ecology; Birds-Ecology

Martinsen, G.D. and T.G. Whitham 1994. ***More birds nest in hybrid cottonwood trees.*** Wilson Bulletin 106(3): 474-481.

Meiklejohn, B.A. and J.W. Hughes. 1999. ***Bird communities in riparian buffer strips of industrial forests.*** The American Midland Naturalist 141(1): 172-84.

DE: Forest-ecology; Ecology-Communities; Birds-Ecology; Streamside-ecology

Morgon, K.H. and S.P. Wemore. 1986. ***A study of riparian bird communities from the dry interior of British Columbia.*** Series Display Technical Report Series / Pacific and Yukon Region, Canadian Wildlife Service no. 11 ISSN 0831-6481.

Murray, N.L. and D.F. Stauffer. 1995. ***Nongame bird use of habitat in central Appalachian riparian forests.*** The Journal of Wildlife Management 59: 78-88.

DE: Forest-ecology-Appalachian-region; Birds-Ecology; Streamside-ecology-Appalachian-region

Nur, N., S. Laymon, G. Geupel, and D. Evans. 1997. ***Save Our Songbirds: Songbird conservation in California's riparian habitats; population assessments and management recommendations.*** Final report, project 96-040. National Fish and Wildlife Foundation, Washington, DC.

Ohmart, R.D. 1994. ***The effects of human-induced changes on the avifauna of western riparian habitats.*** Pp. 273-285. IN: Jehl, J.R., Jr., and N.K. Johnson, (eds.). A Century of Avifaunal Change in Western North America. Studies in Avian Biology No. 15.

Ohmart, R.D., K.V. Rosenberg and B.W. Anderson. 1982. ***Community organization of riparian breeding birds; response to an annual resource peak.*** The Auk. 99(2): 260.

Prescott, D.R.C., J.J. Murphy, and E. Ewaschuk. 1995. ***An avian community approach to determining biodiversity values of NAWMP habitats in the aspen parkland of Alberta.***

Alberta NAWMP Centre Document Number: NAWMP 012. 58p

AB

Prescott, D.R.C. and A.J. Murphy. 1995. ***Bird populations and vegetation structure of tame dense nesting cover (DNC) in Alberta's aspen parkland.*** Alberta NAWMP Centre Document Number: NAWMP 014. 19p

AB

Prescott, D.R.C. 1996. ***Birds of the parkland agricultural research initiative parkland conservation farm, 1993 - 1996.*** Alberta NAWMP Centre Document Number: NAWMP 024. 13p

AB

Rice, J., W.B. Anderson and R.D. Ohmart. 1984. ***Comparison of the importance of different habitat attributes to avian community organization.*** Journal of Wildlife Management 48: 895-911.

Rice, J., R.D. Ohmart and B.W. Anderson. 1983. ***Turnovers in species composition of avian communities in contiguous riparian habitats.*** Ecology 64: 1444-55.

DE: Bird-census; Seasonal-variation-Biology-Birds; Birds-Ecology

Rich, T. 1998. ***Guide for assessing the occurrence of breeding birds in western riparian systems***. Draft Report, Fish, Wildlife and Forests Group, Bureau of Land Management, Boise ID.

Rottenborn, S.C. 1999. ***Predicting the impacts of urbanization on riparian bird communities***. Biological Conservation 88(3): 289-99.

Birds-Ecology; Man-Influence-on-nature; Urbanization

Saab, V. 1999. ***Importance of spatial scale to habitat use by breeding birds in riparian forests: A hierarchical analysis***. Ecological Applications 9(1): 135-151.

Sanders, T. A. and D.W. Edge. 1998. ***Breeding bird community composition in relation to riparian vegetation structure in the western United States***. Journal of Wildlife Management 62(2): 461-73.

DE: Streamside-ecology-Western-States; Birds-Ecology; Diversity-Biology-Birds

Saunders, E.J., 1988. ***Avian ecology of riparian habitats along the Red Deer River in Dinosaur Provincial Park, Alberta***. MS Thesis, University of Calgary, Alberta.

AB

Sedgwick, J.A. 1997. ***Sequential cavity use in a cottonwood bottomland***. The Condor 99: 880-7.

DE: Tree-cavities; Birds-Nesting

Sedgwick, J.A. and F.L. Knopf. 1992. ***Cavity turnover and equilibrium cavity densities in a cottonwood bottomland***. The Journal of Wildlife Management 56: 477-484.

Sedgwick, J.A. and F.L. Knopf. 1990. ***Habitat relationships and nest site characteristics of cavity-nesting birds in cottonwood floodplains***. The Journal of Wildlife Management 54: 112-24.

DE: Birds-Nesting; Wildlife-management-Colorado; Floodplain-ecology-Colorado

Sedgwick, J.A. and F.L. Knopf. 1986. ***Cavity-nesting birds and the cavity-tree resource in plains cottonwood bottomlands***. The Journal of Wildlife Management 50: 247-52.

DE: Birds-Ecology; Forested-wetlands; Poplars

Skagen, S.K., C.P. Melcher and W.H. Howe. 1998. ***Comparative use of riparian corridors and oases by migrating birds in southeast Arizona***. Conservation Biology 12(4): 896-909.

DE: Birds-Migration; Streamside-ecology-Arizona; Diversity-Biology-Birds

Steel, E.A., R.J. Naiman and S.D. West. 1999. ***Use of woody debris piles by birds and small mammals in a riparian corridor***. Northwest Science 73(1): 19-26.

Strong, T.R. and C.E. Bock. 1990. ***Bird species distribution patterns in riparian habitats in southeastern Arizona***. The Condor 92: 866-885

Szaro, R.C. and M.D. Jakle. 1985. ***Avian use of a desert riparian island and its adjacent scrub habitat***. The Condor 87: 511-19.

Streamside-flora-Arizona; Birds-Ecology; Scrub-Vegetation

Triquet, A.M., G.A. McPeck and W.C. McComb. 1990. ***Songbird diversity in clearcuts with and without a riparian buffer strip***. Journal of Soil and Water Conservation 45: 500-3.

DE: Forest-ecology-Kentucky; Diversity-Biology-Birds; Streamside-ecology; Birds-Ecology; Clearcutting-; Songbirds-

Tubbs, A.A. 1980. ***Riparian bird communities of the great plains***. In R.M. DeGrass and N.G. Tilgham Management of Western Forests and Grasslands for Non-game Birds. USDA Forest Service General Technical Report INT-86.

Twedt, D.J., R.R. Wilson, J.L. Henne-Kerr and R.B. Hamilton. 1999. ***Impact of forest type and management strategy on avian densities in the Mississippi Alluvial Valley***, USA Forest Ecology and Management. 123(2-3): 261-274.

Twedt, D.J. and J. Portwood. 1997. ***Bottomland hardwood reforestation for Neotropical migratory birds: Are we missing the forest for the trees***. Wildlife Society Bulletin 25(3): 647-652.

Warkentin, I.G. and R.M. Reed. 1999. ***Effects of habitat type and degradation on avian species richness in Great Basin riparian habitats*** Great Basin Naturalist 59(3): 205-212.

Wiebe, K.L. and K. Martin. 1998. ***Seasonal use by birds of stream-side riparian habitat in coniferous forest of northcentral British Columbia***. Ecography 21(2): 124-134.

Whitaker, D.M. and W.A. Montevecchi. 1999. ***Breeding bird assemblages inhabiting riparian buffer strips in Newfoundland, Canada***. The Journal of Wildlife Management 63(1): 167-79.  
DE: Streamside-ecology-Newfoundland; Birds-Ecology; Forest-ecology-Newfoundland

Whitaker, D.M. and W.A. Montevecchi. 1997. ***Breeding bird assemblages associated with riparian, interior forest, and non-riparian edge habitats in a balsam fir ecosystem***. Canadian Journal of Forest Research 27(8): 1159-1167.

## **Reptiles & Amphibians (1,0)**

Burbrink, F.T., C.A. Phillips and E.J. Heske. 1998. ***A riparian zone in southern Illinois as a potential dispersal corridor for reptiles and amphibians***. Biological Conservation 86(2): 107-15.  
DE: Dispersal-Ecology-Amphibia; Dispersal-Ecology-Reptiles; Streamside-ecology-Illinois; Landscape-ecology-Illinois

## **Insects (6,0)**

Fleishman, E., G.T. Austin and P.F. Brussard. 1999. ***A comparison of butterfly communities in native and agricultural riparian habitats in the Great Basin, USA***. Biological Conservation 89(2): 209-18.  
DE: Butterflies-; Streamside-ecology-Great-Basin; Insect-conservation-Great-Basin

Floate, K.D., G.D. Martinsen and T.G. Whitham. 1997. ***Cottonwood hybrid zones as centres of abundance for gall aphids in western North America: importance of relative habitat size***. The Journal of Animal Ecology 66: 179-88.  
DE: Pemphigus-betae; Trees-Hybrids; Poplar-; Insects-Host-plants

French, W.B. and N.C. Elliott. 1999. ***Spatial and temporal distribution of ground beetle (Coleoptera: Carabidae) assemblages in riparian strips and adjacent wheat fields***. Environmental Entomology 28(4): 597-607.  
DE: Ground-beetles; Insects-Ecology; Wheat-Diseases-and-pests

Samways, M.J. and N.S. Steytler. 1996. ***Dragonfly (Odonata) distribution patterns in urban and forest landscapes, and recommendations for riparian management***. Biological Conservation 78(3): 279-88.

DE: Dragonflies-; Insects-Ecology; Forest-ecology; Urban-ecology; Streamside-ecology

Sterling, A., J.L. Viejo and E.F. Galiano. 1985. ***The role of riparian forests in the conservation of butterflies in a Mediterranean area***. Environmental Conservation 12(4): 361.

Wettstein, W. and B. Schmidt. 1999. ***Conservation of arthropod diversity in montane wetlands: effect of altitude, habitat quality and habitat fragmentation on butterflies and grasshoppers***. Journal of Applied Ecology 36(3): 363-373.

## **Vegetation (5,2)**

Braatne, J.H., S.B. Rood and P.E. Heilman. 1996. ***Life history, ecology and conservation of riparian cottonwoods in North America***. In: Stettler, R.F., H.D.J. Bradshaw, P.E. Heilman and T.M. Hinkley (eds.) Biology of Populus and its implications for management and conservation. NRC Research Press, National Research Council of Canada, Ottawa.

Bradley, C.E. 1991. ***The biology and status of riparian poplars in southern Alberta***. Alberta Forestry Lands and Wildlife report. **AB**

Cordes, L.D., F.M. Hughes and M. Getty. 1997. ***Factors affecting the regeneration and distribution of riparian woodlands along a northern prairie river: the Red Deer River, Alberta, Canada***. Journal of Biogeography 24: 675-95.. **AB**  
DE: Forest-reproduction; Forests-and-forestry-Alberta

Heinze, D.H. 1994. ***Montana Willows***. USDI Bureau of Land Management, Montana State Office, Billings. Gen. Tech. Bull. No. 2. 84 Pp.

Pollock, M.M., R.J. Naiman and T.A. Hanley. 1998. ***Plant species richness in riparian wetlands - A test of biodiversity theory***. Ecology 79(1): 94-105

## **Overall Biodiversity / Ecological Integrity of Riparian Zones (16,0)**

Busch, D.E. and M.L. Scott. 1995. ***Western riparian ecosystems***. IN: LaRoe, E.T.; G.S. Farris; C.E. Puckett; P.D. Doran and M.J. Mac, (eds.). Our Living Resources: A Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals and Ecosystems. USDI National Biological Service, Washington D.C.

Croonquist, M., and R. Brooks. 1991. ***Use of avian and mammalian guilds as indicators of cumulative impacts in riparian wetland areas***. Environmental Management 15(5): 701-714.

Deardorff, D. and K. Wadsworth. 1996. ***Cooperative management of riparian forest habitats to maintain biological quality and ecosystem integrity***. Pp. 227-229. IN: Shaw, D.W. and D.M. Finch, (tech. coord.). USDA/Forest Service General Technical Report RM-GTR-272.

Garcia, J.C. 1985. ***A method for assessing the value of stream corridors to fish and wildlife***. Pp. 335-338. IN: Johnson, R.R.; C.D. Ziebell and C.D. Paton et al. (eds.). Riparian Ecosystems and Their

Management: Reconciling Conflicting Uses. North American Riparian Conference, Tucson, AZ. (Apr. 16-18, 1985). USDA/USFS Gen. Tech. Rep. RM-120.

Gregory, S.V., F.J. Swanson et al. 1991. *An ecosystem perspective of riparian zones*. BioScience 41: 540-551.

Harding, J.S., E.F. Benfield, P.V. Bolstad, G.S. Helfman and E.B.D. Jones. 1998. *Stream biodiversity: The ghost of land use past*. Proceedings of the National Academy of Sciences of the United States of America. 95 (25): 14843-14847.

Hancock, C.N., P.G. Ladd and R.H. Froend. 1996. *Biodiversity and management of riparian vegetation in Western Australia*. Forest Ecology and Management 85: 239-50.  
Streamside-ecology-Western-Australia-Australia; Forest-ecology-Western-Australia-Australia; Diversity-Biology

Hughes, R.M. and R.F. Noss. 1992. *Biological diversity and biological integrity: current concerns for lakes and streams*. Fisheries 17(3): 11-19.

Kinney, J.W., and W.P. Clary, 1998. *Time-lapse photography to monitor riparian meadow use*. US For. Serv. Res. Note RMRS-RN-5 5pp. Available from Rocky Mountain Research Station, 3825 E. Mulberry St., Fort Collins, CO 80524-8597.

Lynch, D. 1955. *Ecology of the aspen groveland in Glacier County, Montana*. Ecological Monographs 25: 321-344.

O'Connell, M.A., J.G. Hallet and S.D. West. 1993. *Wildlife use of riparian habitats: A Literature review*. TFW-WL1-93-001.

Mensing, D.M., S.M. Galatowitsch and J.R. Tester. 1998. *Anthropogenic effects on the biodiversity of riparian wetlands of a northern temperate landscape*. Journal of Environmental Management 53(4): 349-77  
Streamside-ecology-Minnesota; Wetland-ecology-Minnesota; Diversity-Biology; Man-Influence-on-nature

Naiman, R.J., H. Decamps and M. Pollock. 1993. *The role of riparian corridors in maintaining regional biodiversity*. Ecological Applications 3:209-212.

Naiman, R.J. and H. Decamps. 1997. *The ecology of interfaces: Riparian zones*. Annual Review of Ecology and Systematics 28: 621-658.

Schaefer, J. M. and M.T. Brown. 1992. *Designing and protecting river corridors for wildlife*. Rivers 3(1): 14-26.

Tockner, K and J.V. Ward. 1999. *Biodiversity along riparian corridors*. Archiv Fur Hydrobiologie 3(115): 293-310.

## **General Management (13,1)**

DeBullman, B, H.J. Cortner and M.G. Wallace et al., (tech. coord.). *Riparian Management: Common Threads and shared interests*. USDA/ Forest Service, General Technical Report RM-226.

Dodd, J. 1991. USFS ***Standards for riparian zones: Are they based on real world or fantasy world models?*** Society for Range Management, WY Section Newsletter, April 9-10, 1991.

Gorges, M.W. and T.E. Wilson. 1989. ***Riparian management for upland drainage in Eastern Montana***. Pp.170-171. IN: Gresswell, R.E.; B.A. Barton and J.L. Kershner, (eds.). Practical Approaches to Riparian Resource Management, An Educational Workshop. (May 8-11, 1989). Billings, MT.

Gregory, S.V. and L. Ashkenas. 1990. ***Riparian Management Guide***. Willamette National Forest, Eugene, OR. 120 p. (a condensed field guide is also available)

Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummins. 1991. ***An ecosystem perspective of riparian zones***. BioScience 41(8): 540-550.

Gresswell, R.E., B.A. Barton and J.L. Kershner (eds.) 1989. ***Practical Approaches to Riparian Resource Management: An Educational Workshop***. USDI Bureau of Land Management, Billings, MT, USA. 193pp.

Kauffman, J.B. 1995. ***An ecological basis for the management and recovery of riparian zones***. In: Eastern Oregon Agriculture Research Center Field Day annual report. Oregon Agricultural Experiment Station Special Report 951. Oregon State University, Corvallis, OR. pp 27-33.

Knopf, F.L., R.R. Johnson, T. Rich, R.B. Samson and R.C. Szaro 1988. ***Conservation of Riparian Ecosystems in the United States***. The Wilson Bulletin 100(2).

Krueper, D.J. 1993. ***Effects of land use practices on Western riparian ecosystems***. Pages 321 - 330 in Status and management of Neotropical migratory birds, D.M. Finch and P.W. Stangel (eds). General Technical Report RM-229, Fort Collins, CO. USDA Forest Service Rocky Mountain Forest and Range Experiment Stations. 422 pp.

Leonard, S.G., G.J. Staidl, K.A. Gebhardt and D.E. Prichard. 1992. ***Viewpoint: Range site/ ecological site information requirements for classification of riverine riparian ecosystems***. Journal of Range Management 45(5): 431-435.

Prichard, D., H. Barrett, J. Cagney, R. Clark et al. 1993. ***Riparian areas management: Process for assessing proper functioning condition***. TR-1737-9. Bureau of Land Management, Tech. Ref. BLM/SC/ST-93/003+1737, Service Center, Denver, CO. 60 Pp.

Taylor, B.J. 1984. ***Protecting the riparian area, a handbook for planners***. Portland, Oregon. Oregon Department of Fish & Game.

Tellman, B. (ed.). 1993. ***Riparian area management, common threads and shared interests: A western regional conference on river management strategies***. (4-6 Feb 1993). USDA/ Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. General Technical Report RM-226. 419 Pp.

World Wildlife Fund Canada and Forestry Lands and Wildlife. 1992. ***Conservation and management strategy for riparian forests in southern Alberta***. Government of Alberta document.

**AB**

## **Inventory & Classification (3,0)**

(note - this was not a key search topic)

Bartz, K.L. and J.L. Kershner. 1993. *The applicability of using aerial videography in classifying riparian habitats*. IN: Fish Habitat Relationships (FHR), Technical Excellence in Fisheries Bulletin No. 16, USDA, Forest Service.

Batson, F.T. and W.A. Crisco. 1989. *The use of aerial photography to inventory and monitor riparian areas*. IN: Gresswell, R.E., B.A. Barton and J.L. Kershner (eds.) 1989. *Practical Approaches to Riparian Resource Management: An Educational Workshop*. USDI Bureau of Land Management, Billings, MT, USA. 193pp.

Batson, F.T., P.E. Cuplin and W.A. Crisco. 1987. *Riparian area management: The use of aerial photography to inventory and monitor riparian areas*. USDI/ BLM Tech. Ref. 1737-2, 13 Pp.

## **Hydrology, Geomorphology & Soils (5,0)**

Bern, L.J. 1993. *Riparian zone, stream and floodplain issues: A review*. Journal of Hydrology 150(2-4): 277-299.

Gorges, M.W. and T.E. Wilson. 1989. *Riparian management for upland drainage in eastern Montana*. IN: Gresswell, R.E., B.A. Barton and J.L. Kershner (eds.) 1989. *Practical Approaches to Riparian Resource Management: An Educational Workshop*. USDI Bureau of Land Management, Billings, MT, USA. 193pp.

Huggenberger, P., E. Hoehn, and R. Beschta. 1998. *Abiotic aspects of channels and floodplains in riparian ecology*. Freshwater Biology 40 (3): 407-25.  
DE: Streamside-ecology; River-ecology; Hydrology-; Floodplain-ecology

Johnson, S.L. and A.P. Covich. 1997. *Scales of observation of riparian forests and distribution of suspended detritus in a prairie river*. Freshwater Biology 37: 163-75  
DE: Detritus-; River-ecology-Oklahoma; Landscape-ecology-Oklahoma; Watersheds-Oklahoma

Stanford, J.A. 1998. *Rivers in the landscape: introduction to the special issue on riparian and groundwater ecology*. Freshwater Biology 40(3): 402-6.  
DE: Streamside-ecology; Groundwater-; River-ecology

## APPENDIX 2: Scientific Literature on Livestock Grazing & Riparian Areas

The numbers after each subtitle indicate the total number of publications followed by the number that are Alberta-based. All known Alberta-based publications are marked with an "AB". Where descriptions were available (for references originating from Bio-Ag Abstracts), they were included.

### Fish & Grazing (14,2)

Brown, R.S. and S.S. Stanislawski. 1995. *Assessment of the trout population in the North Raven River after two decades of habitat enhancement*. Department of Environmental Protection, Natural Resources Service, Fish and Wildlife Division, Rocky Mountain House, Alberta. AB

Keller, C, L.A. Anderson and P. Tappel. 1979. *Fish habitat changes in Summit Creek, ID, after fencing the riparian area*. In Proceedings: Forum on grazing and riparian/stream ecosystems. Trout Unlimited Inc. Vienna, VA pp46-52.

Keller, C.R. and K.P. Burnham. 1982. *Riparian fencing, grazing and trout habitat preference on Summit Creek, Idaho*. North American Journal of Fisheries Management 2:53-59.

Knapp, R. A and K.R. Matthews. 1996. *Livestock grazing, golden trout, and streams in the Golden Trout Wilderness, California: impacts and management implications*. North American Journal of Fisheries Management 16: 805-20  
DE: Grazing-Experiments-Cattle; Rainbow-trout; Stream-ecology-California; Fisheries-management-California

Larsen, R.E., W.C. Krueger and M.R. George. 1998. *Viewpoint: livestock influences on riparian zones and fish habitat: literature classification*. Journal of Range Management 51(6): 661-4  
DE: Streamside-ecology; Fishes-Ecology; Range-management-Bibliography; Livestock

Li,W.H., G.A. Lamberti and T.N. Pearsons. 1994. *Cumulative effects of riparian disturbances along high desert trout streams of the John Day Basin, Oregon*. Transactions of the American Fisheries Society 123: 627-40

Marcuson, P.E. 1977. *The effect of cattle grazing on brown trout in Rock Creek, Montana*. Montana Department of Fish and Game, Special Report, Project Number F-20-R-21-11a. 23p., Helena, MT.

Overton, C.K., G.L. Chandler and J.A. Pisano. 1994. *Northern/intermountain regions fish habitat inventory: grazed, rested and ungrazed reference stream reaches, Silver King Creek, California*. U.S. Forest Service General Technical Report INT; No. 311, 27pp.

Platts, W.S. 1990. *Fish, wildlife and livestock: protection of riparian areas*. Western Wildlands 16(2): 16-19.

Platts, W.S. 1991. *Livestock Grazing*. In Influences of forest and rangeland management on salmonid fishes and their habitats. Edited by W.R. Meehan, American Fisheries Society Special Publication 19. American Fisheries Society, Bethesda, MD. pp. 389-423.

Platts, W.S and R.L. Nelson. 1985. ***Stream habitat and fisheries response to livestock grazing and instream improvement structures, Big Creek, Utah.*** Journal of Soil and Water Conservation 40: 374-9.

DE: Grazing-Experiments-Livestock; Fishes-Ecology

Rhude, L.A. and M.E. Kraft. 1987. ***The effect of habitat enhancement upon the trout population and physical characteristics of the North Raven River from 1973 – 1985.*** Department of Forestry, Lands and Wildlife. Fish and Wildlife Division Rocky Mountain House, Alberta.

**AB**

Smith, B.H. 1982. ***Livestock-riparian- fisheries interrelationships; or, functional applications of adaptation for personal survival.*** Proc. 17th Annual Meeting, Colorado-Wyoming Chapter, Amer. Fish. Soc. March 3-4, 1982. Fort Collins, CO, 4 pp.

Wohl, N.E. and R.F. Carline. 1996. *Relations among riparian grazing, sediment loads, macroinvertebrates, and fishes in three central Pennsylvania streams.* **Canadian Journal of Fisheries and Aquatic Sciences 53:260-6**

DE: Stream-ecology-Pennsylvania; Streamside-ecology-Pennsylvania; Fishes-Ecology; Invertebrates-Ecology

## **Mammals & Grazing (8,1)**

Jones, A.L. and .S. Longland. 1999. ***Effects of cattle grazing on salt desert rodent communities.*** American Midland Naturalist 141(1): 1-11

Kie, J. G., C. J. Evans, E. R. Loft, and J. W. Menke. 1991. ***Foraging Behaviour by Mule Deer: The Influence of Cattle Grazing.*** Journal of Wildlife Management 55(1): 665-674.

Loft, E. R., J. W. Menke, J. G. Kie, and R. C. Bertram. 1987. ***Influence of Cattle Stocking Rate on the Structural Profile of Deer Hiding Cover.*** Journal of Wildlife Management 51(1): 655-664.

Loft, E. R., J. W. Menke, and J. G. Kie. 1991. ***Habitat Shifts by Mule Deer: The Influence of Cattle Grazing.*** Journal of Wildlife Management 55(1): 16-26.

Medin, D.E. and W.P. Clary. 1989. ***Small mammal populations in a grazed and ungrazed riparian habitat in Nevada.*** U.S. Forest Service Research Paper: INT-413. 6p.

Munther, G.L. 1982. ***Beaver management in grazed riparian ecosystems.*** In: Wildlife-livestock relationships symposium: Proceedings 10. University of Idaho Forest, wildlife, and Range Experiment Station, Moscow, ID. pp. 234-241.

Rosenstock, S. S. 1996. ***Shrub-grassland small mammal and vegetation responses to rest from grazing.*** Journal of Range Management 49: 199-203.

DE: Grazing-Experiments-Livestock; Grassland-ecology-Utah; Wildlife-and-vegetation

Telfer, E.S. 1994. ***Cattle and Cervid Interactions on a Foothills watershed in southwestern Alberta.*** Canadian Field Naturalist 108(2): 186-194.

**AB**

## **Birds & Grazing (22,5)**

Ammon, E.M. and P.B. Stacey. 1997. ***Avian nest success in relation to past grazing regimes in a montane riparian system.*** The Condor 99: 7-13.

Bock, C.E. and J.H. Bock. 1999. ***Response of winter birds to drought and short-duration grazing in southeastern Arizona*** Conservation Biology 13 (5): 1117-1123.

Bock, C.E., V.A. Saab, T.D. Rich, and D.S. Dobkin. 1993. ***Effects of livestock grazing on Neotropical migratory landbirds in western North America*** Pages 296 - 309 in Status and management of Neotropical migratory birds, D.M. Finch and P.W. Stangel (Eds). Gen Tech. Rep. RM-229, Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, 422 pp.

Bock, C.E., and B. Webb. 1984. ***Birds as a grazing indicator species in Southeastern Arizona.*** Journal of Wildlife Management 48: 1045-1049.

Bradford, D.F., S.E. Franson, A.C. Neale, D.T. Heggem, G.R. Miller and G.E. Canterbury. 1998. ***Bird species assemblages as indicators of biological integrity in Great Basin rangeland.*** Environmental Monitoring and Assessment 49 (1): 1-22.

Dobkin, D.S., A.C. Rich, and W.H. Pyle. 1998. ***Habitat and avifaunal recovery from livestock grazing in a riparian meadow system of the northwest Great Basin.*** Conservation Biology 12: 209-221.

Goguen, C.B. and N.E. Mathews. 1998. ***Songbird community composition and nesting success in grazed and ungrazed pinyon-juniper woodlands.*** Journal of Wildlife Management 62(2): 474-484.

Holmquist, C.L. 1991. ***Avian use of riparian corridors located in grazed pastures.*** M.S. Thesis, Pennsylvania State University.

Hurly, T.A., E.J. Saunders and L.A. Fitch. 1998. ***Effects of cattle grazing on bird communities in cottonwood forests along the Oldman River, Alberta.*** In Thorpe, J. et al. (eds.) 1999 Proceedings of the Fifth Prairie Conservation and Endangered Species Conference. Published by Provincial Museum of Alberta.

AB

Kantrud, H.A. 1990. ***Effects of vegetation manipulation on breeding waterfowl in prairie wetlands – A literature review.*** In: Can livestock be used as a tool to enhance wildlife habitat? USDA Forest Service. General Technical Report RM-194. Rocky Mountain Forest and Range Experiment Station, Ft. Collins, CO. pp.192-213.

Medin, D.E. 1986. ***Grazing and passerine breeding birds in a Great Basin low-shrub desert.*** Great Basin Naturalist 46(3): 567-572.

Medin, D.E. and W.P. Clary 1991. ***Breeding bird populations in a grazed and ungrazed riparian habitat in Nevada.*** US Department of Agriculture Forest Service, Intermountain Research Station Research Paper INT-441.

Mosconi, S.L. and R.L. Hutto 1981. ***The effect of grazing on the land birds of a western Montana riparian habitat.*** Symposium: Wildlife-Livestock Relationships, Department of Wildlife Management, College of Forestry, University of Idaho, Moscow: 221-223

Ohmart, R.D. 1994. ***The effects of human-induced changes on the avifauna of western riparian habitats***. Pp. 273-285. IN: Jehl, J.R., Jr., and N.K. Johnson, (eds.). A Century of Avifaunal Change in Western North America. Studies in Avian Biology No. 15.

Saab, V.A, C.E. Bock, T.D. Rich and D.S. Dobkin. 1995. ***Livestock grazing effects in western North America***. In: Martin, T. and D.M. Finch (eds.). Ecology and management of neotropical migratory birds. New York: Oxford University Press: 311-352.

Saunders, E.J. and T.A. Hurly. 2000. ***The influence of grazing on bird populations along a prairie creek in southern Alberta***. Unpublished report prepared for Alberta Environment, Natural Resource Services

AB

Saunders, E.J. and T.A. Hurly. 2000. ***Birds, creeks and cows: The influence of grazing on birds and vegetation in cottonwood forests along the Oldman River***. In Proceedings of the Western Range Science Seminar: The Range Program and Potential. Published by Agriculture and Agri-Food Canada.

AB

Saunders, E.J. and T.A. Hurly. 1999. ***The influence of cattle grazing on fall bird use of cottonwood forests along the Oldman River***. Unpublished report prepared for the Cows and Fish program.

AB

Sedgwick, J.A. and F.L. Knopf. 1987. ***Breeding bird response to cattle grazing of a cottonwood bottomland***. The Journal of Wildlife Management 51: 230-7.

DE: Grassland-ecology-Colorado; Population-biology-Birds; Birds-Ecology; Forested-wetlands-Colorado; Forest-ecology-Colorado; Grazing-in-forests

Taylor, D.M. 1986. ***Effects of cattle grazing on passerine birds nesting in riparian habitat***. Journal of Range Management 39(3): 254-258.

Valentine, B.E., T.A. Roberts, S.P. Boland and A.P. Woodmann. 1988. ***Livestock management and productivity of willow flycatchers in the central Sierra Nevada***. Transactions of the Western Section of the Wildlife Society 24: 105-114.

Wershler, C. and W. Smith. 1995. ***Bar-U Ranch National Historical Site Wildlife Monitoring 1994***. Unpublished report for Alberta Environmental Protection.

AB

## **Reptiles & Amphibians & Grazing (1,0)**

Szaro, R.C., S.C. Belfit, J.K. Aitkin, and J.N. Rinne. 1985. ***Impact of Grazing on a Riparian Garter Snake***. General Technical Report RM-120. U.S.D.A. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

## **Invertebrates & Grazing (7,2)**

Bromham, L., M. Cardillo, A.F. Bennett and M.A. Elgar. 1999. ***Effects of stock grazing on the ground invertebrate fauna of woodland remnants***. Australian Journal of Ecology 24 (3): 199-207.

Hornung, J.P. and C.L. Rice. 2000. *Odonates (dragonflies and damselflies) as indicators of wetland integrity in southern Alberta: A preliminary study*. Poster presentation at the 11<sup>th</sup> Annual Meeting of the Alberta Chapter of the Wildlife Society, March 9-11. Abstract only.

AB

Lek-Ang, S., L. Deharveng and S. Lek. 1999. *Predictive models of collembolan diversity and abundance in a riparian habitat*. Ecological Modelling 120(2-3): 247-260.

Rambo, J.L. and S.H. Faeth. 1999. *Effect of vertebrate grazing on plant and insect community structure*. Conservation Biology 13(5): 1047-54  
DE: Wildlife-and-vegetation; Diversity-Biology-Plants; Diversity-Biology-Insects

Saunders, E.J. and T.A. Hurly. 2000. *The influence of cattle grazing on invertebrate populations in cottonwood forests along the Oldman River: A pilot study*. Unpublished report prepared for the Cows and Fish program.

AB

Seymour, C.L. and W.R.J. Dean. 1999. *Effects of heavy grazing on invertebrate assemblages in the Succulent Karoo, South Africa* Journal of Arid Environments 43(3): 267-286.

Strand, M., and R.W. Merritt. 1999. *Impacts of Livestock Grazing Activities on Stream Insect Communities and the Riverine Environment*. American Entomologist 45(1): 13-29.

### **General Wildlife & Grazing (3,1)**

Ambrose, N. 1999. *The effects of timing of cattle grazing on bird and amphibian abundance and diversity in and around sloughs in central Alberta*. Poster presented at the 10<sup>th</sup> Annual Meeting of the Alberta Chapter of the Wildlife Society. Abstract only.

AB

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DE: Range-management-Alberta; Woody-plants; Burning-of-land-Alberta; Grazing-Experiments-Cattle

AB

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DE: Grazing-Experiments-Ungulates; Poplar-; Grazing-in-forests

Clary, W.P. 1999. *Stream channel and vegetation responses to late spring cattle grazing*. Journal of Range Management 52(3): 218-27.  
DE: Grazing-Experiments-Cattle; Streamside-ecology; Range-management-Idaho

Clary, W.P. 1995. *Vegetation and soil responses to grazing simulation on riparian meadows*. Journal of Range Management 48: 18-25.  
DE: Grazing-Experiments; Streamside-flora; Grazing-and-soils

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DE: Range-management-Oregon; Plant-succession; Grazing-Experiments-Livestock; Range-ecology-Oregon

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DE: Range-research; Range-management-Canada

AB

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DE: Streamside-ecology; Grazing-Experiments-Cattle; Range-management

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DE: Grazing-Experiments; Streamside-flora

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DE: Wildlife-and-vegetation; Diversity-Biology-Plants; Diversity-Biology-Insects

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DE: Streamside-flora; Grazing-Experiments; Range-ecology-Colorado

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DE: Grazing-Experiments-Cattle; Streamside-ecology; Range-management-Idaho

Clary, W.P. 1995. ***Vegetation and soil responses to grazing simulation on riparian meadows.*** Journal of Range Management 48:18-25.

DE: Grazing-Experiments; Streamside-flora; Grazing-and-soils

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## **Grazing management & grazing influences on riparian areas in general (29,2)**

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DE: Streamside-ecology-Western-States; Fishes-Ecology; Grazing-Experiments-Livestock

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DE: Streamside-ecology; Aquatic-ecology; Grazing-Livestock

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DE: Agricultural-industry-Environmental-aspects; Grazing-Livestock

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DE: Grazing-Experiments; Streamside-ecology-Colorado; Floodplain-ecology-Colorado

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DE: Streamside-ecology; Agricultural-ecology

## **Riparian Areas & Cattle Behaviour (5,0)**

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Gillen, R.L., W.C. Krueger and R.F. Miller. 1985. ***Cattle use of riparian meadows in the Blue Mountains of northeastern Oregon.*** Journal of Range Management 38: 205-9.  
DE: Streamside-flora-Oregon; Pastures-and-meadows-Oregon; Grazing-Experiments-Cattle

Goodman, T., G.B. Donart et al. 1989. ***Cattle behavior with emphasis on time and activity allocations between upland and riparian habitats.*** IN: Gresswell, R.E., (1989). Practical Approaches to Riparian Resources Management: An Educational Workshop. USDI/ BLM. Pp. 95-102.

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DE: Range-ecology-Montana; Streamside-ecology-Montana; Grazing-Experiments-Cattle

## **A few other Grazing & Biodiversity References that may be useful (not directly related to riparian areas)**

Belsky, J.A. and D.M. Blumenthal. 1997. ***Effects of livestock grazing on stand dynamics and soils in upland forests of the interior West.*** Conservation Biology 11: 315-27.  
DE: Wildlife-and-vegetation-Western-States; Forests-and-forestry-Western-States; Grazing-and-soils; Grazing-in-forests; Forests-and-forestry-Stand-composition

Bock, C. E., J.H. Bock, W.R. Kenney, and V.M. Hawthorne. 1984. ***Responses of Birds, Rodents, and Vegetation to Livestock Exclosure in a Semi-desert Grassland Site.*** Journal of Range Management 37(3): 239-242.

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DE: Grazing-Experiments-Livestock; Burning-of-land-North-Dakota; Ducks-Mallard; Water-birds-Ecology

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Richards, K.W. and T.W. Myers. 1996. ***Effect of Livestock grazing on bumble bee populations.*** In W.D. Willms and J.F. Dormaar (eds) Proceedings of the Fourth Prairie Conservation and Endangered Species Workshop: 316.

West, N.E. 1993. ***Biodiversity of rangelands,*** Journal of Range Management 46(1): 2 -13.

## **APPENDIX 3: Unpublished / In Progress Research Relating to the Biodiversity of Riparian Areas & Livestock Grazing**

The following in-progress Alberta-based research was identified during the course of this literature / resource review (please note that this list is not exhaustive, there may be other projects underway that are not listed here - these are projects that came up during the course of the literature review):

### **Effects of cattle grazing on macroinvertebrates, amphibian, songbirds and waterfowl in pothole ponds and riparian areas in the aspen parkland.**

Investigator: Richard Casey & C. Paszkowski

Project Description: This study will examine if cattle grazing around ponds affects biodiversity.

Affiliation: Alberta Research Council

Project Status: There should be an unpublished report available from Institute for Wetland and Waterfowl Research in Manitoba

### **Comparing small mammal response to landscape structure at different spatial scales**

Investigator: Christine V. Corkum (MSc student)

Project Description: Predicting spatial scales of landscape structure that are important for small mammals. Primarily forest industry based.

Affiliation: University of Alberta

Supervisor: Dr. Stan Boutin

Project Status: In progress (abstract available at biodiversity challenge grants web site)

### **Species diversity in aspen parkland**

Investigator: Hannah Buckley (Phd student)

Project Description: Measuring species diversity of vascular plants, lichens, ground beetles and diatoms in Rumsey Ecological Reserve

Affiliation: University of Alberta

Supervisor: Dr. Mark Dale

Project Status: In progress (abstract available at biodiversity challenge grants web site)

### **Response of yellow warblers to territory quality and spatial structure**

Investigator: Claudio Celada (MSc student)

Project Description: Looking at territory choice, size and predation of yellow warblers in aspen parkland in relationship to the spatial configuration of the landscape.

Affiliation: University of Alberta

Supervisor: Dr. S.J. Hannon

Project Status: In progress (abstract available at biodiversity challenge grants web site)

### **Wood frog response to disturbance in boreal Alberta**

Investigator: Brian Eaton (Phd student)

Project Description: Looking at the degree to which amphibians use ponds in disturbed and undisturbed areas (primarily disturbance by forestry rather than agriculture)

Affiliation: University of Alberta

Supervisor: Dr. Cynthia Paszkowski

Project Status: In progress (abstract available at biodiversity challenge grants web site)

### **The ecology of prairie-dwelling bats in southeastern Alberta**

Investigator: Gillian Holloway (MSc student)

Project Description: Research on species composition, foraging & roosting ecology of bats along the South Saskatchewan and Red Deer river valleys. *Found that riparian zones are critical bat habitat for roosting & foraging. Bats foraged mostly in and around cottonwoods. This corresponded to the pattern of nocturnal insect abundance.*

However the bats did not roost in the trees, but in cliffs and coulees.

Affiliation: University of Calgary

Supervisor: Dr. Robert Barclay

Project Status: Research completed, being written up (abstract available at biodiversity challenge grants web site)

### **Putting the squeeze on ovenbirds in riparian buffer strips**

Investigator: J. Daniel Lambert

Project Description: Looking at ovenbird abundance and territories in riparian buffer strips in managed forests.

Affiliation: University of Alberta

Supervisor: Dr. Susan Hannon

Project Status: Research completed, being written up (abstract available at biodiversity challenge grants web site)

### **Elk, cattle & biodiversity management in the Cypress Hills.**

Investigator: Dr. Cormack Gates

Project Description: Effects of cattle and elk grazing on biodiversity in the Cypress Hills.

Focus is on the fescue grasslands, but they may do some work on the riparian / treed areas at a later date

Affiliation: University of Calgary

Project Status: Just starting out - some data will be collected this summer.

### **The interaction of burning and grazing on rough fescue grasslands of the Cypress Hills**

Investigator: Ed Korpela

Project Description: Looking at interaction of spring & fall burning and mowing with grazing pressure in fescue grasslands and the effects on vegetation community composition.

Affiliation: Alberta Research Council

Project Status: Underway (information from poster presented at the Western Range Science Seminar, January 2000)

## **Cattle grazing and management of stream-riparian systems in Cypress Hills Provincial Park**

Investigator: Ed Korpela

Project Description: Will look at effects of different grazing regimes on upland and riparian plants, water quality and stream life. Also looking at cattle weight gains.

Affiliation: Alberta Research Council

Project Status: Starts this spring (information from poster presented at the Western Range Science Seminar, January 2000)

## **APPENDIX 4: Internet Resources Relating to Riparian Biodiversity and Livestock**

### **Research Category**

<http://www.rwrp.umt.edu/>

University of Montana Riparian and Wetland Research

<http://www.forestry.umt.edu/index/>

Forestry related research projects at University of Montana. Most relevant is:

<http://www.fs.fed.us/rm/ecopartner/>

Bitterroot riparian bird project site - research & education site

<http://www.forestry.ubc.ca/people/martin.html>

Kathy Martin, University of British Columbia, conducts bird research in coniferous forest ecosystems. E.g. "Seasonal use of by birds of stream-side riparian habitat in coniferous forest of northcentral British Columbia" *Ecography* 21:1 (1998)

<http://www.geog.ubc.ca/research/mnorth1.html>

Margaret North, University of British Columbia, conducts research on riparian vegetation & geomorphology on northern rivers.

<http://www.npwrc.usgs.gov/resource/1998/ripveg/ripveg.htm>

Northern Prairie Wildlife Research Centre site. "Birds as Indicators of Riparian Vegetation Condition in the Western US". Shows how the common yellowthroat and song sparrow are excellent indicators of ecosystem recovery after livestock grazing (in Arizona).

<http://www.src.sk.ca/ecology.html>

Saskatchewan Research Council

<http://www.cprc.uregina.ca/pecos/>

Prairie Ecosystem Study.

### ***Excerpt***

The Prairie Ecosystem Study Project (PECOS) is a community-based and interdisciplinary investigation focusing on the agricultural sustainability of a semi-arid grassland ecosystem. Historical and current land use practices are examined, then related to the overall health of the natural and human communities extant within the study area. PECOS's main objective is to evaluate human impacts on the ecosystem and to investigate alternate land use practices that may lead to regional sustainability in terms of human and environmental health.

The project involves 30 senior scientists, 7 Ph.D. students and 22 Master students at the universities of Saskatchewan and Regina. It also includes adjunct professors who work with Environment Canada and Agriculture and Agri-Food Canada and community representatives. The Eco-Research Program supports and emphasizes graduate student training and research that is relevant to a policy of sustainable development.

The objective of the study is to evaluate current land use from the perspective of long-term sustainability, and to look for alternatives that may contribute to a promising future. Input from local residents on the planning of research projects is strongly encouraged.

<http://www.pamodelforest.sk.ca/pubs/029.html>

Prince Alberta Model Forest. Includes a variety of forest bird research, but the primary focus is forestry.

<http://www.consecol.org/Journal/>

Journal of Conservation Ecology

Abstracts from the Journal, <http://www.consecol.org/Journal/vol2/iss2/index.html> contains a special issue on sustainability and resilience in boreal regions.

<http://www.biology.ualberta.ca/biodiversity/>

Biodiversity Challenge Grants Program site (*good place to check for new and in-progress graduate research*)

<http://www.arc.ab.ca/>

Alberta Research Council

<http://www.afns.ualberta.ca/>

Department of Agriculture, Food & Nutritional Science at the University of Alberta.

Contains information on active research projects, including work at the;

<http://www.afhe.ualberta.ca/kinmin/kinsella.html>

Kinsella Ranch

## **U.S.A. - Government Sites**

<http://www.ak.blm.gov/ado/riparian.html>

Bureau of Land Management - Anchorage Office, Riparian Program

### ***Excerpt:***

Riparian areas are the zones that border streams, springs, bogs, wet meadows, lakes and ponds. Riparian areas usually have a greater diversity of vegetation and wildlife than adjoining habitats. Riparian systems filter and purify water as it moves through riparian zones, reduce sediment loads, support soil stability and recharge groundwater. They provide cool, moist environments that contrast the hotter, dryer upland habitats. The natural resources, aesthetic values, proximity to water and access to water travel also make riparian zones attractive to humans.

The Bureau of Land Management manages thousands of miles of streams and thousand of acres of wetlands with pristine riparian habitats within the 16 million acre Anchorage Field Office. These areas vary from clear running, narrow first order streams to the wide floodplain of the Yukon River and the margins of large deep lakes and millions of small, shallow tundra ponds. These streams, rivers, lakes and ponds provide habitat for a wide

variety of wildlife including spawning salmon, moose, black and brown bear, and a multitude of migratory song birds and waterfowl.

Work:

The Anchorage Field Office's Riparian Program is responsible for managing riparian habitats and their resources to maintain their long-term productivity. This work includes: monitoring, inventory, protection, and restoring riparian habitats and the wildlife populations that depend on them.

<http://www.state.ma.us/dfwele/river/rivfact3.htm>

Riverways Program, Massachusetts Department of Fisheries, Wildlife and Environmental Law Enforcement

<http://www.greatplains.org/npresource/1999/ripsd/ripsd.htm>

Northern Prairie Wildlife Research Centre - Riparian Areas of South Dakota

***Excerpt:***

What is a Riparian Area?

Riparian areas are the "green zones" of water-loving vegetation along waterways, streams, rivers, lakes, reservoirs, and springs. Riparian areas protect water quality, maintain stream function, and provide important fish and wildlife habitat. If managed properly, they provide many benefits to people.

Maintenance of productive riparian areas displays good stewardship of shared resources like water, fish and wildlife. Maintaining riparian area creates friends and allies for your operation.

Well-managed riparian areas buffer the destructive impacts of floods and drought.

The legal and political battles waged elsewhere on riparian issues and problems can be avoided with voluntary efforts now to include riparian management in overall operations.

*{For the general public / landowners} - very nicely laid out & lots of good photos}*

[http://watershed.org/wmchome/news/win\\_92/rip\\_ecosystems.html](http://watershed.org/wmchome/news/win_92/rip_ecosystems.html)

Oregon site (Cascade Centre for Ecosystem Management)

***Excerpt:***

### **Managing Riparian Zones as Ecosystems**

The group of researchers and managers associated with the Andrews Experimental Forest on the Willamette National Forest (collectively referred to as the Cascade Center for Ecosystem Management) has been studying the ecology and management of stream and riparian systems for nearly two decades. We have recently published a review of scientific findings and guides for riparian zone management.

As an outgrowth of interdisciplinary work, we take an ecosystem approach to defining riparian zones, rather than using hydrologic or botanical definitions. Riparian zones are the

zone of direct interaction between terrestrial and stream systems. Forest-stream interactions include: shading which regulates light available for aquatic primary production and for warming stream water; fine litter from terrestrial vegetation which is a food resource for aquatic organisms; coarse litter (e.g., fallen logs) that creates habitat structure and affects the ability of the aquatic system to retain dissolved and particulate organic matter; and biogeochemical cycling involving transfers among surface and groundwater systems and terrestrial vegetation. A variety of additional ecological linkages operate in riparian zones, such as the response of some wildlife species to the combined aquatic-terrestrial influences on habitat structure, composition, and microclimate found in riparian zones.

<http://www.prbo.org/CPIF/Riparian/PIFrplan.html>

California Partners in Flight

Riparian Habitat Conservation Plan: A strategy for arresting the decline of birds species in California

A project of California Partners in Flight.

*{Lots of monitoring information, focusing on birds}*

<http://www.wes.army.mil/el/workshop/SM6-4.html>

US Army Waterways Experiment Station "Management for Biodiversity in Riparian Ecosystems on US Army Corps of Engineer Lands

<http://www.csuchico.edu/biol/CSCC/mgmt.html>

Riparian management in northern California

<http://www.greatplains.org/npresource/othrdata/landscap/landscap.htm>

Koford, Rolf R. and Louis B. Best. 1996. Management of agricultural landscapes for the conservation of Neotropical migratory birds. Pages 68-88 in Frank R. Thompson, III, ed. Management of agricultural landscapes for the conservation of Neotropical migratory birds. U.S. Forest Service, General Technical Report. NC - 187. North Central Forest Experiment Station, St. Paul, MN. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page.

<http://www.npwrc.usgs.gov/resource/othrdata/landscap/landscap.html> (Version 16JUL97).

*(from Greatplains.org)*

<http://www.greatplains.org/resource/index.htm>

Great Plains resource finder - can search for on-line versions of many documents from across the Great Plains (search words include riparian function riparian management)

***Excerpt:***

Welcome to Greatplains.org! Because of significant environmental alterations resulting from human activities over the last two centuries, the ability of the Great Plains to sustain and replenish itself has become a major concern. This site serves the people of the Great Plains, whether they be private citizens, business owners, elected or government officials, or scientists, in achieving long-term sustainability of the land and its natural resources. Inside you will find a wealth of information ranging from "how-to" extension information to inventories and atlases of Great Plains natural resources to interactive forums and discussion areas for sharing information.

## **U.S.A. - Non-Government Sites**

<http://www.sw-centre.org/swcbd/grazing/resources.html>

radical anti-grazing US site! However, it does have a good list of grazing-related literature resources:

Grazing Related Research. Compiled by Jeff Burgess. Last Updated 1/27/00

[http://www.apnm.org/waste\\_of\\_west/Chapter3.html](http://www.apnm.org/waste_of_west/Chapter3.html)

another anti-grazing site

<http://glinda.cnrs.humboldt.edu/wmc/index.html>

The Watershed Management Council is a non-profit educational organization dedicated to the advancement of the art and science of watershed management { *this is a California based organization*}

### ***Excerpt:***

#### **The Watershed Management Council**

The Watershed Management Council is a non-profit organization whose members represent a broad range of watershed management interests and disciplines. Membership includes professionals, students, teachers, and individuals whose interest is in promoting proper watershed management.

Our activities include:

- Providing a forum for the integration of knowledge from a wide array of technical disciplines;

- Periodically summarizing the state of knowledge and technologies of watershed management;

- Identifying research needs and priorities;

- Membership training;

- Encouraging appropriate policies and legislation relating to watershed management;

- Assisting in implementing of existing knowledge;

- Stimulating the transfer, interchange, and dissemination of current data and technology;

- Providing a forum for discussion of social and economic ramifications of watershed management;

- Networking with other organizations related to watershed management;

- Recognition of significant contributions to knowledge or management of watersheds; and

- Promotion of public awareness of the importance of appropriate watershed management.

<http://www.sw-center.org/swcbd/>

Centre for Biological Diversity (environmental activist group based in American south-west)

### ***Excerpt:***

Old growth forests teeming with life, clean, free flowing rivers, untrampled deserts, people living in balance with nature...the West we envision for the future will provide an exceptional quality of life, it will be based on healthy ecosystems supporting diverse plant and animal communities as well as thriving urban and rural lifestyles. The Center for Biological Diversity represents the union of the most successful biodiversity activists in the Southwest. It combines rigorous conservation biology with innovative legal strategies and a powerful vision of what we can build together.

Site contains a searchable grazing bibliography database at  
<http://www.sw-center.org/swcbd/grazing/grazingbib.html>

***Excerpt:***

This bibliography was created in full by the Southwest Center for Biological Diversity it contains details of 679 scientific articles, conference proceedings, government agency documents and newspaper media dating from 1849 to 1996. It includes 436 abstracts written with the activist in mind. Topics range from: Avifauna (Gamebirds, Raptors, Rangeland birds, and water birds), Biodiversity, BLM permits, Cattle behaviour, Cattle prices, Desertification, Erosion, Fence impacts, Fire, Fisheries, Forest Structure, Grazing Fees, Grazing systems, Herpetofauna, Historical conditions, Large Mammals, Law, Overviews and Bibliographies, Prairies, Rangeland Management and Ecology, Small Mammals, Soil, Vegetation (Silviculture, Succession, and Plant vigor), Water Quality and Riparian issues, Wildlife.

## **Canada - Government Sites**

<http://www.wetland.sk.ca/>

Saskatchewan Wetland Corporation

## **Canada - Non-Government Sites**

<http://www.agric.gov.ab.ca/sustain/fish1.html>

Cows and Fish web-site (soon to change to <http://www.cowsandfish.org>)

<http://www.ducks.ca/iwwr/projects/westplains.htm>

Listing of NAWMP projects

<http://www.landstewardship.org/>

Land Stewardship centre of Canada.

## **Bibliographies**

[http://glinda.cnrs.humboldt.edu/wmc/rip\\_bib/rip\\_index.html](http://glinda.cnrs.humboldt.edu/wmc/rip_bib/rip_index.html)

Riparian references from: RIPARIAN TOPICS BIBLIOGRAPHY for Riparian Reserve Technical Team

Interagency Watershed Analysis Center

USDA-Forest Service, Six Rivers National Forest

Compiled & Revised 5/23/96 by R. Herness

This bibliography has been subdivided into four sections:

Part I: Laws, Regulations and Management Acts  
Part II: Management and Classification of Riparian Ecotones  
Part III: Flora and Fauna of Riparian Ecotones  
Part IV: Scientific, Research & Technical Citations

<http://www.npwrc.usgs.gov/resource/literatr/ripareco/ripareco.htm>

Northern Prairie Wildlife Research Centre - Riparian Ecosystem Creation and Restoration - A literature review. This resource is based on the following source: Mancini, Karen M. 1989. Riparian ecosystem creation and restoration: A literature summary. U.S. Fish and Wildlife Service Biological Report 89(20):1-59.

<http://www.npwrc.usgs.gov/resource/literatr/riparian/riparian.htm>

Northern Prairie Science Center. 1996. Riparian communities and related topics: An annotated bibliography. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/literatr/riparian/riparian.html> (Version 15MAY98).

*{ includes a downloadable text file of a very comprehensive searchable bibliography on riparian ecosystems with many references to livestock grazing however there are no references after 1986 in this bibliography).*

[http://www.greatplains.org/resource/ecobib/t\\_ripzones.htm](http://www.greatplains.org/resource/ecobib/t_ripzones.htm)

Bibliography of ecological indicators with a section on riparian zones.

## **Educational / Interpretive Sites**

<http://frontpage.lightspeed.net/KRP/riparian.htm>

Rivers of birds - A California site - the focus is on birds and is interpretive and it is geared towards the general public

## **Internet Searches Performed & Results**

(Using Infoseek.go.com)

Riparian = 4,722 matches

riparian = 16,363 matches

riparian + biodiversity = 2,186 matches

riparian + biodiveristy + research = 85

riparian + biodiversity + Alberta = 29 matches

riparian + bats = 177 matches

riparian + bats + grazing = 33 matches

riparian + biodiversity + Canada = 20 matches

riparian + birds = 1009 matches

riparian + wildlife =

riparian + Canada = 14 matches

riparian + Alberta = 33 matches

boreal forest = 2,898,454 matches

boreal forest + riparian = 3,780 matches

boreal forest + riparian + grazing = 736 matches

grazing + boreal forest = 3,432

grazing + aspen parkland = 1129

grazing + aspen parkland + cattle = 207

cattle + forest = 1511

cattle + forest + boreal = 25