

Aquatic Habitats

Lotic Habitats (Streams, Rivers)

1369. Adapting existing models to examine effects of agricultural conservation programs on stream habitat quality.

Shields, F. D.; Langendoen, E. J.; and Doyle, M. W.
Journal of the American Water Resources Association
42(1): 25-33. (2006)

NAL Call #: GB651.W315; ISSN: 1093474X

Descriptors: agricultural watersheds/ aquatic habitat/ buffers/ index of biotic integrity/ modeling/ stream ecosystems/ water quality

Abstract: Annual expenditures by the federal government in the United States for agricultural conservation programs increased about 80 percent with passage of the 2002 Farm Bill. However, environmental benefits of these programs have not been quantified. A national project is under way to estimate the effect of conservation practices on environmental resources. The watershed models intended for use in that project are focused on water quantity and quality and have minimal habitat assessment capability. Major impairments to aquatic ecosystems in many watersheds consist of physical habitat degradation, not water quality, suggesting that current models for this national initiative do not address one of the most significant aspects of aquatic ecosystem degradation. Currently used models contain some components relevant to aquatic habitat, and this paper describes specific components that should be added to allow rudimentary stream habitat quality assessments. At least six types of variables could be examined for ecological impact: land use, streamflow, water temperature, streambed material type, large woody debris, and hydraulic conditions at base flow. All of these variables are influenced by the presence, location, and quality of buffers. Generation of stream corridor ecological or habitat quality indices might contribute to assessments of the success or failure of conservation programs. Additional research is needed to refine procedures for combining specific measures of stream habitat into ecologically meaningful indices. JAWRA Copyright © 2006.

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1370. Agricultural land use effects on sediment loading and fish assemblages in two Minnesota (USA) watersheds.

Zimmerman, J. K. H.; Vondracek, B.; and Westra, J.
Environmental Management 32(1): 93-105. (2003)

NAL Call #: HC79.E5E5; ISSN: 0364152X

Descriptors: agriculture/ land use/ streams/ suspended sediment/ trout/ warmwater fish/ agriculture/ erosion/ land use/ runoff/ sediments/ water quality/ watersheds/ sediment loading/ environmental engineering/ agriculture/ land use/ sediment/ watershed/ agriculture/ fishes/ geologic sediments

Abstract: We examined the relationship between water quality and fish communities within two agricultural areas using a computer simulation model. Our analyses focused on a coolwater stream, Wells Creek in southeastern Minnesota, and a warmwater stream, the Chippewa River in western Minnesota. We used the Agricultural Drainage and Pesticide Transport (ADAPT) model in relation to land use to calculate instream suspended sediment concentrations using estimates of sediment delivery, runoff, baseflow and streambank erosion, and quantified the

effects of suspended sediment exposure on fish communities. We predicted the effects of agricultural practices on stream fish communities under several possible land use scenarios, with reference to current conditions. Land use changes led to reductions in sediment loading of up to 84% in Wells Creek and 49% in the Chippewa River. The reduction in sediment loading across scenarios may be directly related to a reduction in runoff by about 35% in both study areas. We found a 98% decrease in "lethal" concentrations of suspended sediment on fish in Wells Creek with an increase in conservation tillage, riparian buffers, and permanent vegetative cover. However, the effects of suspended sediment did not significantly decrease in the Chippewa River. This difference between study areas was likely due to differences in tolerance to suspended sediment between coolwater and warmwater fish communities and differences in topography, runoff and bank erosion between the two streams.

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1371. Amendments to the fish and wildlife program call for tests of alternative dam operations.

Northwest Power Planning Council

Council Quarterly (Spring 2003): 1-2.

Descriptors: dams/ ecosystems/ foods-feeding/ habitat alterations/ habitat management/ management/ predation/ protection/ reservoirs/ riparian habitat/ rivers/ wildlife/ wildlife-habitat relationships/ Columbia River and Basin/ Washington/ Idaho/ Montana

Abstract: The Northwest Power Planning Council amended its Columbia River Basin Fish and Wildlife Program, which was intended to protect all fish and wildlife that used the main-stem rivers as habitat. The conditions could be achieved through dam operations. It could benefit salmon and steelhead in the lower Columbia River and the fish in the upper river basin. The program was aimed to determine the relationship between fish survival and water spills at dams, the optimum fish survival and evaluate the benefits of fish survival, identify the effects of shifting summer flows and assess the impact of predation and harvest of various species in the main-stem rivers.

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1372. Aquatic condition response to riparian buffer establishment.

Teels, B. M.; Rewa, C. A.; and Myers, J.

Wildlife Society Bulletin 34(4): 927-935. (2006)

NAL Call #: SK357.A1W5; ISSN: 00917648.

Notes: doi: 10.2193/0091-7648(2006)34

[927:ACRTRB]2.0.CO;2.

Descriptors: Conservation Reserve Enhancement Program/ fish assemblage/ index of biotic integrity/ Northern Virginia/ practice effects/ riparian buffers/ riparian restoration/ watershed

Abstract: Although riparian buffers established along streams in agricultural landscapes are expected to provide water-quality functions similar to natural ecosystems, few studies have documented specific changes in the condition of aquatic resources resulting from buffer establishment. In 2000 the Commonwealth of Virginia, USA, began an extensive cooperative venture under the Chesapeake Bay

Initiative to establish riparian buffers on agricultural lands, primarily through United States Department of Agriculture's Conservation Reserve Enhancement Program (CREP). Prior to CREP implementation, the Natural Resources Conservation Service (NRCS) developed a regionally tailored fish Index of Biotic Integrity (IBI) for use as a watershed assessment technique in Northern Virginia. Using this regional IBI framework, we evaluated the effects of recently established riparian buffers on aquatic condition. Within the geographic scope of the regional IBI, we evaluated all buffer segments planned between 2000 and 2003. Cumulatively during this period, we assessed stream physical condition on 36 buffer sites and 12 reference sites using the NRCS Stream Visual Assessment Protocol (SVAP); we also assessed the aquatic community at these sites using the IBI. Improvements in stream condition were clearly demonstrated at certain sites within one year of buffer establishment. Although not all buffer projects responded with positive trends, mean SVAP and IBI scores for buffered sites increased over the course of the study, whereas the trend on reference sites was level or slightly downward. We observed positive IBI response at sites with highly disturbed local conditions prior to buffer establishment combined with small, relatively undisturbed watersheds above. Simple solutions such as buffer establishment alone cannot be expected to protect streams from adverse human impacts that occur at a broader scale. Therefore, riparian restoration should be planned and carried out in concert with other conservation practices at a watershed scale in a way that maximizes buffer effectiveness.

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1373. Are stream crossing culverts a barrier to the movement of the Pacific giant salamander (*Dicamptodon tenebrosus*)?

Sagar, Jina P.; Olson, Deanna H.; Schmitz, Richard A.; and Guetterman, John

Northwestern Naturalist 84(2): 113-114. (2003)

NAL Call #: QL671.M8; ISSN: 1051-1733

Descriptors: stream culverts/ Pacific giant salamanders/ *Dicamptodon tenebrosus*/ movement/ spatial isolation/ genetic isolation/ abundance/ habitat management

Abstract: Barriers to the movement of aquatic organisms can increase the genetic and spatial isolation of populations. Focus on culvert passage issues has increased as federal agencies attempt to inventory and replace road-crossing stream culverts that are barriers to the movement of anadromous fishes. The effect of stream crossing culverts on the movement of other aquatic organisms, however, is not known. In a mark-recapture study on 15 3rd- and 4th-order streams in the Oregon Coast Range, we examined monthly movements of larval Pacific giant salamanders (*Dicamptodon tenebrosus*) in streams with and without culverts. Salamander abundances ranged from 0.3 to 3.2 larvae/m. From June to August 2002, a total of 2227 *D. tenebrosus* were captured. Recapture rates ranged from 31 to 69%. The mean movement distance for salamanders caught on consecutive visits was 2.5 m, with a maximum distance of 51 m. Preliminary results indicate a barrier effect (limited movement between stream reaches above and below culverts) on culvert streams when compared with reference

streams. Furthermore, use and movement through culverts appears to vary with culvert type (for example, pipe vs. half pipe with stream bottom). Integrated analysis of range of movement, directionality, and movement frequency through culvert type will contribute to regional dialogue on culvert design for effective passage.

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1374. Beaver herbivory of willow under two flow regimes: A comparative study on the Green and Yampa Rivers.

Andersen, D. C.; Wilson, K. R.; and Breck, S.W.

Western North American Naturalist 63(4): 463-471. (2003)

NAL Call #: QH1.G7; ISSN: 1527-0904

Descriptors: beavers/ behavior/ cottonwood/ Flaming Gorge Dam [map]/ flow/ flow regimes/ foraging/ Green River/ herbivory/ Little Snake River/ regulated flow/ studies/ willow/ Yampa River/ forestry/ agriculture/ rivers/ lakes/ Colorado/ Insectae and Sedis/ *Castor canadensis*/ *Salix exigua*/ *Populus deltoides wislizenii*

Abstract: The effect of flow regulation on plant-herbivore ecology has received very little attention, despite the fact that flow regulation can alter both plant and animal abundance and environmental factors that mediate interactions between them. To determine how regulated flows have impacted beaver (*Castor canadensis*) and sandbar willow (*Salix exigua*) ecology, we first quantified the abundance and mapped the spatial distribution of sandbar willow on alluvial sections of the flow-regulated Green River and free-flowing Yampa River in northwestern Colorado. We then established 16 and 15 plots (1m x 2.7m) in patches of willow on the Green and Yampa Rivers, respectively, to determine whether rates of beaver herbivory of willow differed between rivers (Green versus Yampa River), seasons (fall-winter versus spring-summer), and years (spring 1998 - spring 1999 versus spring 1999 - spring 2000). Areal extent of willow was similar on each river, but Green River willow patches were smaller and more numerous. Beavers cut more stems during fall and winter than spring and summer and cut over 6 times more stems (percentage basis) on the green River than on the Yampa River. We attribute the between-river difference in herbivory to higher availability of willow, greater beaver density, and lower availability of young Fremont cottonwood (*Populus deltoides* subsp. *Wislizenii*; an alternative food source) on the Green River. Flow regulation increased willow availability to beaver by promoting the formation of island patches that are continuously adjacent to water and feature a perimeter with a relatively high proportion of willow interfacing with water.

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1375. Benthic macroinvertebrate fauna in small streams used by cattle in the Blue Ridge Mountains, Virginia.

Braccia, Amy and Voshell, J. Reese

Northeastern Naturalist 13(2): 269-286. (2006)

NAL Call #: QH105.M2M36; ISSN: 1092-6194

Descriptors: commercial activities/ conservation measures/ freshwater habitat/ lotic water/ land zones/ Macroinvertebrata: farming and agriculture/ benthic fauna/ small montane streams/ cattle/ habitat management/ Virginia/ Blue Ridge Mountains/ invertebrates

Abstract: Cattle production is a common land use, and the adverse effects of cattle grazing on stream habitat and

macroinvertebrates has been well documented. The purpose of our study was to provide a list of taxa that can be expected to occur in small streams impacted by cattle in the southern Blue Ridge Mountains and to demonstrate how taxon-specific natural history information can be used to gain insight about benthic habitat condition. We identified 97 benthic macro invertebrate taxa from five cattle-impacted streams that differed in cattle grazing intensity. Our findings suggest that some macroinvertebrate taxa can sustain low levels of cattle grazing and that sedimentation is a major stressor to the macroinvertebrate fauna.
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1376. Bioassessment of the Green River Basin using fish: The effects of land use and hydrology on community composition.

Lewis, B. E. and Grubbs, S. A.
Southeastern Biology (2002)

Descriptors: Green River/ hydrology/ agriculture/ water quality/ water chemistry/ freshwater fish/ population structure/ Impact of forestry or agriculture/ freshwater fish
Abstract: Fish communities within the Green River Basin are affected by a number of land use and hydrological factors. We present results from qualitative sampling of 75 sites within the Green River Basin. Agricultural runoff, silt, and mining operations affect water quality throughout the basin and increase inter-drainage similarity. Important chemical and habitat factors affecting fish diversity and evenness include substrate embeddedness, habitat diversity and pH. Similarity between communities in areas of low perturbation is primarily affected by stream size and connectivity between sites. Sites in these drainages should exhibit a higher intra-drainage to inter-drainage similarity ratio than drainages with lower water quality.

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1377. Bioeconomic analysis of selected conservation practices on soil erosion and freshwater fisheries.

Westra, J. V.; Zimmerman, J. K. H.; and Vondracek, B.
Journal of the American Water Resources Association 41(2): 309-322. (2005)

NAL Call #: GB651.W315; ISSN: 1093474X

Descriptors: agricultural drainage and pesticide transport model/ ADAPT/ best management practices/ BMPs/ economics/ fish/ ecosystems/ mathematical models/ runoff/ farmers/ land management/ wildlife habitat/ soils/ agricultural catchment/ fishery management/ nonpoint source pollution/ soil erosion/ suspended sediments/ riparia
Abstract: Farmers can generate environmental benefits (improved water quality and fisheries and wildlife habitat), but they may not be able to quantify them. Furthermore, farmers may reduce their incomes from managing lands to produce these positive externalities but receive little monetary compensation in return. This study simulated the relationship between agricultural practices, water quality, fish responses to suspended sediment and farm income within two small watersheds, one of a cool water stream and one of a warm water stream. Using the Agricultural Drainage and Pesticide Transport (ADAPT) model, this study related best management practices (BMPs) to calculated instream suspended sediment concentrations by estimating sediment delivery, runoff, base flow, and streambank erosion to quantify the effects of suspended sediment exposure on fish communities. By implementing selected BMPs in each watershed, annual net farm income

declined \$18,000 to \$28,000 (1 to 3 percent) from previous levels. "Lethal" fish events from suspended sediments in the cool water watershed decreased by 60 percent as conservation tillage and riparian buffers increased. Despite reducing suspended sediments by 25 percent, BMPs in the warm water watershed did not reduce the negative response of the fisheries. Differences in responses (physical and biological) between watersheds highlight potential gains in economic efficiency by targeting BMPs or by offering performance based "green payments."

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1378. Biological effects of fine sediment in the lotic environment.

Wood, Paul J. and Armitage, Patrick D.
Environmental Management 21(2): 203-217. (1997)
NAL Call #: HC79.E5E5; ISSN: 0364-152X

Descriptors: biological effects/ conservation/ deposition/ fine sediment/ habitat quality/ lotic environment/ river sedimentation/ soil science/ transport/ fish/ invertebrate/ Invertebrata/ Pisces/ animals/ chordates/ nonhuman vertebrates/ vertebrates

Abstract: Although sedimentation is a naturally occurring phenomenon in rivers, land-use changes have resulted in an increase in anthropogenically induced fine sediment deposition. Poorly managed agricultural practices, mineral extraction, and construction can result in an increase in suspended solids and sedimentation in rivers and streams, leading to a decline in habitat quality. The nature and origins of fine sediments in the lotic environment are reviewed in relation to channel and nonchannel sources and the impact of human activity. Fine sediment transport and deposition are outlined in relation to variations in streamflow and particle size characteristics. A holistic approach to the problems associated with fine sediment is outlined to aid in the identification of sediment sources, transport, and deposition processes in the river catchment. The multiple causes and deleterious impacts associated with fine sediments on riverine habitats, primary producers, macroinvertebrates, and fisheries are identified and reviewed to provide river managers with a guide to source material. The restoration of rivers with fine sediment problems are discussed in relation to a holistic management framework to aid in the planning and undertaking of mitigation measures within both the river channel and surrounding catchment area.

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1379. Biological response of aquatic communities to streambank fencing in selected streams impacted by agricultural grazing.

Argent, D. G. and Lenig, A.
In: Proceedings of the 2005 Watershed Management Conference: Managing Watersheds for Human and Natural Impacts: Engineering, Ecological, and Economic Challenges. Williamsburg, VA; pp. 967-978; 2005.

Descriptors: grazing/ livestock/ streams/ streambanks/ fencing/ aquatic habitat/ aquatic life

Abstract: Streams impacted by agricultural grazing experience compromised functioning because of physical degradation and various pollutants (e.g., nitrates and fecal coliforms). The objective of this study was to determine if stream functioning could be significantly improved with the removal of livestock from the adjacent corridor. In 1999,

four grazed pastures that contained meadow streams received streambank fencing through the Partners for Fish and Wildlife Program (treatment sites). These streams exhibited unstable streambanks and elevated nitrate and fecal coliform levels as a direct result of cattle impacts on the stream. Concurrent with streambank fencing, we established monitoring stations that were 100-m long within each stream. In addition, several control streams were monitored that had (a) no history of grazing and no fencing (control streams) or (b) a history of grazing and no fencing (control farms). At each station seasonal collections were made for benthic macroinvertebrates and fishes; and various water chemistry parameters (TKN, nitrates, ammonia, phosphates, fecal coliforms, and turbidity). Over the course of this study, nitrates have remained reasonably constant during the spring season and declined significantly during the summer and fall seasons; TKN, and phosphorus have not changed appreciably during the spring collection periods at treatment sites, but were slightly elevated during the summer sampling period. Turbidity has declined significantly during the spring sampling period, but remains elevated during the summer and fall periods. Fecal coliform concentrations continue to be quite high in treatment farm streams, but fluctuate, seasonally. Treatment sites contain a good diversity and abundance of macroinvertebrates and fish that are comparable to those found in control streams. Our findings to date suggest that streams impacted by agricultural grazing may require appreciable periods of time to experience improved stream functioning.
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1380. Can biological assessments discriminate among types of stress? A case study from the Eastern Corn Belt Plains ecoregion.

Norton, S. B.; Cormier, S. M.; Smith, M.; and Jones, R. C. *Environmental Toxicology and Chemistry* 19 (4, Part 2): 1113-1119. (2000)
NAL Call #: QH545.A1E58
Descriptors: agricultural ecosystem/ aquatic organisms/ assessments/ benthic fauna/ benthos/ biochemical oxygen demand/ bioindicators/ case studies/ community structure/ ecology/ ecosystem disturbance/ environmental impact/ environmental monitoring/ environmental stress/ freshwater fish/ macroinvertebrates/ midges/ models/ multivariate analysis/ nutrient concentrations/ pollution effects/ pollution indicators/ regional analysis/ regional planning/ risk assessment/ streams/ zoobenthos/ Pisces/ Zea mays/ Ohio
Abstract: We investigated the feasibility of using the structure of fish and benthic macroinvertebrate communities to distinguish among major types of stressors (e.g., siltation, nutrient enrichment, and stream structural degradation) using spatially and temporally matched data on stressors and responses. The 19 stressor variables addressed stream chemistry and in-stream habitat and included biological oxygen demand (BOD), total suspended solids, nitrogen, phosphorus, and components of the Qualitative Habitat Evaluation Index. The 42 response variables addressed fish and invertebrate community structure and included many of the component metrics of the Index of Biological Integrity and the Invertebrate Community Index as well as variables specifically calculated for this project. All data were collected between 1988 and 1994 by the Ohio Environmental Protection Agency in the Eastern Corn Belt Plains ecoregion. Prior to analysis, variables were transformed to near normality, and

variables significantly correlated with drainage area were fit to regression models and the resulting residuals used in the analyses. Multivariate analyses included factor and discriminant analysis. The first six stressor factors explained 69% of the variation. Discriminant functions formed using the response variables significantly separated site clusters classified into high, medium, and low categories along stressor gradients. Both fish and macroinvertebrate variables were important in distinguishing site categories. For example, percentage Tanytarsini midges and percentage Glyptotendipes were important in distinguishing sites having high and low BOD. Percentage darters was associated with sites having high scores for stream corridor structure and low concentrations of inorganic nutrients, and percentage roundbodied suckers was associated with sites having low BOD and low concentrations of zinc and lead. These results indicate that diagnostic models may be developed that will be useful for site-specific and regional assessments.
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1381. Can warmwater streams be rehabilitated using watershed-scale standard erosion control measures alone.

Shields, F. Douglas; Knight, Scott S.; and Cooper, Charles M.
Environmental Management 40(1): 62-79. (July 2007)
NAL Call #: HC79.E5E5
Descriptors: fish/ monitoring/ river restoration/ restoration assessment/ ecosystem rehabilitation/ instream structures/ channel incision
Abstract: Degradation of warmwater streams in agricultural landscapes is a pervasive problem, and reports of restoration effectiveness based on monitoring data are rare. Described is the outcome of rehabilitation of two deeply incised, unstable sand-and-gravel-bed streams. Channel networks of both watersheds were treated using standard erosion control measures, and aquatic habitats within 1-km-long reaches of each stream were further treated by addition of instream structures and planting woody vegetation on banks (habitat rehabilitation). Fish and their habitats were sampled semiannually during 1-2 years before rehabilitation, 3-4 years after rehabilitation, and 10-11 years after rehabilitation. Reaches with only erosion control measures located upstream from the habitat measure reaches and in similar streams in adjacent watersheds were sampled concurrently. Sediment concentrations declined steeply throughout both watersheds, with means $\geq 40\%$ lower during the post-rehabilitation period than before. Physical effects of habitat rehabilitation were persistent through time, with pool habitat availability much higher in rehabilitated reaches than elsewhere.
This citation is from AGRICOLA.

1382. Changes in fish assemblage structure of the Red River of the North.

Aadland, Luther P.; Koel, Todd M.; Franzin, William G.; Stewart, Kenneth W.; and Nelson, Patrick
In: American Fisheries Society Symposium, 45; Bethesda, MD: American Fisheries Society, 2005. 293-321.
Notes: Symposium on Changes in Fish Community Structures in Large USA Rivers, Phoenix, AZ, USA; 1888569727 (ISBN); No. 45.

Descriptors: freshwater ecology: ecology, environmental sciences/ biogeography: population studies/ wildlife management: conservation/ reintroduction/ applied and field techniques/ agriculture/ assemblage structure/ channelization/ dam construction/ wetland drainage

Abstract: The Red River of the North basin (RRNB) has an area of about 287,000 square kilometers of the upper Midwestern United States and south-central Canada. The river forms the North Dakota-Minnesota boundary and flows into Lake Winnipeg, Manitoba, and then, via the Nelson River, into Hudson Bay. While the Red River main stem remains a sinuous stream similar to early descriptions, the river's watershed has been altered dramatically by intensive agriculture, wetland drainage, channelization of tributary streams, and dam construction. Early land surveys described a landscape largely covered by prairie and wetlands. However, thousands of kilometers of ditches have been excavated to drain wetlands for agriculture in the United States in the late 1800s to the 1920s, and continuing, in Canada, to the present. Over 500 dams have blocked access to critical spawning habitat in the basin starting in the late 1800s. Also, during the mid-1900s, many of the tributaries were channelized, causing the loss of several thousand stream kilometers. While much of RRNBs fish assemblage remains similar to earliest historical records, the loss of the lake sturgeon *Acipenser fulvescens* is a notable change resulting from habitat loss and fragmentation, and overfishing. Additional localized extirpations of channel catfish *Ictalurus punctatus*, several redhorse *Moxostoma* species, sauger *Sander canadensis*, and other migratory fishes have occurred upstream of dams on several tributaries. Presently, efforts are underway to restore migratory pathways through dam removal, conversion of dams to rapids, and construction of nature-like fishways. Concurrently, lake sturgeon is being reintroduced in the hope that restored access to historic spawning areas will allow reestablishment of the species. Proposed construction of new flood control dams may undermine these efforts.

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1383. Changes in fish assemblage structure upstream of impoundments within the upper Wabash River Basin, Indiana.

Guenther, Cameron B. and Spacie, Anne
Transactions of the American Fisheries Society 135(3): 570-583. (2006)

NAL Call #: 414.9-Am3; ISSN: 0002-8487

Descriptors: commercial activities/ ecology/ freshwater habitat/ lotic water/ land zones/ Pisces: Industry/ Dams and impoundments/ distribution and trophic structure effects/ streams/ trophic structure/ Dams and impoundments effects/ community structure/ distribution within habitat/ stream/ distribution and trophic structure/ Indiana/ Upper Wabash River Basin/ Pisces/ chordates/ fish/ vertebrates

Abstract: The effects of dams and impoundments on downstream fish assemblages have been well documented, but changes in fish assemblages in upstream tributaries have received little attention. We compared changes in abundance and composition in fish assemblages in streams fragmented by impoundments with those found in nearby unfragmented streams by sampling fish, in-stream habitat, physicochemical factors, and drainage features in 22 agriculturally dominated streams during the summers of 2002 and 2003. Eleven sampling sites were tributaries

upstream of impoundments, while 11 were tributaries of free-flowing rivers. We tested the hypothesis that fish assemblages upstream of impoundments would differ from those found in streams without impoundments. Using multiple regression and canonical correspondence analysis, we partitioned the variation in species distributions into that explained by in-stream habitat, reach-level factors, drainage features, and temporal variation. Spatial patterns of species distributions indicated significant upstream effects of impoundment, fragmentation being the single largest predictor of species distributions. Mean fluvial specialist richness was significantly greater in unfragmented (6 species/reach) than in fragmented streams (3 species/reach), whereas mean fluvial generalist richness was significantly greater in fragmented (12 species/reach) than unfragmented streams (8 species/reach). A shift in piscivore abundance and composition was also observed, with smallmouth bass *Micropterus dolomieu* and redbfin pickerel *Esox americanus* replaced by largemouth bass *M. salmoides* and white bass *Morone chrysops* in the streams fragmented by impoundments. Additionally, greater total richness and piscivore abundance was observed in tributaries upstream of impoundments. Unfragmented streams showed a significantly lower total abundance of piscivores (7 fish/reach) than upstream tributaries of impoundments (14 fish/reach). The downstream presence of an impoundment led to significant homogenization of fish assemblages through a significant increase in generalist richness and abundance in fragmented streams and a shift in the abundance and type of piscivores.

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1384. Changes in fish assemblages in the tidal Hudson River, New York.

Daniels, R. A.; Limburg, K. E.; Schmidt, R. E.; Strayer, D. L.; and Chambers, R. C.

American Fisheries Society Symposium 45: 471-503. (2005)

Descriptors: climatic changes/ commercial fishing/ deforestation/ domestic wastes/ dredging/ environmental impact/ estuaries/ freshwater fish/ harvesting/ introduced species/ rivers/ urbanization/ watersheds/ *Microgadus tomcod*/ *Morone saxatilis*/ *Notropis hudsonius*/ *Osmerus mordax*/ New Jersey/ Hudson R.

Abstract: The main channel of the Hudson River is a tidal estuary from its mouth in New York Harbor to Troy, New York, 247 km upstream. It drains about 35,000 km² and is an important navigational, commercial, and recreational system. Since the arrival of European settlers over 400 years ago, it has undergone numerous environmental changes. These changes have included channel maintenance by dredging, wholesale dumping of industrial and domestic wastes, scattered in-basin urbanization and shoreline development, deforestation of the watershed and an increase in agriculture, and water removal for commercial, industrial, and agricultural needs. In addition, the biota of the river has supported commercial and recreational harvesting, exotic species have become established, and habitats have become fragmented, replaced, changed in extent, or isolated. The tidal portion of the Hudson River is among the most-studied water bodies on Earth. We use data from surveys conducted in 1936, the 1970s, the 1980s, and the 1990s to examine changes in fish assemblages and from other sources dating back to

1842. The surveys are synoptic but use a variety of gears and techniques and were conducted by different researchers with different study goals. The scale of our assessment is necessarily coarse. Over 200 species of fish are reported from the drainage, including freshwater and diadromous species, estuarine forms, certain life history stages of primarily marine species, and marine strays. The tidal Hudson River fish assemblages have responded to the environmental changes of the last century in several ways. Several important native species appear to be in decline (e.g., rainbow smelt *Osmerus mordax* and Atlantic tomcod *Microgadus tomcod*), others, once in decline, have rebounded (e.g., striped bass *Morone saxatilis*), and populations of some species seem stable (e.g., spottail shiner *Notropis hudsonius*).

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1385. Channelization and livestock impacts on salmonid habitat and biomass in western Washington.

Chapman, D. W. and Knudsen, E.

American Fisheries Society: Transactions 109(4): 357-363. (1980)

NAL Call #: 414.9-Am3; ISSN: 0002-8487

Descriptors: channelization/ grazing/ habitat alterations/ management/ research: rivers and streams/ riparian habitat/ fish/ ecology/ flowing waters/ rivers/ streams/ salmonids/ Washington/ Salmonidae

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1386. Comparative effects of sheep and cattle grazing on an anadromous fish stream in central Idaho.

May, B. E. and Somes, W. L.

In: *Proceedings of the Annual Conference of the Western Association of Fish and Wildlife Agencies*. Las Vegas, Nevada; Vol. 62; pp. 490-500; 1982.

NAL Call #: SK351.W47

Descriptors: habitat alterations/ grazing/ management/ research: rivers and streams/ riparian habitat/ Idaho

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1387. A comparison of single-cell and multicell culverts for stream crossings.

Wargo, R. S. and Weisman, R. N.

Journal of the American Water Resources Association 42(4): 989-995. (2006)

NAL Call #: GB651.W315; ISSN: 1093474X

Descriptors: aggradation/ backwater/ bankfull/ culverts/ erosion/ fish passage/ floodplain/ perching/ rivers/ streams/ scour/ sediment transport/ stream restoration

Abstract: Single-barrel culverts are a common means of roadway crossings for smaller streams. While this culvert design provides an economical solution for a crossing, the adverse effects of conveying the stream through a single opening can be far reaching. The single-barrel culvert is typically sized for a design storm much greater than the channel forming discharge. This oversizing causes an interruption of the normal flow patterns and sediment transport for the system. Shallow depths at low flow in the pipe and perching at the outlet can impede fish passage. Multicell culverts (where the main culvert at the channel invert is sized for bankfull discharge, and additional pipes are placed at the floodplain elevation to convey overbank flow up to the design discharge) have been recommended as a best management practice to minimize erosion and improve fish passage. This flume study scaled a prototype

single-barrel culvert to both a single-cell model, and a multicell design to compare outlet scour and flow depths within the culvert. The results provide designers and planners with evidence of the benefits of multicell culverts to justify the higher cost of installation compared to single-barrel culverts.

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1388. A comparison of the areal extent of fish habitat gains and losses associated with selected compensation projects in Canada.

Harper, D. J. and Quigley, J. T.

Fisheries 30(2): 18-25. (2005)

NAL Call #: SH1.F54; ISSN: 03632415

Descriptors: aquatic habitat/ fish/ no net loss/ performance/ policy tools/ Canada

Abstract: We conducted a review of studies that evaluated the effectiveness of fish habitat compensation projects in achieving the conservation goal of no net loss of productive capacity of fish habitat in Canada. Combined, the 103 compensation projects assessed in the 10 studies created and/or restored 493,205 m² of fish habitat to offset habitat impacts totalling 1,142,648 m². Most of the compensation projects assessed were a result of impacts to estuarine and riverine in-channel habitats. Forestry and urban development activities resulted in the greatest percentage of compensation projects. Overall, 64% of the projects were deemed to have achieved no net loss. Fifty percent of the projects had a compensation ratio (compensation area:impacted area) of less than 1:1. The small number of studies found in the literature suggests that performance evaluations are rarely conducted, limiting our ability to practice adaptive management. We advocate that a national monitoring program be developed through which the achievement of no net loss can be assessed on an ongoing basis.

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1389. Comparison of two methods of habitat rehabilitation for brown trout in a southeast Minnesota stream.

Thorn, W. C. and Anderson, C. S.

Minnesota Department of Natural Resources(488)(2001).

Notes: Project Number: MN F-026-R/Study 689

[Unpublished Fish Report].

Descriptors: habitat management for fish/ trout, brown/ rehabilitation/ streams/ techniques/ cover/ shores and banks/ habitat changes/ size/ abundance/ standing crop/ Minnesota/ Salmo/ Salmonidae/ Salmo trutta

Abstract: Habitat rehabilitation with overhead bank cover and woody debris for brown trout under a no-kill regulation was evaluated in two reaches of Hay Creek.

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1390. Concentrations of faecal coliform bacteria in Prince Edward Island headwater streams: An interim report.

Adams, J. D.

In: *Effects of land use practices on fish, shellfish, and their habitats on Prince Edward Island.*, Canadian Manuscript Report of Fisheries and Aquatic Sciences 2408; Charlottetown, Prince Edward Island: Canadian Department of Fisheries and Oceans, 2002. 121-141.

Descriptors: agricultural pollution/ bacterial/ excretory

products/ organic wastes/ water pollution/ Canada, Prince Edward Island

Abstract: This project measured faecal coliform (FC) levels in headwater streams of Prince Edward Island in July-November 1998 and May-October 1999. Potential FC bacteria contributors at study sites included cattle, sheep, geese, and humans. Water and sediment (1998 only) samples were taken upstream and downstream of potential FC contributors. There was a significant positive correlation between wet-days and FC concentrations in water, suggesting that runoff or resuspension contributes to increased FC levels. All the cattle and sheep access sites showed a significant increase of FC downstream from the livestock. The site with a forested buffer zone which had cattle fenced out of the stream showed no difference in FC concentrations between upstream and downstream sampling points. The waterfowl site, consisting of a stream that runs through two ponds, provided evidence that high numbers of geese had a significant effect on FC concentrations. Results from this site also suggested that ponds can act as filters or buffers for FC concentrations. Water samples from the stream exiting the upper pond showed significantly lower FC concentrations than water samples taken upstream of the pond. Additional sites were sampled in the 1999 field season. The two 1999 cattle access sites showed significant increases in FC concentrations at downstream sampling sites, and the 1999 cattle fenced site showed no change in bacteria levels between upstream and downstream points. A site added in the 1999 field season provided a reference on what levels of FC to expect naturally since the stream occurred primarily in a forested area without other influences. Several upstream locations in which there was no agricultural or anthropogenic activity also showed low FC levels.

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1391. Conflicts between people and fish for water: Two British Columbia salmon and steelhead rearing streams in need of flows.

Rosenau, M. and Angelo, M.
Vancouver, BC: Pacific Fisheries Resource Conservation Council, 2003.
http://www.fish.bc.ca/files/ConflictsPeopleFish_2003_0_Complete.pdf

Descriptors: environmental effects/ habitat/ habitat improvement/ legislation/ salmon fisheries/ water/ Oncorhynchus/ Canada, British Columbia/ Canada, British Columbia, Englishman R./ Canada, British Columbia, Nicola R./ Canada, British Columbia, Thompson R.

Abstract: The amount of water flowing in a stream during the spawning, incubation and early life stages of salmon and steelhead is crucial to their health and survival. The freshwater rearing phase for all species of salmon requires the maintenance of the quality and quantity of water in terms of temperature, nutrition and spatial requirements and these parameters are affected by flow. Low flows can impact on salmon and steelhead rearing by reducing habitat capacity and availability for young fish as well as stressing or killing adult and young fish through increased summer water temperatures. Lowered flows can interrupt the passage of adult and juvenile fish to spawning and rearing areas. The extraction of water from streams and lakes has undermined the production of salmon and steelhead in a number of high-profile British Columbia

watersheds. Increasing human settlement throughout the past century has led to unprecedented demands for water for industrial, agricultural and domestic purposes. Indeed, it is the opinion of various fisheries professionals that the over-abstraction of water may have contributed to the decline of some southern-interior coho salmon stocks to the point that they have now been listed by the Committee on the Status of Endangered Wildlife in Canada. The withdrawal of water for an array of purposes has also adversely affected some east-coast Vancouver Island steelhead populations that were already in a crisis state.
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1392. Cost effectiveness of vegetative filter strips and instream half-logs for ecological restoration.

Frimpong, E. A.; Lee, J. G.; and Sutton, T. M.
Journal of the American Water Resources Association 42(5): 1349-1361. (Oct. 2006)
NAL Call #: GB651.W315

Descriptors: ecological restoration/ cost effectiveness/ cost analysis/ streams/ riparian buffers/ riparian forests/ logs/ water pollution/ pollution control/ wildlife habitats/ agricultural watersheds/ watershed management/ Indiana/ pollution/ land resources/ forestry related

Abstract: This paper presents the results of cost effectiveness (CE) analysis of vegetative filter strips (VFS) and instream half-logs as tools for recovering scores on a fish Index of Biotic Integrity (IBI) in the upper Wabash River watershed (UW) in Indiana. Three assumptions were made about recovery time for IBI scores (5, 15, and 30 years) and social discount rates (1, 3, and 5 percent), which were tested for sensitivity of the estimated CE ratios. Effectiveness of VFS was estimated using fish IBIs and riparian forest cover from 49 first-order to fifth-order stream reaches. Half-log structures had been installed for approximately two years in the UW prior to the study and provided a basis for estimates of cost and maintenance. Cost effectiveness ratios for VFS decreased from \$387 to \$277 per 100 m for a 1 percent increase in IBI scores from first- to fifth-order streams with 3 percent discount and 30-year recovery. This cost weighted by proportion of stream orders was \$360. The ratio decreased with decreasing time of recovery and discount rate. Based on installation costs and an assumption of equal recovery rates, half-logs were two-thirds to one-half as cost-effective as VFS. Half-logs would be a cost-effective supplement to VFS in low order streams if they can be proven to recover IBI scores faster than VFS do. This study provides baseline data and a framework for planning and determining the cost of stream restoration.

This citation is from AGRICOLA.

1393. The development and historic use of habitat structures in channel restoration in the United States: The grand experiment in fisheries management.

Thompson, D. M. and Stull, G. N.
Geographie Physique et Quaternaire 56(1): 45-60. (2002).
<http://www.erudit.org/revue/gpq/2002/v56/n1/008604ar.pdf>
Descriptors: channels/ fisheries/ fishery management/ habitats/ history

Abstract: The use of instream structures to modify aquatic habitat has a long history in the USA. Pioneering work by wealthy landowners in the Catskills region of New York produced a range of designs in the decades preceding the Great Depression in an effort to replenish fish populations

depleted from overfishing. The scientific evaluation of structures began in 1930. Within two years, a Michigan research team claimed improved fish populations. Cheap labour and government-sponsored conservation projects spearheaded by the Civilian Conservation Corps allowed the widespread adoption of the techniques in the 1930s, before adequate testing of the long-term impact of the devices. The start of World War II temporarily ended the government conservation efforts and prevented the continued evaluation of structures. During the 1940s, 1950s and 1960s, designs of instream structures remained essentially unchanged. Meanwhile, the small number of evaluations of the impact of the structures often were flawed. The continued use of early designs of instream structures helped instill a false belief that instream structures were proven to be a benefit to fish. Even modern use of instream structures continues to rely on the basic blueprints developed in the Catskills, despite documented problems with the use of these designs.
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1394. Do conservation practices and programs benefit the intended resource concern?

Westra, J. V.; Zimmerman, J. K. H.; and Vondracek, B. *Agricultural and Resource Economics Review* 33(1): 105-120. (2004)
NAL Call #: HD1773.A2N6; ISSN: 10682805
Descriptors: agricultural drainage and pesticide transport model (ADAPT)/ Conservation Reserve Program (CRP)/ Conservation Security Program (CSP)/ fisheries/ green payments/ water quality
Abstract: Many conservation programs under the 2002 Farm Act address resource concerns such as water quality and aquatic communities in streams. Analyzing two such programs, simulated changes in agricultural practices decreased field-edge sediment losses by 25-31 % in two geophysically distinct Minnesota watersheds. However, while in-stream sediment concentrations and lethal fisheries events decreased significantly in one watershed, there was no discernable improvement for the fisheries in the other, despite potentially spending over \$100,000 annually in conservation payments. These results highlight the importance of performance-based conservation payments targeted to genuine resource concerns in watersheds and the value of integrated bioeconomic modeling of conservation programs.
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1395. Ecological responses to trout habitat rehabilitation in a northern Michigan stream.

Rosi-Marshall, Emma J.; Moerke, Ashley H.; and Lamberti, Gary A. *Environmental Management* (2006)
NAL Call #: HC79.E5E5 ; ISSN: 0364-152X
Descriptors: animals/ fisheries/ fishes [physiology]/ invertebrates [physiology]/ Michigan/ population dynamics/ [methods]/ ecosystem/ trout [physiology]
Abstract: Monitoring of stream restoration projects is often limited and success often focuses on a single taxon (e.g., salmonids), even though other aspects of stream structure and function may also respond to restoration activities. The Ottawa National Forest (ONF), Michigan, conducted a site-specific trout habitat improvement to enhance the trout fishery in Cook's Run, a 3rd-order stream that the ONF determined was negatively affected by past logging. Our

objectives were to determine if the habitat improvement increased trout abundances and enhanced other ecological variables (overall habitat quality, organic matter retention, seston concentration, periphyton abundance, sediment organic matter content, and macroinvertebrate abundance and diversity) following rehabilitation. The addition of skybooms (underbank cover structures) and k-dams (pool-creating structures) increased the relative abundance of harvestable trout (>25 cm in total length) as intended but not overall trout abundances. Both rehabilitation techniques also increased maximum channel depth and organic matter retention, but only k-dams increased overall habitat quality. Neither approach significantly affected other ecological variables. The modest ecological response to this habitat improvement likely occurred because the system was not severely degraded beforehand, and thus small, local changes in habitat did not measurably affect most physical and ecological variables measured. However, increases in habitat volume and in organic matter retention may enhance stream biota in the long term.
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1396. Effect of animal grazing on water quality of nonpoint runoff in the Pacific Northwest.

Saxton, K. E.; Elliott, L. F.; Papendick, R. I.; Jawson, M. D.; and Fortier, D. H. Ada, Okla.: United States Environmental Protection Agency Research and Development, 1983. 7 p.
Notes: EPA 600/S2-83/071.
NAL Call #: TD223.7.E442 1983
Descriptors: Pacific Northwest/ freshwater environment/ impact of agriculture/ cattle/ grazing/ erosion/ sedimentation/ water quality/ management/ manure/ indicator bacteria/ freshwater environment/ impact of forestry or agriculture/ policy, management, education or information
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1397. The effect of forest type on benthic macroinvertebrate structure and ecological function in a pine plantation in the North Carolina Piedmont.

Goodman, Keli J.; Hershey, Anne E.; and Fortino, Kenneth *Hydrobiologia* 559: 305-318. (2006)
NAL Call #: 410 H992; ISSN: 0018-8158
Descriptors: ecology/ trophic structure/ freshwater habitat/ lotic water/ terrestrial habitat/ land zones/ Macroinvertebrata: food webs/ stream benthic community trophic function/ effect of forest type/ community structure/ stream benthic community/ stream/ benthic community structure and trophic function/ forest and woodland/ forest type effect on stream benthic community structure and trophic function/ North Carolina/ Tar Pamlico River Basin/ stream benthic community structure and trophic function/ invertebrates
Abstract: We examined the impact of small-scale commercial forestry on the structure and function of 6 headwater streams in the North Carolina Piedmont. During 2001-2003 terrestrial organic matter inputs, temperature, macroinvertebrate community composition and tolerance, leaf breakdown rate, and food web structure were quantified for 2 streams draining mature stands of managed loblolly pine, 2 streams draining mature hardwood forests, and 2 streams draining 3-year-old clear cuts, which had been replanted with loblolly pine. Streams in the clear-cuts and pine plantations were bordered by a 15 m hardwood

buffer. Despite differences in watershed land-use, there were no significant differences in the organic matter supply or temperature between streams draining different forest types. However, algal biomass was significantly higher in clear-cut sites than forested sites, and was also higher in hardwood sites than pine sites. Streams draining the clear-cut sites contained lower macroinvertebrate richness and diversity, and fewer intolerant species, than streams draining pine and hardwood stands. Despite the differences in macroinvertebrates community composition, there was no difference among forest types in leaf-pack breakdown rates. Analysis of $\Delta^{15}\text{N}$ and $\Delta^{13}\text{C}$ natural abundance of functional feeding group indicated that the shredders and predators collected from streams draining clear-cuts had a $\Delta^{15}\text{N}$ value that was enriched relative to the macroinvertebrates of streams draining pine and hardwood forests. This difference in $\Delta^{15}\text{N}$ signature appears to be the result of the incorporation of riparian grass species in the clear-cuts, which have a higher $\Delta^{15}\text{N}$, into the diet of shredders. Pine sites had similar food webs to natural hardwood sites. Our results suggest that clear-cutting changes both the trophic dynamics and macroinvertebrate composition of low-order Piedmont streams in North Carolina despite the presence of hardwood buffers. However, large differences were not found between older pine and hardwood stands, indicating rapid recovery following re-growth of forest vegetation, when hardwood buffer strips were present.

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1398. Effect of streambank fencing on herpetofauna in pasture stream zones.

Homyack, J. D. and Giuliano, W. M.

Wildlife Society Bulletin 30(2): 361-369. (2002)

NAL Call #: SK357.A1W5; ISSN: 0091-7648

Descriptors: riparian environments/ range management/ species richness/ abundance/ biomass/ herpetofauna/ ecosystem management/ ecosystem disturbance/ agriculture/ population density/ community composition/ species diversity/ riparian vegetation/ water quality/ animal populations/ man-induced effects/ stream banks/ ecology/ amphibians/ *Regina septemvittata*/ *Thamnophis sirtalis*/ *Amphibia*/ *Reptilia*/ queen snake/ common garter snake/ reptiles/ streambank fencing/ livestock grazing

Abstract: Grazing livestock in streams and associated riparian zones may negatively impact a variety of wildlife through direct disturbance and alteration of environmental conditions. To evaluate streambank fencing as a management tool, we measured the richness, abundance, and biomass of reptile and amphibian species on 10 grazed streams and associated riparian areas and 10 similar areas that were recently fenced (1-2 yrs) to exclude livestock, during spring and summer of 1998 and 1999. Effects of streambank fencing on vegetation, water quality, and macroinvertebrate populations also were examined because livestock grazing may indirectly impact communities of herpetofauna through their influence on these factors. We found no difference in species richness, abundance of all species combined, or biomass of herpetofauna between fenced and unfenced streams. However, northern queen snakes (*Regina septemvittata*) and eastern garter snakes (*Thamnophis sirtalis*) were more abundant on fenced than unfenced sites. Percent litter cover and vertical obstruction were higher on fenced sites, terrestrial macroinvertebrate biomass was greater on

unfenced sites, and water-quality variables did not differ between site types. Although some species (e.g., birds) responded quickly (<4 yrs) to streambank fencing, it appeared that herpetofauna might require a longer recovery time (>4 yrs). The length of time since livestock were excluded, dispersal ability, reproductive potential, and distance to the nearest remnant population may be important factors in reptile and amphibian recovery in grazed stream and riparian zones.

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1399. The effect of variable-retention riparian buffer zones on water temperatures in small headwater streams in sub-boreal forest ecosystems of British Columbia.

Macdonald, J. S.; MacIsaac, E. A.; and Herunter, H. E.

Canadian Journal of Forest Research 33(8):

1371-1382. (2003)

NAL Call #: SD13.C35; ISSN: 00455067.

Notes: doi: 10.1139/x03-015.

Descriptors: Harvesting/ Insect control/ thermal effects/ forest harvesting/ stream flow/ boreal forest/ buffer zone/ forest management/ harvesting/ riparian zone/ stream/ water temperature/ Canada

Abstract: Stream temperature impacts resulting from forest harvesting in riparian areas have been documented in a number of locations in North America. As part of the Stuart-Takla Fisheries-Forestry Interaction Project, we have investigated the influence of three variable-retention riparian harvesting prescriptions on temperatures in first-order streams in the interior sub-boreal forests of northern British Columbia. Prescriptions were designed to represent a range of possible harvesting options outlined by the Forest Practices Code of B.C., or associated best management practice guidelines. Five years after the completion of harvesting treatments, temperatures remained four to six degrees warmer, and diurnal temperature variation remained higher than in the control streams regardless of treatment. Initially, the high-retention treatment acted to mitigate the temperature effects of the harvesting, but 3 successive years of windthrow was antecedent to reduced canopy density and equivalent temperature impacts. We speculate that late autumn reversals in the impacts of forest harvesting also occur. Temperature impacts in this study remained within the tolerance limits of local biota. However, even modest temperature changes could alter insect production, egg incubation, fish rearing, migration timing, and susceptibility to disease, and the effects of large changes to daily temperature range are not well understood.

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1400. Effect of woody riparian patches in croplands on stream macroinvertebrates.

Wooster, D. E. and DeBano, S. J.

Archiv fur Hydrobiologie 165(2): 241-268. (2006);

ISSN: 00039136.

Notes: doi: 10.1127/0003-9136/2006/0165-0241.

Descriptors: agricultural landscapes/ aquatic macroinvertebrates/ patch size/ riparian buffers/ woody riparian vegetation

Abstract: Woody riparian vegetation plays important roles in stream ecosystems and its presence can have strong impacts on stream fauna. Agricultural practices have led to the removal and fragmentation of woody riparian vegetation

in many watersheds. It is unclear whether small, isolated patches of woody riparian vegetation continue to exert important influences on stream fauna. The impact of these types of patches and the influence of the size of the patches on stream macroinvertebrates was examined in a watershed in northeastern Oregon that is dominated by dryland wheat production. Half of the study reaches flowed through patches of woody riparian vegetation and half flowed through areas in which there was no woody vegetation and wheat fields were found within 3m of the stream. Stream reaches flowing through patches of woody riparian vegetation had higher taxa richness than those flowing through areas lacking woody vegetation. Size of woody patches, as measured by patch length, was positively correlated with shredder abundance, scraper abundance and diversity, and was also correlated with overall community composition as defined by ordination scores. An analysis of individual taxa revealed that patch length was positively associated with nine taxa that are known to be sensitive to human disturbances and negatively associated with one taxon which is considered tolerant of human disturbances. Patch length was also negatively associated with the proportion of sediment on the substrate and it appears that this environmental factor might drive the relationships between patch length and the abundance of the ten taxa. Woody riparian patch width was also examined as a measure of size. In contrast to length, patch width was not correlated with any metric of macroinvertebrate community structure. The results of this study also revealed that macroinvertebrate community structure was influenced by the drainage the study sites were found in. This was unexpected because the study was conducted in a small watershed and the sites within each drainage were specifically chosen to be similar in land use and geology. These results indicate that patch length may be as important, if not more important, than patch width in influencing stream ecosystems. However, the "buffer" literature generally considers only buffer width when examining the relationship between patch size and stream systems. This study highlights the need to consider patch length, as well as width, in studies examining the effect of patches of riparian vegetation on stream fauna, in the design of buffer projects, and in the monitoring of existing project effectiveness. © 2006 E. Schweizerbart'sche Verlagsbuchhandlung. © 2008 Elsevier B.V. All rights reserved.

1401. Effectiveness of best management practices in improving stream ecosystem quality.

Yates, A. G.; Bailey, R. C.; and Schwindt, J. A.

Hydrobiologia 583(1): 331-344. (2007)

NAL Call #: 410 H992; ISSN: 00188158.

Notes: doi: 10.1007/s10750-007-0619-4.

Descriptors: micro-basin scale/ agriculture/ best management practices/ BMPs/ stream agroecosystems/ stream quality

Abstract: Implementation of best management practices (BMPs), such as improved manure storage, buffer strips, and grassed waterways, through government funded conservation programs is a common approach for mitigation of the impacts agricultural activities have on the surrounding environment. In this study, we tested the ability of these practices to meet the environmental goal of improved stream quality at a "micro-basin" scale in the Upper Thames River Watershed, southern Ontario,

Canada. Micro-basins were first and second order basins, averaging 400 ha in area, representing gradients of land cover, geomorphology, and participation in conservation programs. At the outflow of each micro-basin the benthic macro-invertebrate community was sampled, water chemistry measurements completed, and habitat quality assessed. Results showed micro-basins with relatively high levels of BMP implementation consistently demonstrated improved stream ecosystem quality over the majority of micro-basins with low or no implementation. Streams in the Upper Thames River basin appeared to exhibit a threshold effect, where with several BMPs in the same basin an improvement in stream ecosystem quality is visible. In addition to the BMPs implemented through government funded conservation programs, the observed ecosystem improvements are probably due to increased environmental awareness and improved management by farmers. © 2007 Springer Science+Business Media B.V. © 2008 Elsevier B.V. All rights reserved.

1402. Effectiveness of forestry streamside management zones in the sand-clay hills of Mississippi: Early indications.

Carroll, G. D.; Schoenholtz, S. H.; Young, B. W.; and Dibble, E. D.

Water, Air, and Soil Pollution: Focus 4(1): 275-296. (2004); ISSN: 15677230.

Notes: doi: 10.1023/B:WAFO.0000012813.94538.c8.

Descriptors: aquatic macroinvertebrates/ best management practices/ BMPs/ forest management/ logging/ stream habitat/ water quality

Abstract: During the past decade, compliance with initiatives to promote forestry best management practices (BMPs) has been monitored in most states of the southern U.S. and suggests an excellent level of acceptance throughout the region. However, effectiveness of these practices to protect water quality and aquatic habitat in streams that are potentially impacted by forest management activities has not been as thoroughly documented as the degree of compliance. The objective of this study was to determine effectiveness of streamside management zones (SMZs), a key element of BMPs designed for protection of water quality, aquatic habitat, and macroinvertebrate communities, in low-order streams within a region of north central Mississippi that is subjected to intensive forest management. Three SMZ treatments (undisturbed reference, clear-cut logging with an SMZ designated by forest managers, or clear-cut logging with no SMZ) were evaluated using a study with three replications of each treatment. Response metrics including water quality parameters, mineral soil exposure and net deposition/erosion within riparian zones, stream habitat indicators, and aquatic macroinvertebrate communities were comparable between streams receiving SMZs and undisturbed reference streams at all sampling intervals during the first year after treatment. Furthermore, significant elevation of streamwater temperature, decline in habitat stability rating, and increase in density of macroinvertebrates occurring in streams without an SMZ in comparison to reference streams provides additional evidence of SMZ effectiveness during the initial year after harvesting. © 2004 Kluwer Academic Publishers. © 2008 Elsevier B.V. All rights reserved.

1403. Effectiveness of habitat manipulation for wild salmonids in Wyoming streams.

Binns, N. Allen

North American Journal of Fisheries Management 24(3): 911-921. (2004)

NAL Call #: SH219.N66 ; ISSN: 0275-5947

Descriptors: conservation measures/ ecology/ population dynamics/ habitat/ freshwater habitat/ lotic water/ land zones/ Salmonidae: habitat management/ streams/ effectiveness of habitat manipulation/ biomass/ population density/ stream/ Wyoming/ Pisces, Actinopterygii, Salmoniformes/ chordates/ fish/ vertebrates

Abstract: Habitat manipulation is commonly used to enhance habitat and stocks of fluvial trout of the genera *Oncorhynchus*, *Salmo*, and *Salvelinus*, but questions have been raised about the effectiveness of such work.

Consequently, I analyzed wild trout abundance, biomass, and habitat before and after habitat manipulations among 30 projects done by the Wyoming Game and Fish Department. Abundance and biomass of trout increased following habitat manipulation among most of the projects. Excessive angler harvest prevented an increase at three projects, and drought hindered fish response in a fourth stream. At a fifth project, the trout population decreased after intense cattle grazing degraded project structures. Instream structures proved durable. Only one project, which featured wire trash catchers in a fourth-order mountain stream, suffered failure of habitat manipulation devices. Cover for trout and residual pool depth significantly increased following projects, whereas eroding banks significantly decreased. Both timber and log check dams consistently produced good pools, but rock check dams did not. Mean per project cost statewide was US\$39,230/mi. These results demonstrate that well-built, properly located, and properly maintained instream structures can provide better habitat and increase stocks of trout in carefully selected reaches, thus satisfying public and agency expectations for fishery improvement and gaining time to correct watershed problems.

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1404. Effectiveness of isolated pipeline crossing techniques to mitigate sediment impacts on brook trout streams.

Reid, S. M.; Stoklosar, S.; Metikosh, S.; and Evans, J.

Water Quality Research Journal of Canada 37(2): 473-488. (2002); ISSN: 1201-3080

Descriptors: aquatic communities/ dams/ environmental impact/ geological sedimentation/ habitat destruction/ habitats/ pipelines/ pumps/ riparian vegetation/ sediment/ streams/ suspended solids/ fishes/ *Salvelinus fontinalis*/ trout

Abstract: Stream populations of brook trout (*Salvelinus fontinalis*) are sensitive to sediment-caused changes to habitat, i.e., increased embeddedness of bed material. The use of watercourse crossing techniques (dam and pump, and flume methods) that isolate the construction site by diverting flow around the crossing has often been promoted as a means of controlling the amount of sediment released, particularly for those watercourses with sensitive fish species or habitats. However, few case studies have evaluated the effectiveness of isolated crossing construction techniques to mitigate the effects of instream construction activities. We measured suspended sediment

concentrations during six isolated pipeline crossings of brook trout streams in Minnesota (USA), Nova Scotia and Ontario (Canada). In addition, sediment deposition rates, riffle habitats and fish abundance were monitored upstream and downstream of four of the crossings. Results of monitoring studies indicated that isolated techniques can be very effective at: (i) minimizing increases to downstream suspended sediment concentrations during instream construction; and, (ii) preventing sediment-induced effects on habitat and fish abundance downstream of pipeline water crossings. For sensitive watercourses, isolated crossing techniques are an effective alternative to trenchless crossing techniques (e.g., horizontal directional drilling).

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1405. Effects of an agricultural drainwater bypass on fishes inhabiting the grassland water district and the lower San Joaquin River, California.

Saiki, M. K.; Martin, V. A.; Schwarzbach, S. E.; and May, T. W.

North American Journal of Fisheries Management 21(3): 624-635. (2001)

NAL Call #: SH219.N66; ISSN: 1548-8675

Descriptors: grassland water district/ Lower San Joaquin River map/ California/ agricultural drainwater bypass/ freshwater fish/ community structure/ abundance/ selenium concentration/ environmental factors/ abiotic factors/ water quality/ forestry/ physiology, biology, biochemistry/ ecology and conservation

Abstract: The Grassland Bypass Project, which began operation in September 1996, was conceived as a means of diverting brackish selenium-contaminated agricultural drainwater away from canals and sloughs needed for transporting irrigation water to wetlands within the Grassland Water District (the Grasslands), Merced County, California. The seleniferous drainwater is now routed into the San Luis Drain for conveyance to North Mud Slough and eventual disposal in the San Joaquin River. The purpose of this study was to determine the extent to which the Grassland Bypass Project has affected fishes in sloughs and other surface waters within and downstream from the Grasslands. During September-October 1997, 9,795 fish representing 25 species were captured at 13 sampling sites. Although several species exhibited restricted spatial distributions, association analysis and cluster analysis failed to identify more than one fish species assemblage inhabiting the various sites. However, seleniferous drainwater from the San Luis Drain has influenced selenium concentrations in whole fish within North Mud Slough and the San Joaquin River. The highest concentrations of selenium (12-23 µg/g, dry weight basis) were measured in green sunfish *Lepomis cyanellus* from the San Luis Drain where seleniferous drainwater is most concentrated, whereas the second highest concentrations occurred in green sunfish (7.6-17 µg/g) and bluegills *Lepomis macrochirus* (14-18 µg/g) from North Mud Slough immediately downstream from the drain. Although there was some variation, fish in the San Joaquin River generally contained higher body burdens of selenium when captured immediately below the mouth of North Mud Slough (3.1-4.9 µg/g for green sunfish, 3.7-5.0 µg/g for bluegills) than when captured upstream from the mouth (0.67-3.3 µg/g for green sunfish, 0.59-3.7 µg/g for bluegills). Waterborne selenium

was the single most important predictor of selenium concentrations in green sunfish and bluegills, as judged by results from multiple-regression analyses. Among bluegills, water temperature also contributed to the prediction of selenium body burdens.

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1406. Effects of conservation practices on aquatic habitats and fauna.

Knight, Scott S. and Boyer, Kathryn L.

In: Fish and Wildlife Response to Farm Bill Conservation Practices; Bethesda, MD: The Wildlife Society, 2007. 19 pp. <ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwfb7.pdf>

Descriptors: aquatic environment/ surface water/ aquatic habitat/ conservation practices/ terrestrial habitat/ wildlife species/ watershed management/ wildlife management

Abstract: This paper examines the effects of NRCS-defined conservation practices used as conservation measures for aquatic species and their habitats. A major goal of both state and federal agricultural and environmental agencies in the United States is sustainable management of watersheds where agriculture is a dominant land use. Because watershed processes and conditions directly and indirectly affect soil, water, air, plants, animals, and humans, USDA NRCS encourages a watershed approach to management of agricultural operations in the United States. This requires a suite of approaches or practices that address natural resource concerns in uplands and stream corridors. Land clearing, leveling, draining, tilling, fertilizing, and harvesting together create prolonged perturbations manifested in the ecological and physical conditions of streams and rivers. Regardless of the cause of a problem in a watershed, its effect on aquatic habitats and their biological communities is dramatic. Physical damage due to channelization, erosion, sedimentation, and altered hydrological regimes coupled with ecological damage due to excessive nutrients, pesticide contamination, and riparian clearing cumulatively diminish the quality of aquatic habitats and threaten their biological communities. In general, the primary goals for farmers and ranchers in agricultural watersheds are (a) control of non-point source pollutants such as nutrients, sediments, and pesticides, (b) adequate water supplies for crop and animal production, and (c) stream/river channel stability. As indicators of watershed conditions, aquatic species and their habitats play a pivotal role in how we manage watersheds, with the ultimate goal of sustaining water quality and ecological integrity. Conservation planning identifies resource concerns within watersheds and what practices should be implemented to address them. If such practices are applied according to USDA standards, habitats will benefit as will the species that inhabit them.

1407. Effects of gravel augmentation on macroinvertebrate assemblages in a regulated California river.

Merz, J. E. and Chan, L. K.

River Research and Applications 21(1): 61-74. (2005)

NAL Call #: TC530.R43 ; ISSN: 15351459.

Notes: doi: 10.1002/rra.819.

Descriptors: biomass/ gravel/ macroinvertebrates/ physical habitat/ river enhancement/ salmon/ spawning/ species diversity/ biomass/ gravel bed stream/ macroinvertebrate/ salmonid/ spawning/ species diversity/ California/

Mokelumne River/ *Oncorhynchus mykiss*/ Salmonidae

Abstract: Enhancement projects within anadromous salmonid rivers of California have increased in recent years. Much of this work is intended as mitigation in regulated streams where salmon and steelhead spawning habitat is inaccessible or degraded due to dams, water diversions and channelization. Little research has been done to assess the benefits of spawning habitat enhancement to stream organisms other than salmon. We monitored benthic macroinvertebrates at seven spawning gravel augmentation sites in the lower Mokelumne River, a regulated stream in the Central Valley of California. Placement of cleaned floodplain gravel decreased depths and increased stream velocities. Benthic organisms colonized new gravels quickly, equalling densities and biomass of unenhanced spawning sites within 4 weeks. Macroinvertebrate species richness equalled that of unenhanced sites within 4 weeks and diversity within 2 weeks. Standing crop, as indicated by densities and dry biomass, was significantly higher in enhancement sites after 12 weeks than in unenhanced sites and remained so over the following 10 weeks. Although mobile collector/browsers initially dominated new gravels, sedentary collectors were the most common feeding category after 4 weeks, similar to unenhanced sites. These data suggest that cleaned gravels from adjacent floodplain materials, used to enhance salmonid spawning sites, are quickly incorporated into the stream ecosystem, benefiting benthic macroinvertebrate densities and dry biomass.

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1408. Effects of grazing management on streambanks.

Bohn, C. C. and Buckhouse, J. C.

Transactions of the North American Wildlife and Natural Resource Conference 51: 265-271. (1986)

NAL Call #: 412.9 N814; ISSN: 0078-1355

Descriptors: Cervus/ livestock/ *Odocoileus hemionus*/ runoff/ stocking rate/ streams/ wildlife management/ Oregon

This citation is from AGRICOLA.

1409. Effects of habitat disturbance on stream salamanders: Implications for buffer zones and watershed management.

Willson J. D. and Dorcas M. E.

Conservation Biology 17(3): 763-771. (June 2003)

NAL Call #: QH75.A1C5

Descriptors: salamanders/ riparian buffers/ North Carolina/ habitat management

Abstract: With human populations increasing worldwide, habitat destruction and degradation are among the greatest threats facing wildlife. To minimize the impacts of development on aquatic habitats, numerous conservation measures have been implemented, including the use of riparian buffer zones along streams and rivers. We examined the effectiveness of current buffer-zone systems for management of small watersheds in conserving stream-dwelling salamander populations in 10 small streams (draining <40.5 ha) in the western Piedmont of North Carolina. We captured salamanders by means of funnel traps and systematic dipnetting and used a geographic information system to calculate the percentage of disturbed habitat within the watershed of each stream and within 10.7-, 30.5-, and 61.0 -m buffer zones around each stream, upstream from our sampling locations. Although the relative

abundance of salamanders was strongly inversely proportional to the percentage of disturbed habitat in the entire watersheds ($R^2 = 0.71$ for *Desmognathus fuscus* and 0.48 for *Eurycea cirrigera*), we found little to no correlation between the relative abundance of salamanders and the percentage of disturbed habitat present within buffer zones ($R^2 = 0.06-0.27$ for *D. fuscus* and $0.01-0.07$ for *E. cirrigera*). Thus, conservation efforts aimed at preserving salamander populations in headwater streams must consider land use throughout entire watersheds, rather than just preserving small riparian buffer zones.

1410. Effects of livestock grazing enclosure on aquatic macroinvertebrates in a montane stream New Mexico.

Rinne, J. N.

Great Basin Naturalist 48(2): 146-153. (1988)

NAL Call #: 410 G79; ISSN: 0017-3614

Descriptors: mammal/ biomass/ habitat/ watershed/ population density/ chi square

Abstract: Aquatic macroinvertebrate populations inhabiting reaches of a stream within areas excluded from livestock grazing for a decade were markedly different from those in grazed areas when density, biomass, biotic condition indices, and mean chi square indices of the two populations were compared. Increased densities and biomasses of more tolerant forms of macroinvertebrates were observed in grazed reaches. Because pretreatment data were not available, differences in macroinvertebrate populations and relative tolerances of taxa in grazed and ungrazed areas could be as easily attributed to linear changes in stream habitat as to removal of domestic livestock. Results of this study have implications for the design of future research on the effects of livestock grazing on stream environments and biota: (1) baseline/pretreatment information is prerequisite, and (2) the study should take a watershed (ecosystem) approach.

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1411. Effects of local land use on physical habitat, benthic macroinvertebrates, and fish in the Whitewater River, Minnesota, USA.

Nerbonne, B. A. and Vondracek, B.

Environmental Management 28(1): 87-99. (2001)

NAL Call #: HC79.E5E5; ISSN: 0364152X.

Notes: doi: 10.1007/s002670010209.

Descriptors: aquatic insects/ BMPs/ fish/ grass buffers/ physical habitat/ riparian areas/ stream theory/ wooded buffers/ farms/ rivers/ sedimentation/ watersheds/ soil losses/ land use/ benthic environment/ best management practices/ land use/ macroinvertebrates/ land use/ ecosystem/ fishes/ fresh water/ invertebrates/ United States

Abstract: Best management practices (BMPs) have been developed to address soil loss and the resulting sedimentation of streams, but information is lacking regarding their benefits to stream biota. We compared instream physical habitat and invertebrate and fish assemblages from farms with BMP to those from farms with conventional agricultural practices within the Whitewater River watershed of southeastern Minnesota, USA, in 1996 and 1997. Invertebrate assemblages were assessed using the US EPA's rapid bioassessment protocol (RBP), and fish assemblages were assessed with two indices of biotic integrity (BIs). Sites were classified by upland land use (BMP or conventional practices) and riparian management (grass, grazed, or wooded buffer). Physical habitat

characteristics differed across buffer types, but not upland land use, using an analysis of covariance, with buffer width and stream as covariates. Percent fines and embeddedness were negatively correlated with buffer width. Stream sites along grass buffers generally had significantly lower percent fines, embeddedness, and exposed streambank soil, but higher percent cover and overhanging vegetation when compared with sites that had grazed or wooded buffers. RBP and IBI scores were not significantly different across upland land use or riparian buffer type but did show several correlations with instream physical habitat variables. RBP and IBI scores were both negatively correlated with percent fines and embeddedness and positively correlated with width-to-depth ratio. The lack of difference in RBP or IBI scores across buffer types suggests that biotic indicators may not respond to local changes, that other factors not measured may be important, or that greater improvements in watershed condition are necessary for changes in biota to be apparent. Grass buffers may be a viable alternative for riparian management, especially if sedimentation and stream-bank stability are primary concerns.
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1412. Effects of riparian area management on stream habitat and fish communities in central and southwest Wisconsin.

Stephens, T. J. University of Wisconsin, Stevens Point, 2001.

Notes: Degree: M.S.

Descriptors: vegetation/ plant succession/ grasses/ shrubs/ statistics/ temperature, environment/ size/ cover/ Wisconsin

Abstract: Objectives were to: (1) evaluate how differences in riparian vegetation (well-managed grazing, ungrazed grass, early successional-shrub vegetation, and late successional-wooded vegetation) affect stream habitat and fish community characteristics among stream reaches; and (2) assess stream habitat quality and fish community characteristics among streams with different thermal regimes in two ecoregions of Wisconsin.

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1413. Effects of sedimentation and turbidity on lotic food webs: A concise review for natural resource managers.

Henley, W. F.; Patterson, M. A.; Neves, R. J.; and Lemly, A. D.

Reviews in Fisheries Science 8(2): 125-139. (2000); ISSN: 1064-1262

Descriptors: sediment load/ nephelometers/ trophic levels/ environmental impact/ ecosystem disturbance/ water quality control/ population dynamics/ food chains/ turbidity/ environment management/ zooplankton/ sedimentation/ mollusks/ fish/ insects/ watersheds/ suspended sediments/ monitoring/ streams/ habitat community studies/ mechanical and natural changes/ erosion and sedimentation

Abstract: Sedimentation and turbidity are significant contributors to declines in populations of North American aquatic organisms. Impacts to lotic fauna may be expressed through pervasive alterations in local food chains beginning at the primary trophic level. Decreases in primary production are associated with increases in sedimentation and turbidity and produce negative cascading effects through depleted food availability to

zooplankton, insects, freshwater mollusks, and fish. Direct effects at each trophic level are mortality, reduced physiological function, and avoidance; however, decreases in available food at trophic levels also result in depressed rates of growth, reproduction, and recruitment. Impacts of turbidity to aquatic organisms often seem inconsistent among watersheds and experiments, but this apparent difference is actually due to the lack of correlation between suspended sediment concentrations (mg/L) and units of measure (Nephelometric Turbidity Units, NTU). The use of NTU as a surrogate measurement of suspended sediment to predict biotic effects within watersheds is dubious. Similar NTU measurements from different watersheds may be correlated with different concentrations of suspended sediment. For monitoring the effects of turbidity within local watersheds, we recommend that the correlation between suspended sediment and NTUs be examined over a range of discharge recordings, and that this be used as a baseline to examine local effects. We recommend that riparian buffer strips and livestock fencing be used to reduce sediment input to streams.

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1414. Effects of silviculture using best management practices on stream macroinvertebrate communities in three ecoregions of Arkansas, USA.

McCord, S. B.; Grippo, R. S.; and Eagle, D. M. *Water, Air and Soil Pollution* 184(1-4): 299-311. (2007)
 NAL Call #: TD172.W36; ISSN: 00496979.
 Notes: doi: 10.1007/s11270-007-9417-x.

Descriptors: BACI study design/ Euclidean distance/ functional feeding groups/ logging/ best management practices/ BMPs/ streams/ macroinvertebrate communities

Abstract: We examined aquatic macroinvertebrate assemblages in six Arkansas low-order streams across three ecoregions. Samples were taken at locations above and below silviculture sites using Best Management Practices (BMPs) and were compared in winter and spring for 1 year prior to logging and 2 years after treatments. Implementation at all sites scored between 89 and 100% in compliance assessments using state BMP guidelines. Deficiencies were generally limited to engineering controls designed to prevent soil erosion; however, no clear evidence of sedimentation was observed in any of the study streams. Water quality variables were similar between sites upstream and downstream of the harvests in all survey periods. Analysis of variance did not indicate reduced taxonomic richness that could clearly be attributed to silviculture operations, but did reveal several significant differences in relative abundance variables that could be associated with negative impacts, primarily at a single site. Euclidean distance indicated that macroinvertebrate assemblage similarity between reference and treatment stations decreased after treatments at two additional study sites. At most sites, however, there was not an assemblage shift from organisms using coarse particulate organic matter as the primary food source to those using fine particulate organic matter downstream of the harvests. Our results indicated that BMPs were moderately to strongly effective in protecting water quality and biological integrity in five of the six study streams. © 2007 Springer Science+Business Media B.V.

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1415. Effects of streambank fencing of pasture land on benthic macroinvertebrates and the quality of surface water and shallow ground water in the Big Spring Run Basin of Mill Creek Watershed, Lancaster County, Pennsylvania, 1993-2001.

Galeone, D. G.; Brightbill, R. A.; Low, D. J.; and O'Brien, D. L. U.S. Geological Survey; United States Geological Survey Scientific Investigations Report no. 2006-5141, 2006. 197 pp.

<http://pubs.usgs.gov/sir/2006/5141/pdf/sir2006-5141.pdf>

Descriptors: channels/ ground water/ groundwater/ groundwater basins inland water environment/ pastures/ river basins/ stream pollution/ streams/ surface water/ surface-groundwater relations/ vegetation/ watersheds/ zoobenthos/ Iowa, Big Spring/ Pennsylvania, Lancaster Cty.

Abstract: Streambank fencing along stream channels in pastured areas and the exclusion of pasture animals from the channel are best- management practices designed to reduce nutrient and suspended- sediment yields from drainage basins. Establishment of vegetation in the fenced area helps to stabilize streambanks and provides better habitat for wildlife in and near the stream. This study documented the effectiveness of a 5- to 12-foot-wide buffer strip on the quality of surface water and near-stream ground water in a 1.42- mi(sup 2) treatment basin in Lancaster County, Pa. Two miles of stream were fenced in the basin in 1997 following a 3- to 4- year pre-treatment period of monitoring surface- and ground-water variables in the treatment and control basins. Changes in surface- and ground-water quality were monitored for about 4 years after fence installation.

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1416. Effects of watershed best management practices on habitat and fish in Wisconsin streams.

Wang, L.; Lyons, J.; and Kanehl, P.

Journal of the American Water Resources Association 38(3): 663-680. (2002)

NAL Call #: GB651.W315; ISSN: 1093474X

Descriptors: aquatic ecosystems/ BMP evaluation/ fish/ nonpoint source pollution/ physical habitat/ watershed management/ ecosystems/ low temperature effects/ marine biology/ stream flow/ best management practices/ BMPs/ habitat conditions/ habitat management/ water temperature/ United States/ Cottidae/ Salmo trutta/ Salmonidae

Abstract: We evaluated the effectiveness of watershed-scale implementations of best-management practices (BMPs) for improving habitat and fish attributes in two coldwater stream systems in Wisconsin. We sampled physical habitat, water temperature, and fish communities in multiple paired treatment and reference streams before and after upland (barnyard runoff controls, manure storage, contour plowing, reduced tillage) and riparian (stream bank fencing, sloping, limited rip-rapping) BMP installation in the treatment subwatersheds. In Spring Creek, BMPs significantly improved overall stream habitat quality, bank stability, instream cover for fish, abundance of cool- and coldwater fishes, and abundance of all fishes. Improvements were most pronounced at sites with riparian BMPs. Water temperatures were consistently cold enough to support coldwater fishes such as trout (Salmonidae) and sculpins (Cottidae) even before BMP installation. We observed the first-time occurrence of naturally reproduced brown trout (Salmo trutta) in Spring Creek, indicating that

the stream condition had been improved to be able to partially sustain a trout population. In Eagle Creek and its tributary Joos Creek, limited riparian BMPs led to localized gains in overall habitat quality, bank stability, and water depth. However, because few upland BMPs were installed in the subwatershed there were no improvements in water temperature or the quality of the fish community. Temperatures remained marginal for coldwater fish throughout the study. Our results demonstrate that riparian BMPs can improve habitat conditions in Wisconsin streams, but cannot restore coldwater fish communities if there is insufficient upland BMP implementation. Our approach of studying multiple paired treatment and reference streams before and after BMP implementation proved effective in detecting the response of stream ecosystems to watershed management activities.

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1417. Endangered species and irrigated agriculture: Water resource competition in western river systems.

Moore, Michael R.; Mulville, Aimee.; Weinberg, Marca; and United States. Dept. of Agriculture. Economic Research Service.

Washington, D.C.: U.S. Dept. of Agriculture, Economic Research Service; iv, 20 p.: ill., maps; Series: Agriculture information bulletin no. 720 (An Economic Research Service report). (1995).

Notes: Cover title. Distributed to depository libraries in microfiche. Shipping list no.: 97-0500-M. "November 1995" Includes bibliographical references (p. 18-19).

SUDOCs: A 1.75:720.

NAL Call #: Fiche S 133 A 1.75:720

Descriptors: Endangered species---West---United States/ Water resources development---West---United States/ Irrigation farming---West---United States

This citation is from AGRICOLA.

1418. Estimation of smolt-to-adult return percentages for Snake River Basin anadromous salmonids, 1990-1997.

Sandford, B. P. and Smith, S. G.

Journal of Agricultural, Biological, and Environmental Statistics 7(2): 243-263. (2002)

NAL Call #: S566.55.J68; ISSN: 10857117.

Notes: doi: 10.1198/10857110260141274.

Descriptors: bootstrap/ fish passage/ fish transportation/ passive-integrated-transponder tag/ stratified tag-recapture

Abstract: From numbers of juvenile salmonids (smolts) tagged between 1990 and 1997 with passive-integrated-transponder (PIT) tags and detections at downstream hydropower projects on the lower Snake and Columbia Rivers, we applied and adapted stratified tagrecapture methods to estimate the number of PIT-tagged smolts that experienced each possible detection history through the dams. Using adult detection records upon return after 1-3 years of ocean residence, we estimated smolt-to-adult return (SAR) percentages for fish in detection-history categories that included downstream barge transport, migration in-river following detection, and migration in-river with no detection. We used bootstrap methods to estimate 95% confidence intervals for estimated SARs and ratios of SARs for selected detection-history categories. In general, though small numbers of returning adults and statistical uncertainty at various stages of the estimation procedure led to fairly imprecise SAR estimates, some general trends

were evident. Adult return percentages for spring/summer yearling chinook salmon and steelhead were highest for fish transported from Lower Granite and Little Goose Dams but only slightly higher than for nondetected fish. Passage routes of nondetected fish (through spill and turbines) may represent optimal passage conditions. Once a juvenile fish is entrained in a bypass system at a "collector dam," transporting the fish maximizes the probability of its eventual return as an adult. © 2002 American Statistical Association and the International Biometric Society. © 2008 Elsevier B.V. All rights reserved.

1419. An evaluation of instream and riparian restoration techniques applied to the Spafford Creek drainage in Otisco Valley, NY.

Connerton, M.; Schwartz, C.; and Hamilton, C. *American Fisheries Society Annual Meeting* 133: 153. (2003).

Notes: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.

Descriptors: conservation/ channel flow/ creek drainages: habitat/ ditching/ farming practices/ flooding/ habitat improvement/ over grazing/ restoration techniques: instream, riparian/ stream bank stability/ vegetation changes

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1420. Evaluation of restoration efforts on the 1996 upper Adams River sockeye salmon run.

Hume, J. M.; Morton, K. F.; Lofthouse, D.; MacKinlay, D.; Shortreed, K. S.; Grout, J.; and Volk, E.

Canadian Technical Report of Fisheries and Aquatic Sciences 2466: i-vi, 1-57. (2003); ISSN: 0706-6457

Descriptors: behavior/ ecology/ population dynamics/ population structure/ habitat/ freshwater habitat/ lotic water/ land zones/ North America/ Canada/ Oncorhynchus nerka: conservation measures/ migration/ age class distribution/ recruitment/ river/ British Columbia/ Upper Adams River/ migratory stock restoration efforts evaluation/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates

Abstract: The Upper Adams River has an estimated 1.25 million m² of spawning grounds and Adams Lake has the potential to produce 26 million sockeye salmon (*Oncorhynchus nerka*) smolts but blockages, including a splash dam on the Adams River (1907 to 1922) and a slide at Hells Gate on the Fraser River in 1913 resulted in the total elimination of the Upper Adams River sockeye salmon stock. In light of the previous abundant run and the unused capacity of the system, a long term effort has been made to rebuild the sockeye run to the Upper Adams River. This included egg and fry transplants from 1949 to 1984 resulting in increasing run sizes every four years (most Adams sockeye mature at age-4) until 1988 (7,000). In 1992 the run was considerably smaller (3,000) and a renewed effort was made to enhance the offspring of the 1992 brood year. Reduced exploitation rates (19%) in 1996 resulted in 25,000 sockeye spawners. Fish culture and fry release programs in 1992 and 1996 used native stock from both the Upper Adams River and nearby Momich River system, releasing fry into the river and after net pen rearing, into the north end of Adams Lake. In 1997, 1.3 million fry were released into the river and lake. In addition to the fry release project, the lake was fertilized in 1997 to promote

the lake growth and subsequent survival of sockeye in the lake and marine environments. An average of 3 mg P/m²/wk and 48 mg N/m²/wk were added to the lake from May to September, using a "front end" loading regime where the nutrients were added at a higher rate in June than in September. We applied two agricultural fertilizers by boat, ammonium nitrate (28-0-0) and ammonium polyphosphate (10-34-0). Particulate C and P were higher in the fertilized year and the year following than in a reference year 1986. Chlorophyll concentrations were highest in 1997 but macrozooplankton showed no significant difference between years. Our analysis, based on known sockeye escapements, length frequency analysis, and the levels of marine Sr in the otolith cores of juvenile *O. nerka*, determined that reference year samples were virtually all from lake resident kokanee, making between year size comparisons of trawl caught fall fry invalid. However, migrating smolts from the 1996 brood year were 1 g larger (3.6 g) than smolts from the 1992 brood year, which is expected to result in increase marine survival. Comparisons of adult returns to the Upper Adams River from the 1980 cycle brood years with co-migrating stocks to other nearby rivers, indicates increased abundance due to restoration efforts, although the sample size is insufficient for statistically significant comparisons.
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1421. Experimental enrichment of two oligotrophic rivers in south coastal British Columbia.

Wilson, G. A.; Ashley, K. I.; Land, R. W.; and Slaney, P. A. In: American Fisheries Society Symposium: Nutrients in Salmonid Ecosystems - Sustaining Production and Biodiversity.; Vol. 34.; pp. 149-162; 2003.

Descriptors: agriculture/ anadromous species/ biodiversity/ biomass/ coastal zone/ escapement/ fertilizers/ fishery limnology/ fishery management/ forest industry/ freshwater fish/ habitat improvement (chemical)/ man-induced effects/ nitrogen/ nutrients (mineral)/ overfishing/ phosphorus/ population density/ population dynamics/ population structure/ restoration/ river discharge/ rivers/ salmon fisheries/ *Oncorhynchus mykiss*/ Salmonidae/ Canada, British Columbia, Adam R./ Canada, British Columbia, Big Silver Creek

Abstract: Big Silver Creek and the Adam River are oligotrophic (conductivity < 45 µ Omega /cm; TDP < 2-5 µg/L; NO₂₊₃ -N < 45 µg/L), mid-sized coastal rivers in southwestern British Columbia. They were treated with inorganic P (phosphorus) and N (nitrogen) to examine the feasibility of low-level inorganic fertilization as a method of increasing resident fish populations in rivers subject to habitat loss by historical logging practices. Both rivers have low numbers and sizes of resident salmonids (<20/ha, >20 cm fork length), despite extensive suitable habitat. Water temperatures in summer average 12 degree C and 14 degree C with summer discharge averaging 12 and 4 m³/S in Big Silver Creek and the Adam River, respectively. In 1992-1997, physical, chemical, and biological assessments took place from May to September in three reaches of each river. Liquid agricultural fertilizer was added to the lower reaches) of each river from June to September of 1994-1997, while upstream reaches were monitored as controls. Fertilizer addition methods evolved from dripping through a hose and valve system, to a more dependable preprogrammable injection system, with the merits of each system discussed. In each river, chlorophyll-a accrual and

benthic invertebrate biomass and density increased, on average, two to four-fold in the fertilized reaches. There was an average four-fold increase in rainbow trout abundance in each river following four summers of fertilization, with a large increase in mountain whitefish *Prosopium williamsoni* (Big Silver Creek) and a smaller increase in brown trout *Salmo trutta* (Adam River). The experimental treatments confirmed that low-level fertilization augmented productivity, resulting in a significant response of resident trout in two oligotrophic streams. The technique can be applied to aquatic systems with reduced fish populations resulting from habitat loss, overfishing, or to anadromous populations caught in the negative feedback loop of decreasing escapement and associated losses of marine-derived nutrients.

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1422. Experimental nutrient addition to the Keogh River and application to the Salmon River in coastal British Columbia.

Slaney, P. A.; Ward, B. R.; and Wightman, J. C. In: American Fisheries Society Symposium: Nutrients in Salmonid Ecosystems - Sustaining Production and Biodiversity.; Vol. 34.; 111-126; 2003.

Descriptors: agriculture/ aquatic insects/ carcasses/ chlorophylls/ colonization/ fertilizers/ fishery limnology/ fishery management/ forest industry/ freshwater fish/ fry/ habitat improvement (chemical)/ man-induced effects/ nutrients (mineral)/ phosphorus/ phytoplankton/ population density/ population structure/ primary production/ restoration/ river fisheries/ rivers/ salmon fisheries/ smolts/ species diversity/ trophic structure/ zoobenthos/ *Oncorhynchus kisutch*/ *Oncorhynchus mykiss*/ Canada, British Columbia, Salmon R./ Canada, British Columbia, Vancouver I., Keogh R.

Abstract: Oligotrophic streams are ubiquitous throughout coastal British Columbia, and thereby, significant nutrient influx can be provided externally via salmon carcasses. At the Keogh River on northern Vancouver Island, experimental nutrient addition was conducted from 1983 to 1986 to examine if potential increases in trophic productivity may augment growth and production of salmonid smolts. Subsequently, an applied treatment was conducted over the past decade at the infertile Salmon River to offset intensive logging impacts and to accelerate colonization of steelhead trout *Oncorhynchus mykiss* of headwater reaches above a hydroelectric diversion. The two rivers were treated with agricultural (dry, later liquid) fertilizers, while upstream control reaches were untreated. At Keogh, inorganic P and N were introduced to produce target soluble phosphorus concentrations of 10-15 mg per L, and N loadings of 50-100 mg per L over the four years of nutrient addition. Average peak algal biomass as chlorophyll a increased 5-10-fold in response to nutrient addition. Geometric mean weights of steelhead trout and coho salmon *O. kisutch* fry within several treated reaches were 1.4-2.0-fold higher than the control, and mean weights of steelhead part were 30-130% greater in the three treated reaches. Average steelhead smolt yield in three brood years increased 62% (peak, 2.5-fold in 1987) over prefertilization years; yet there was no increase in average smolt size because mean smolt age was reduced by about one year. There were corresponding increases in returning adults and reported catches by steelhead anglers at the

Keogh River, compared with trends at an adjacent river fishery. The response of coho smolts to nutrient addition was less marked, or a suggested 21% increase in numbers ($P < 0.1$) with no change in size, although results were moderated by production of coho smolts from several untreated tributaries and small lakes. At the upper Salmon River, where nutrient targets were reduced to one-third that of the Keogh, nutrient addition was associated with 3-7-fold higher benthic insect density in treated reaches than controls, and 2-3-fold greater mean weights and biomass of steelhead and rainbow trout in treated index sites than upstream, unfertilized sites. Over the decade, estimated numbers of steelhead part and smolt migrants at the Salmon River diversion increased from about 1,500 to 8,000. The results at the Salmon River confirmed those of the Keogh and indicated that lower-level nutrient addition can produce a similar positive trophic response.
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1423. Experimental provision of large woody debris in streams as a trout management technique.

Lehane, B. M.; Giller, P. S.; O'Halloran, J.; Smith, C.; and Murphy, J.
Aquatic Conservation: Marine and Freshwater Ecosystems 12(3): 289-311. (May 2002-June 2002)

Descriptors: aquatic Environment/ deforestation/ detritus/ ecology/ ecosystem management/ environment management/ fisheries/ fluvial features/ freshwater fish/ habitat/ management/ rivers/ streams/ trout/ wood/ *Salmo trutta*/ Eire, Munster, Cork, Douglas R.

Abstract: 1. The natural stock of large woody debris (LWD) in the afforested Douglas River (Fermoy, Co. Cork) is very low relative to old-growth forests, which seems to arise from deficiency both of supply and retention. Woody debris is important to the ecology and physical structure of forest streams, so its abundance is relevant to aquatic conservation and the maintenance and size of salmonid fish stocks. 2. The physical characteristics and fish stocks of 16 contiguous segments of two 200 m stream reaches were surveyed in spring 1998 prior to the installation of 12 partially spanning debris structures on four of the segments. This study investigated the effect of debris structures on the heterogeneity of flow and substratum, and the distribution of brown trout (*Salmo trutta*), and assessed the potential use of woody debris manipulation as a tool in the management of forest streams. 3. Surveys of stream habitat conditions over a 2 year period following the installation of woody debris showed a change in stream architecture. This created more suitable habitat for trout through development of additional pools in which beds of fine sediment developed, and constraining the main current, increasing the amount of eddies and slack water areas. 4. There were significant increases in trout density and biomass in the debris segments relative to control segments without debris dams 1 and 2 years after debris addition, although trout condition was not modified by the addition of LWD. These results suggest that the addition of woody debris offers a positive and practical management technique for enhancing fish in plantation forest streams.
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1424. Factors related to amphibian occurrence and abundance in headwater streams draining second-growth Douglas-fir forests in southwestern Washington.

Wilkins, R. Neal and Peterson, N. Phil
Forest Ecology and Management 139(1/3): 79-91. (2000)
NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: *Ascaphus truei*/ *Dicamptodon*/ *Dicamptodon copei*/ *Dicamptodon tenebrosus*/ *Plethodon*/ *Plethodon dunni*/ *Plethodon vandykei*/ *Plethodon vehiculum*/ *Rhyacotriton kezeri*/ amphibians and reptiles/ habits-behavior/ distribution/ Douglas fir/ ecosystems/ forests, coniferous/ habitat use/ rivers/ status/ wildlife-habitat relationships/ *Columbia torrent salamander*/ giant salamander/ tailed frog/ Pacific giant salamander/ Cope's giant salamander/ woodland salamander/ western red-backed salamander/ Dunn's salamander/ Van Dyke's salamander/ *Pseudotsuga* spp./ Washington, southwestern area

Abstract: Forested headwaters of the US Pacific Northwest are an important habitat resource for a varied amphibian fauna. Factors related to occupancy and relative abundance for many of these species are poorly known, adding uncertainty to conservation decisions in managed forestlands. We sampled occurrence and abundance of amphibians in 40 perennial headwater streams traversing 50-65-year-old second-growth forests in the coast range of southwestern Washington. Streams were divided among basalt (n=18) and marine sediment (n=22) lithologies. Our samples resulted in collections of 1141 amphibians of six taxa--three stream-breeders and three woodland salamanders. Stream breeding taxa included larval and neotenic giant salamanders (*Dicamptodon* spp.), *Columbia torrent salamanders* (*Rhyacotriton kezeri*) and larval tailed frogs (*Ascaphus truei*). Pacific giant salamanders (*D. tenebrosus*) and/or Cope's giant salamanders (*D. copei*) occupied 95% of sampled streams, accounting for 57% of total amphibians collected. Streams traversing basalt lithology had almost twice the giant salamander abundance of marine sediment streams. Adjusting for lithology, giant salamanders increased in abundance with increasing pool frequencies in combination with increasing large woody debris (LWD) accumulations in adjacent riparian areas, and decreased with increasing accumulations of large (>60 cm diameter) woody debris in the channel. Torrent salamanders occupied 53% of sampled streams. The likelihood of habitat occupancy by torrent salamanders increased as channel gradient increased and basin area decreased. When adjusted for basin area, torrent salamander abundance increased as the proportion of the active channel with flowing water decreased, and at more northerly aspects. Larval tailed frogs larva were found in 13% of sampled streams, exclusively occupying basalt streams at elevations >300 m. At least one of the three species of woodland salamanders (*Plethodon* spp.) occupied habitats adjacent to 93% of sampled streams. Western red-backed salamanders (*P. vehiculum*) were most ubiquitous, occupying habitats adjacent to 85% of sampled streams. Dunn's salamanders (*P. dunni*) occupied habitats adjacent to 58% of sampled streams, likelihood of occurrence increasing with increasing gradient of the steepest sideslope. Van Dyke's salamanders (*P. vandykei*) occupied habitats adjacent to three streams, all of which traversed basalt lithologies on north facing slopes. Our results suggest that habitat quality for headwater

amphibians in this region is strongly influenced by landform characteristics, including basin lithology. These associations provide managers an opportunity to improve headwater amphibian conservation strategies by prioritizing stream segments with respect to their likely amphibian fauna.

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1425. Fencing to control livestock grazing on riparian habitats along streams: Is it a viable alternative?

Platts, W. S. and Wagstaff, F. J.

North American Journal of Fisheries Management 4(3): 266-272. (1984)

NAL Call #: SH219.N66 ; ISSN: 0275-5947

Descriptors: habitat alterations/ management/ research: rivers and streams/ riparian habitat

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1426. Fish and grazing relationships in southwestern national forests.

Rinne, John N.

Developments in Animal and Veterinary Sciences 30: 329-371. (2000); ISSN: 0167-5168.

Notes: Literature review; Livestock Management in the American Southwest: Ecology, Society, and Economics.

Descriptors: commercial activities/ ecology/ land and freshwater zones/ Pisces: farming and agriculture/ fauna/ conservation measures/ livestock grazing/ freshwater habitat/ United States, southwestern region/ chordates/ fish/ vertebrates

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1427. Fish assemblage response to recent mitigation of a channelized warmwater stream.

Raborn, S. W. and Schramm, H. L.

River Research and Applications 19(4): 289-301. (2002)

NAL Call #: TC530.R43 .

Notes: doi:10.1002/rra.704.

Descriptors: Mississippi/ Luxapallila Creek/ environment management/ rivers/ habitat/ habitat restoration/ freshwater fish/ ecology/ freshwater environment/ freshwater fish

Abstract: Various designs of low-head dams are used to rehabilitate streams or forestall upstream channel incision after channelization. We report on the efficacy of using notched sills and grade control structures (GCS) to restore the fish assemblage in Luxapallila Creek, Mississippi. We tested the null hypotheses that habitat variables and species richness, evenness, and assemblage structure would not differ among: (1) a channelized segment with no modifications, (2) a channelized segment mitigated by the installation of sills and GCS, (3) a segment upstream of the installations and undergoing channel incision, and (4) an unaltered segment. Although habitat variables changed, neither species richness, evenness, nor fish assemblage structure differed between mitigated and channelized segments with both exhibiting less richness and different assemblage structures than the unaltered segment. Lack of differences in species richness between the incised and unaltered segments suggest that the GCS may have halted the negative effects of upstream channel incision before species were extirpated. Conspicuous habitat differences between the altered (channelized and mitigated) and unaltered segments were lack of backwaters and riparian

vegetation in the altered segments. Our results suggest a more comprehensive rehabilitation strategy is required in Luxapallila Creek.

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1428. Fish communities and their associations with environmental variables, lower San Joaquin River drainage, California.

Brown, Larry R.

Environmental Biology of Fishes 57(3): 251-269. (2000); ISSN: 0378-1909

Descriptors: pollution assessment control and management/ bioassessment/ assessment method/ multivariate analysis/ statistical method/ index of biotic integrity/ agricultural development/ cost benefit balance/ ecotoxicology/ environmental variables/ habitat quality/ human disturbances/ resource management/ species distribution/ specific conductance/ water depth/ water quality

Abstract: Twenty sites in the lower San Joaquin River drainage, California, were sampled from 1993 to 1995 to characterize fish communities and their associations with measures of water quality and habitat quality. The feasibility of developing an Index of Biotic Integrity was assessed by evaluating four fish community metrics, including percentages of native fish, omnivorous fish, fish intolerant of environmental degradation, and fish with external anomalies. Of the thirty-one taxa of fish captured during the study, only 10 taxa were native to the drainage. Multivariate analyses of percentage data identified four site groups characterized by different groups of species. The distributions of fish species were related to specific conductance, gradient, and mean depth; however, specific conductance acted as a surrogate variable for a large group of correlated variables. Two of the fish community metrics - percentage of introduced fish and percentage of intolerant fish - appeared to be responsive to environment quality but the responses of the other two metrics - percentage of omnivorous fish and percentage of fish with anomalies - were less direct. The conclusion of the study is that fish communities are responsive to environmental conditions, including conditions associated with human-caused disturbances, particularly agriculture and water development. The results suggest that changes in water management and water quality could result in changes in species distributions. Balancing the costs and benefits of such changes poses a considerable challenge to resource managers.

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1429. Fish communities of the Sacramento River Basin: Implications for conservation of native fishes in the Central Valley, California.

May, J. T. and Brown, L. R.

Environmental Biology of Fishes 63(4): 373-388. (2002); ISSN: 03781909.

Notes: doi: 10.1023/A:1014964318485.

Descriptors: environmental gradients/ flow regulation/ index of biotic integrity/ introduced species/ metrics/ multivariate analysis/ native species/ water-quality/ community structure/ conservation/ environmental gradient/ ichthyofauna/ river basin/ United States/ Pisces

Abstract: The associations of resident fish communities with environmental variables and stream condition were evaluated at representative sites within the Sacramento River Basin, California between 1996 and 1998 using multivariate ordination techniques and by calculating six fish community metrics. In addition, the results of the current study were compared with recent studies in the San Joaquin River drainage to provide a wider perspective of the condition of resident fish communities in the Central Valley of California as a whole. Within the Sacramento drainage, species distributions were correlated with elevational and substrate size gradients; however, the elevation of a sampling site was correlated with a suite of water-quality and habitat variables that are indicative of land use effects on physiochemical stream parameters. Four fish community metrics - percentage of native fish, percentage of intolerant fish, number of tolerant species, and percentage of fish with external anomalies - were responsive to environmental quality. Comparisons between the current study and recent studies in the San Joaquin River drainage suggested that differences in water-management practices may have significant effects on native species fish community structure. Additionally, the results of the current study suggest that index of biotic integrity-type indices can be developed for the Sacramento River Basin and possibly the entire Central Valley, California. The protection of native fish communities in the Central Valley and other arid environments continues to be a conflict between human needs for water resources and the requirements of aquatic ecosystems; preservation of these ecosystems will require innovative management strategies.

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1430. Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes.

Freeman, M. C.; Bowen, Z. H.; Bovee, K. D.; and Irwin, E. R.

Ecological Applications 11(1): 179-190. (2001)

NAL Call #: QH540.E23; ISSN: 10510761

Descriptors: flow regulation/ habitat stability/ hydrologic alteration/ instream habitat/ juvenile fish/ PHABSIM/ riverine fishes/ southeastern U.S. river/ Tallapoosa River/

abundance/ community response/ ecological impact/ flow regulation/ habitat availability/ ichthyofauna/ United States
Abstract: Conserving biological resources native to large river systems increasingly depends on how flow-regulated segments of these rivers are managed. Improving management will require a better understanding of linkages between river biota and temporal variability of flow and instream habitat. However, few studies have quantified responses of native fish populations to multiyear (>2 yr) patterns of hydrologic or habitat variability in flow-regulated systems. To provide these data, we quantified young-of-year (YOY) fish abundance during four years in relation to hydrologic and habitat variability in two segments of the Tallapoosa River in the southeastern United States. One segment had an unregulated flow regime, whereas the other was flow-regulated by a peak-load generating hydropower dam. We sampled fishes annually and explored how continuously recorded flow data and physical habitat simulation models (PHABSIM) for spring (April-June) and summer (July-August) preceding each sample explained fish abundances. Patterns of YOY abundance in relation to habitat availability (median area) and habitat

persistence (longest period with habitat area continuously above the long-term median area) differed between unregulated and flow-regulated sites. At the unregulated site, YOY abundances were most frequently correlated with availability of shallow-slow habitat in summer (10 species) and persistence of shallow-slow and shallow-fast habitat in spring (nine species). Additionally, abundances were negatively correlated with 1-h maximum flow in summer (five species). At the flow-regulated site, YOY abundances were more frequently correlated with persistence of shallow-water habitats (four species in spring; six species in summer) than with habitat availability or magnitude of flow extremes. The associations of YOY with habitat persistence at the flow-regulated site corresponded to the effects of flow regulation on habitat patterns. Flow regulation reduced median flows during spring and summer, which resulted in median availability of shallow-water habitats comparable to the unregulated site. However, habitat persistence was severely reduced by flow fluctuations resulting from pulsed water releases for peak-load power generation. Habitat persistence, comparable to levels in the unregulated site, only occurred during summer when low rainfall or other factors occasionally curtailed power generation. As a consequence, summer-spawning species numerically dominated the fish assemblage at the flow-regulated site; five of six spring-spawning species occurring at both study sites were significantly less abundant at the flow-regulated site. Persistence of native fishes in flow-regulated systems depends, in part, on the seasonal occurrence of stable habitat conditions that facilitate reproduction and YOY survival.

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1431. Flows for floodplain forests: A successful riparian restoration.

Rood, S. B.; Gourley, C. R.; Ammon, E. M.; Heki, L. G.;

Klotz, J. R.; Morrison, M. L.; Mosley, D.;

Scoppettone, G. G.; Swanson, S.; and Wagner, P. L.

Bioscience 53(7): 647-656. (2003)

NAL Call #: 500 Am322A; ISSN: 00063568

Descriptors: birds/ cottonwoods/ ecosystem restoration/ River regulation/ Chasmistes cujus/ Populus fremontii/ Salix exigua

Abstract: Throughout the 20th century, the Truckee River that flows from Lake Tahoe into the Nevada desert was progressively dammed and dewatered, which led to the collapse of its aquatic and riparian ecosystems. The federal designation of the endemic cui-ui sucker (*Chasmistes cujus*) as endangered prompted a restoration program in the 1980s aimed at increasing spring flows to permit fish spawning. These flows did promote cui-ui reproduction, as well as an unanticipated benefit, the extensive seedling recruitment of Fremont cottonwood (*Populus fremontii*) and sandbar willow (*Salix exigua*). Recruitment was scattered in 1983 but extensive in 1987, when the hydrograph satisfied the riparian recruitment box model that had been developed for other rivers. That model was subsequently applied to develop flow prescriptions that were implemented from 1995 through 2000 and enabled further seedling establishment. The woodland recovery produced broad ecosystem benefits, as evidenced by the return by 1998 of 10 of 19 riparian bird species whose populations had been locally extirpated or had declined severely between 1868 and 1980. The dramatic partial recovery along this severely

degraded desert river offers promise that the use of instream flow regulation can promote ecosystem restoration along other dammed rivers worldwide.

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1432. Geomorphological processes in meandering and straight reaches of an agricultural stream in east central Illinois: Relations to aquatic habitat.

Frothingham, K. M.

Urbana-Champaign, IL: University of Illinois at Urbana-Champaign, 2001.

Descriptors: agriculture/ fishery data/ fluvial morphology/ geomorphology/ habitat/ man-induced effects/ meandering/ population dynamics/ rivers/ sedimentation/ soil erosion/ stream flow/ Illinois

Abstract: In environments dominated by human activity, such as the agricultural Midwest, stream channel geomorphology is influenced strongly by anthropogenic factors. Past research has shown that human-induced channel modifications, including stream channelization, affects both the abiotic and biotic components of a stream. However, connections between changes in geomorphological form and function and ecological conditions in agricultural streams are still poorly understood. The objectives of this research are threefold: (1) determine characteristic patterns of three-dimensional (3-D) fluid motion in planform-scale stream reaches with different channel morphologies; (2) develop an objective method of classifying geomorphic features (e.g., pools and riffles) based on stream morphology; and (3) identify planform- and bar-element scale linkages between geomorphological variability and ecological conditions. Geomorphological and fisheries data were collected in the headwaters of the Embarras River where channel maintenance for agricultural drainage has produced a straight channelized reach adjacent to a highly sinuous unmodified reach. Geomorphological data were collected between 1997 and 2000. Planform scale fish sampling was conducted approximately monthly from July 1997 to August 1998 to provide information on community structure in the highly sinuous and straight reaches. Bar element scale fisheries data were collected in an extended meandering reach during July and August 1999. Results indicate that the highly sinuous reach has greater geomorphological variability, both over time and over space, than the straight reach. Bed morphology within the highly sinuous reach is characterized by multiple pool-riffle sequences with all of the pools located along the outer bank of the curved stream channel. Flow through the highly sinuous reach is fully three-dimensional and has a well-developed spatial pattern of helical motion. In contrast, bed morphology within the straight reach is relatively uniform and flow moves predominantly in the downstream. The highly sinuous reach has higher rates of channel erosion than the straight reach and the pattern of erosion in the highly sinuous reach generally conforms to zones of maximum near-bank velocity and areas of pronounced helical motion. The highly sinuous reach also contains more and larger individual fish than the straight reach, suggesting that increased geomorphological complexity at the planform-scale results in increased fish abundance and total biomass. At the bar-element scale, fish abundance in pools and riffles is the same; however, species composition is different. A larger

percentage of fish classified as pool specialists are found in pools while more riffle specialists are found in riffles. These results indicate that both pools and riffles are critical stream habitat structures needed to support a diverse aquatic community in human-modified streams.

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1433. Grazing effects on stream habitat and fishes: Research design considerations.

Rinne, J. N.

North American Journal of Fisheries Management 8(2): 240-247. (1988)

NAL Call #: SH219.N66; ISSN: 0275-5947

Descriptors: grazing/ river banks/ erosion control/ vegetation cover/ habitat improvement (biological)/ fishery management/ research programs/ environmental impact/ environmental conditions/ population levels/ Salmonidae/ population levels/ New Mexico, Vacas R./ vegetation cover/ habitat improvement (biological)

Abstract: A 4-year study of a montane stream from which cattle grazing had been excluded for 10 years indicated that stream bank vegetation and stability were markedly improved and that stream substrate fines were somewhat reduced, but it indicated that fish populations were unaffected. Shortcomings of this case history study are common to past similarly designed studies of grazing effects on fishes and their habitats. Three major deficiencies in research design are (1) lack of pretreatment data, (2) improper consideration of fishery management principles, and (3) linear positioning of treatments along a stream. Future research on riparian grazing effects must address these factors in addition to designs of long-term (10+ years) ecosystem (watershed) studies.

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1434. Grazing management influences on two brook trout streams in Wyoming.

Hubert, W. A.; Lanka, R. P.; Wesche, T. A.; and Stabler, F.

In: *Riparian ecosystems and their management: Reconciling conflicting uses*, General Technical Report-RM 120/ Johnson, R. Roy; Ziebell, Charles D.;

Patton, David R.; Ffolliott, Peter F.; and Hamre, R. H.; Fort Collins, Colo.: Rocky Mountain Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture, 1985.

pp. 290-294.

Notes: Conference held April 16-18, 1985 in Tuscon, Ariz.

NAL Call #: aSD11.A42

Descriptors: riparian environments/ grazing/ environment management/ environmental impact/ habitat/ abundance/ *Salvelinus fontinalis*/ Wyoming/ cattle grazing

Abstract: Brook trout (*Salvelinus fontinalis*) abundance and instream habitat characteristics were evaluated in two rangeland streams. Heavily grazed and lightly grazed reaches of two streams with different grazing management were compared. Relationships between stream morphology, riparian zone characteristics, and trout abundance were observed.

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1435. Habitat and fish responses to multiple agricultural best management practices in a warm water stream.

Wang, L.; Lyons, J.; and Kanehl, P.
Journal of the American Water Resources Association 42(4): 1047-1062. (2006)
 NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: agricultural land use/ best management practices/ BMPs/ fish/ nonpoint source pollution/ riparian buffers/ warm water stream/ watershed management/ aquatic habitat
Abstract: Thirteen years of annual habitat and fish sampling were used to evaluate the response of a small warm water stream in eastern Wisconsin to agricultural best management practices (BMPs). Stream physical habitat and fish communities were sampled in multiple reference and treatment stations before, during, and after upland and riparian BMP implementation in the Otter Creek subwatershed of the Sheboygan River watershed. Habitat and fish community measures varied substantially among years, and varied more at stations that had low habitat diversity, reinforcing the notion that the detection of stream responses to BMP implementation requires long term sampling. Best management practices increased substrate size; reduced sediment depth, embeddedness, and bank erosion; and improved overall habitat quality at stations where a natural vegetative buffer existed or streambank fencing was installed as a riparian BMP. There were lesser improvements at locations where only upland BMPs were implemented. Despite the habitat changes, we could not detect significant improvements in fish communities. It is speculated that the species needed to improve the fish community, mainly pollution intolerant species, suckers (Castomidae), and darters (Percidae), had been largely eliminated from the Sheboygan River watershed by broadscale agricultural nonpoint source pollution and could not colonize Otter Creek, even though habitat conditions may have been suitable.
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1436. Habitat associations of age-0 cutthroat trout in a spring stream improved for adult salmonids.

Hubert, W. A. and Joyce, M. P.
Journal of Freshwater Ecology 20(2): 277-286. (2005)
 NAL Call #: QH541.5.F7J68; ISSN: 02705060
Descriptors: habitat management/ habitat use/ juvenile/ salmonid/ vegetation cover/ *Amadina fasciata*/ *Aves*/ *Galliformes*/ *Oncorhynchus*/ *Oncorhynchus clarki*/ *Salmonidae*/ *Serpentes*
Abstract: Native cutthroat trout (*Oncorhynchus clarki*) in the Snake River watershed use streams formed by large springs for spawning and nursery habitat. Several spring streams have been modified to enhance abundance of adult salmonids, but the habitat associations of age-0 cutthroat trout in these systems are undescribed. We assessed the frequency of collection of age-0 cutthroat trout in riffles, riffle margins, pool margins, and backwaters from late June to the middle of August 2000 in a spring stream with such modifications. The proportion of sites in which age-0 cutthroat trout were collected increased up to the middle of July and then decreased. We found substantially lower frequencies of collection of age-0 cutthroat trout in riffles compared to the three stream-margin habitat types. Age-0 cutthroat trout appeared to select shallow, low-velocity, stream-margin habitat with

cover that provided protection from piscivorous adult salmonids and avian predators. Our observations suggest that modification of spring streams for production of cutthroat trout should include efforts to manage stream margins so they provide cover in the form of aquatic macrophytes or overhanging vegetation for age-0 fish.
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1437. Habitat associations with upland stream fish assemblages in Bankhead National Forest, Alabama.

Powers, S. L.; Jones, G. L.; Redinger, P.; and Mayden, R. L.
Southeastern Naturalist 2(1): 85-92. (2003)
 NAL Call #: IPSP11706; ISSN: 1528-7092.
Descriptors: abiotic factors/ community structure/ species composition/ large woody debris (LWD)/ regression analysis/ habitats/ fish assemblages/ Sipsey Fork River/ Bankhead National Forest/ environmental factors/ habitat association/ ecology/ checklist/ freshwater fish/ Alabama
Abstract: Fishes and habitat were sampled at nine sites in the Sipsey Fork River drainage in Bankhead National Forest, Alabama. Stream width, depth, current velocity, substrate type, bank height and amount of large woody debris (LWD) were measured at each site to test for association of these habitat variables with upland stream fish assemblages. Regression of habitat variables onto species richness indicated that only bank height was significantly associated with species richness in our study area. The lack of habitat associations with species richness seemingly contradicts findings by several previous investigators working in lowland streams. The availability of large substrate and both deep and shallow habitats at all sites may have reduced the observed association of these variables and LWD with stream fish assemblages. Stream width and current velocity, though not significant, did show strong positive correlations with species richness. The significant association between high banks and species richness may reflect a more intact riparian zone due to inaccessibility of streams in gorges.
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1438. Habitat, land use, and fish assemblage relationships in Iowa streams: Preliminary assessment in an agricultural landscape.

Heitke, Jeremiah D.; Pierce, Clay L.; Gelwicks, Gregory T.; Simmons, Gregory A.; and Siegwarth, Gary L.
 In: American Fisheries Society Symposium, 48; Bethesda, MD: American Fisheries Society, 2006. 287-303.
Notes: Symposium on Influences of Landscape on Stream Habitat and Biological Communities, Madison, WI, USA; August 25 -26, 2004; 188856976X (ISBN); No. 48.
Descriptors: biogeography: population studies/ freshwater ecology: ecology, environmental sciences/ biotic integrity index/ land use/ physical habitat
Abstract: Iowa leads the nation in percentage of land area converted to cropland, with a resulting negative impact on streams. We examined physical habitat, land use, and fish assemblage data from 37 second- to sixth-order stream sites, representing 7 of the 10 ecoregions within Iowa. Physical habitat conditions varied widely among sites, with sand dominating substrate composition. A nonmetric multidimensional scaling ordination of physical habitat variables suggested a pattern of among-site similarities defined by a stream size axis, an axis contrasting sites dominated by either woody or rocky fish cover, and an axis

characterizing degree of riparian canopy coverage. Bluntnose minnow *Pimephales notatus* and sand shiner *Notropis stramineus* were the most abundant fish species, followed by green sunfish *Lepomis cyanellus* and common carp *Cyprinus carpio*. These four species were collected in more than 80% of the sites. Fish species richness at sites averaged 22, ranging from 6 to 38, and fish index of biotic integrity (IBI) at sites averaged 47 (fair), ranging from 21 (poor) to 96 (excellent). Species richness and IBI were highest at sites characterized by rocky fish cover and relatively coarse substrates. Values for several physical habitat and land use variables were significantly different between sites with IBI: 30 (fair) and sites with IBI \geq 50 (good). We found a general pattern of IBI, species richness, total fish abundance, and width-to-depth ratio decreasing from the northeast to the southwest ecoregions, and percentage of unvegetated banks and bank slope increasing from northeast to southwest. Stable and vegetated banks, wide stream channels with coarse substrates, and rocky fish cover were associated with high biotic condition; while unvegetated and eroding banks, and deep channels with predominantly fine substrates were associated with lower biotic condition. Land use was calculated at three spatial scales: catchment, network riparian buffer, and local riparian buffer. We found few relationships of fish assemblages with land use, potentially due to sampling design and the pervasiveness of agriculture across Iowa. There is substantial variation among physical habitat, land use, and fish assemblage conditions across Iowa, due to a combination of geology, climate, zoogeography, and human alteration.
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1439. Habitat rehabilitation for inland fisheries: Global review of effectiveness and guidance for rehabilitation of freshwater ecosystems.

Roni, P.; Hanson, K.; Beechie, T.; Pess, G.; Pollock, M.; and Bartley, D. M.
FAO-Fisheries-Technical-Paper 484, 2005. 116 pp.
Notes: Literature review; ISSN: 0429-9345.
<http://www.fao.org/docrep/008/a0039e/a0039e00.htm>
Descriptors: aquatic environment/ cost benefit analysis/ dams/ development projects/ fisheries/ floodplains/ floods/ freshwater ecology/ freshwater fishes/ habitat destruction/ habitats/ hydraulic structures/ monitoring/ nature conservation/ planning/ rehabilitation/ riparian vegetation/ rivers/ streams/ watersheds/ fishes
Abstract: This bulletin discusses the key steps to consider when designing monitoring and evaluation of habitat rehabilitation activities for inland fisheries at various scales. Three areas lacking in most rehabilitation projects are demonstrated: (i) adequate assessment of historic conditions, impaired ecosystem processes and factors limiting biotic production; (ii) understanding upstream or watershed-scale factors that may influence effectiveness of reach or localized rehabilitation; and (iii) well-designed and well-funded monitoring and evaluation. These are the same factors that consistently limit the ability of published studies to determine the success of a given technique at improving habitat conditions or fisheries resources. Finally, this review suggests that many habitat rehabilitation techniques show promise, but most have not received adequate planning, monitoring or cost-benefit analysis.
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1440. Habitat restoration, landowner outreach, and enhancement of Russian River coho populations in northern California.

Olin, P. G.; Coey, B.; Acomb, D.; Moore, J.; Nossaman, S.; Thompson, L.; Wilson, B.; and Lewis, D.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.; Vol. 133.; pp. 59; 2003.
Descriptors: wildlife management: conservation/ agricultural expansion/ captive broodstock program/ dam construction/ enhancement program/ gravel mining/ habitat restoration/ landowner outreach/ stream habitat
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1441. Habitat selection by juvenile coho salmon in response to food and woody debris manipulations in suburban and rural stream sections.

Giannico, G. R.
Canadian Journal of Fisheries and Aquatic Science 57(9): 1804-1813. (2000)
NAL Call #: 442.9 C16J
Descriptors: agricultural runoff/ food availability/ geographical distribution/ habitat/ habitat improvement (physical)/ man-induced effects/ sheltered habitats/ urbanization/ *Oncorhynchus kisutch*/ Canada, British Columbia, Vedder-Chilliwack R.
Abstract: This study explored the effects of food and woody debris manipulations on the summer distribution of juvenile coho salmon (*Oncorhynchus kisutch*) in small suburban streams. To examine fish responses to these factors, three different experiments were carried out in modified sections of two streams. The results showed that the distribution of juvenile coho salmon in a stream section was primarily controlled by the availability and distribution of food among pools and by the presence and density of woody debris. Food, however, played a dominant role because the foraging quality of a pool not only affected the density of fish in it but also the response of those fish towards instream debris. In food-rich stream sections, low proportions of juvenile coho salmon occupied pools with dense woody debris in the spring, which changed towards late summer. In contrast, in food-poor reaches, high proportions of fish were found in pools with abundant debris in the spring. Pools that combined abundant food with sparse woody debris were the most favoured by the fish. It is important that salmonid habitat enhancement projects consider that open foraging areas interspersed with woody debris characterize the type of summer habitat that juvenile coho salmon prefer.
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1442. Habitat use, movements, and survival of American black duck, *Anas rubripes*, and mallard, *A. platyrhynchos*, broods in agricultural landscapes of southern Quebec.

Maisonneuve, C.; Desrosiers, A.; and McNicoll, R.
Canadian Field Naturalist 114(2): 201-210. (2000)
NAL Call #: 410.9 Ot8; ISSN: 00083550
Descriptors: agricultural landscapes/ American black duck/ *Anas platyrhynchos*/ *Anas rubripes*/ brood survival/ habitat/ mallard/ movements/ Quebec/ habitat use/ movement/ survival/ waterfowl/ Canada/ *Anas rubripes*
Abstract: American Black Duck and Mallard females were equipped with radiotransmitters in order to identify habitats used during brood-rearing, to quantify brood movements

and to assess survival. The majority (96%) of the 134 brood sightings were made on waterways: 59% on streams, 19% in ditches, and 19% on mill ponds created on these streams. Mean proportions of sightings per brood were greater on streams (64%) and ditches (31%) for Black Ducks (64%), whereas for Mallards these were greater on streams (43%) and mill ponds (37%). Broods of both species made extensive movements, mainly along waterways. Overland movements and maximum distances from the nest were greater for Black Ducks than for Mallards. Daily survival rates (DSR) of broods of both species were similar. DSRs were lower for Class I broods (0.921) than for Class II broods (0.988). The probability of broods of both species surviving to 30 days was relatively similar (95% CI for Black Duck: 0.134-0.206, 95% CI for Mallard: 0.186-0.232). Results of this study indicate a lack of adequate brood-rearing marsh habitat in the agricultural landscapes of southern Quebec where extensive drainage work has been carried out.

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1443. Herpetofaunal and vegetational characterization of a thermally-impacted stream at the beginning of restoration.

Bowers, C. F.; Hanlin, H. G.; Guynn, D. C.; McLendon, J. P.; and Davis, J. R.

Ecological Engineering 15(Suppl. 1)(2000)

NAL Call #: TD1.E26; ISSN: 09258574.

Notes: doi: 10.1016/S0925-8574(99)00076-2.

Descriptors: amphibians/ floodplain restoration/ herpetofauna/ reptiles/ riparian width/ species diversity/ community response/ restoration ecology/ riparian zone/ thermal pollution/ United States/ Amphibia/ Reptilia/ Riparia

Abstract: Pen Branch, a third order stream on the Savannah River Site (SRS), located near Aiken, SC, USA, received thermal effluents from the cooling system of a nuclear production reactor from 1954 to 1988. The thermal-effluent and increased flow destroyed vegetation in the stream corridor (i.e. impacted portion of the floodplain), and subsequent erosion created a braided stream system with a greatly expanded delta. Restoration of the area began with planting of bottomland hardwood species in 1993.

Occurrence of amphibians and reptiles was monitored by daily sampling from 1 January 1995 through 30 September 1996 to characterize the course of the restoration.

Vegetation was sampled in the summer of 1996 to characterize the habitats in the unimpacted riparian zone and the impacted stream corridor. A total of 12 580 individuals representing 72 species of herpetofauna were captured. There were no significant differences in relative abundance or diversity of herpetofauna in unplanted versus planted zones within the impacted corridor 3 years after planting. Likewise, there were no significant differences in abundance or diversity of herpetofauna in the upper and lower corridor areas, which differed in site preparation before planting, or in riparian zones of different widths. However, species diversity of amphibians and reptiles in the unimpacted riparian zone was significantly higher than on vegetated islands located between stream braids within the impacted floodplain corridor. There were also significantly more species and individuals within the riparian zone than in the corridor, and the species assemblage within the riparian zone differed from that of the corridor.

Woody vegetation within the unimpacted riparian zone was significantly higher in basal area than on islands within the corridor.

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1444. Historical changes in fish distribution and abundance in the Platte River in Nebraska.

Peters, E. J. and Schainost, S.

In: American Fisheries Society Symposium, 45; Bethesda, MD: Amer Fisheries Soc, 2005. 239-248.

Notes: Symposium on Changes in Fish Community Structures in Large USA Rivers, Phoenix, AZ, USA; 1888569727 (ISBN); No. 45.

Descriptors: freshwater ecology: ecology, environmental sciences/ pollution assessment control and management/ biogeography: population studies/ wildlife management: conservation/ irrigation/ applied and field techniques/ mining/ applied and field techniques/ pollution/ historical distribution/ historical abundance

Abstract: From its headwaters in the Rocky Mountains, the Platte River drains 230,362 km² in Colorado, Wyoming, and Nebraska. The Platte River is formed by the confluence of the North Platte and South Platte near the city of North Platte, Nebraska, and receives additional flow from the Loup and Elkhorn rivers that drain the Sand Hills region of Nebraska. Water diversions for mining and irrigation began in the 1840s in Colorado and Wyoming, and irrigation diversions in Nebraska began in the 1850s. Construction of dams for control of river flows commenced on the North Platte River in Wyoming in 1904. Additional dams and diversions in the North Platte, South Platte, and Platte rivers have extensively modified natural flow patterns and caused interruptions of flows. Pollution, from mining, industrial, municipal, and agricultural sources, and introductions of 24 nonnative species have also taken their toll. Fishes of the basin were little studied before changes in land use, pollution, and introduction of exotic species began. The current fish fauna totals approximately 100 species from 20 families. Native species richness declines westward, but some species find refugia in western headwaters streams. Declines in 26 native species has led to their being listing as species of concern by one or more basin states.

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1445. Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales.

Freeman, M. C.; Pringle, C. M.; and Jackson, C. R.

Journal of the American Water Resources Association 43(1): 5-14. (2007)

NAL Call #: GB651.W315; ISSN: 1093474X.

Notes: doi: 10.1111/j.1752-1688.2007.00002.x.

Descriptors: aquatic ecology/ biodiversity/ ecosystem function/ environmental impacts/ hydrologic connectivity/ rivers/ streams

Abstract: Cumulatively, headwater streams contribute to maintaining hydrologic connectivity and ecosystem integrity at regional scales. Hydrologic connectivity is the water-mediated transport of matter, energy and organisms within or between elements of the hydrologic cycle. Headwater streams compose over two-thirds of total stream length in a typical river drainage and directly connect the upland and

riparian landscape to the rest of the stream ecosystem. Altering headwater streams, e.g., by channelization, diversion through pipes, impoundment and burial, modifies fluxes between uplands and downstream river segments and eliminates distinctive habitats. The large-scale ecological effects of altering headwaters are amplified by land uses that alter runoff and nutrient loads to streams, and by widespread dam construction on larger rivers (which frequently leaves free-flowing upstream portions of river systems essential to sustaining aquatic biodiversity). We discuss three examples of large-scale consequences of cumulative headwater alteration. Downstream eutrophication and coastal hypoxia result, in part, from agricultural practices that alter headwaters and wetlands while increasing nutrient runoff. Extensive headwater alteration is also expected to lower secondary productivity of river systems by reducing stream-system length and trophic subsidies to downstream river segments, affecting aquatic communities and terrestrial wildlife that utilize aquatic resources. Reduced viability of freshwater biota may occur with cumulative headwater alteration, including for species that occupy a range of stream sizes but for which headwater streams diversify the network of interconnected populations or enhance survival for particular life stages. Developing a more predictive understanding of ecological patterns that may emerge on regional scales as a result of headwater alterations will require studies focused on components and pathways that connect headwaters to river, coastal and terrestrial ecosystems. Linkages between headwaters and downstream ecosystems cannot be discounted when addressing large-scale issues such as hypoxia in the Gulf of Mexico and global losses of biodiversity. © 2007 American Water Resources Association.
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1446. Impact of cattle on two isolated fish populations in Pahrangat Valley, Nevada.

Taylor, Frances R.; Gillman, Leah A.; and Pedretti, John W. *Great Basin Naturalist* 49(4): 491-495. (1989)
NAL Call #: 410 G79; ISSN: 0017-3614
Descriptors: habitat alterations/ grazing/ management/ research/ nitrogen/ pollution/ rivers and streams/ Nevada/ Nevada: Ash Springs/ Nevada: Brownie Spring/ Cichlasoma/ Cichlidae/ Cyprinidae/ Gambusia/ Poecilia/ Poeciliidae/ Rhinichthys/ Cichlasoma nigrofasciatum/ Crenichthys baileyi baileyi/ Gambusia affinis/ Poecilia mexicana/ Rhinichthys osculus
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1447. Impact of deferred rotation grazing on stream characteristics in central Nevada: A case study.

Myers, T. J. and Swanson, S. *North American Journal of Fisheries Management* 15(2): 428-439. (1995)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: land use/ ranching/ watersheds/ fluvial morphology/ habitat improvement/ grazing/ range management/ Nevada/ range management/ ranching/ fluvial morphology/ habitat improvement
Abstract: Three central Nevada streams were selected to study the watershed-scale effects on stream morphology and bank stability of deferred rotation cattle grazing, complete rest from grazing, and the presence of road crossings. The streams had gravel substrates, and their

entrenchments, width: depth ratios, sinuosities and gradients were moderate. Based on statistical analysis of 1980 stream survey results, geologic basin features, and the occurrence of similar flooding, we concluded that the three streams had similar conditions at the start of the grazing treatment. Since 1980, deferred rotation grazing allowed much improvement of aquatic and riparian habitats but the improvement was limited by the presence of roads, which apparently added sediment to the streams. Complete rest from grazing without the presence of roads allowed the most improvement. Of the variables measured in the 1980 survey, streambank soil stability, type and amount of vegetation cover, and quality of pools improved most in all three streams. The best values for channel and water width: depth ratios, channel entrenchment, bank angle, bank undercut, and bank depth were measured on the stream managed with complete rest. Deferred rotation grazing in the absence of roads produced the second best values. The ratio of channel width to base flow water width was significantly higher on bare ground transects. Shrub and tree cover increased significantly more on the rested than on the grazed watersheds. These results should help managers select aquatic habitat and stream morphology objectives for grazing management.

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1448. Impact of environmental factors on fish distribution assessed in rangeland streams.

Thompson, L. C.; Forero, L.; Sado, Y.; and Tate, K. W. *California Agriculture* 60(4): 200-206. (2006);
ISSN: 0008-0845

Descriptors: environmental factors/ habitats/ rangelands/ spatial distribution/ streams/ watersheds/ wildlife management/ fishes

Abstract: We sampled fish in pools located on tributaries of Cow Creek in the northern Sacramento Valley, and related fish distribution and habitat use to environmental factors across the 2003 agricultural growing season. This rangeland watershed experiences extensive livestock use, and many landowners divert stream water for pasture irrigation. Our goal was to provide landowners and managers with current baseline information about the conditions in which fish were found. Our results provide a basis for the development and comparison of irrigation best management practices that may improve conditions for native fish in rangeland streams.

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1449. Impact of livestock grazing activities on stream insect communities and the riverine environment.

Strand, M. and Merritt, R. W. *American Entomologist* 45(1): 13-30. (1999)
NAL Call #: QL461.A52; ISSN: 1046-2821

Descriptors: grazing/ community composition/ riparian environments/ aquatic insects/ environment management/ ecosystem disturbance/ insecta/ insects

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1450. Impacts of the Columbia River hydroelectric system on main-stem habitats of fall chinook salmon.

Dauble, D. D.; Hanrahan, T. P.; Geist, D. R.; and Parsley, M. J.

North American Journal of Fisheries Management 23(3): 641-659. (2003)

NAL Call #: SH219.N66 ; ISSN: 02755947

Descriptors: ecological impact/ habitat restoration/ hydroelectric power plant/ salmonid/ spawning/ United States/ *Oncorhynchus tshawytscha*

Abstract: Salmonid habitats in main-stem reaches of the Columbia and Snake rivers have changed dramatically during the past 60 years because of hydroelectric development and operation. Only about 13% and 58% of riverine habitats in the Columbia and Snake rivers, respectively, remain. Most riverine habitat is found in the upper Snake River; however, it is upstream of Hells Canyon Dam and not accessible to anadromous salmonids. We determined that approximately 661 and 805 km of the Columbia and Snake rivers, respectively, were once used by fall chinook salmon *Oncorhynchus tshawytscha* for spawning. Fall chinook salmon currently use only about 85 km of the main-stem Columbia River and 163 km of the main-stem Snake River for spawning. We used a geomorphic model to identify three river reaches downstream of present migration barriers with high potential for restoration of riverine processes: the Columbia River upstream of John Day Dam, the Columbia-Snake-Yakima River confluence, and the lower Snake River upstream of Little Goose Dam. Our analysis substantiated the assertion that historic spawning areas for fall chinook salmon occurred primarily within wide alluvial floodplains, which were once common in the mainstem Columbia and Snake rivers. These areas possessed more unconsolidated sediment and more bars and islands and had lower water surface slopes than did less extensively used areas. Because flows in the main stem are now highly regulated, the predevelopment alluvial river ecosystem is not expected to be restored simply by operational modification of one or more dams. Establishing more normative flow regimes - specifically, sustained peak flows for scouring - is essential to restoring the functional characteristics of existing, altered habitats. Restoring production of fall chinook salmon to any of these reaches also requires that population genetics and viability of potential seed populations (i.e., from tributaries, tailrace spawning areas, and hatcheries) be considered.

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1451. In search of effective scales for stream management: Does agroecoregion, watershed, or their intersection best explain the variance in stream macroinvertebrate communities?

Dovciak, A. L. and Perry, J. A.

Environmental Management 30(3): 365-377. (2002)

NAL Call #: HC79.E5E5; ISSN: 0364152X.

Notes: doi: 10.1007/s00267-002-2529-6.

Descriptors: agriculture/ ecoregion/ landscape/ macroinvertebrates/ stream/ watershed/ geology/ soils/ water quality/ watersheds/ stream management/ environmental impact/ classification/ community structure/ macroinvertebrate/ river management/ stream/ resource management/ river ecosystem/ stream (river)/ ecosystem/ environmental protection/ invertebrate/ United States/ conservation of natural resources/ ecosystem/ invertebrates

Abstract: Our lack of understanding of relationships

between stream biotic communities and surrounding landscape conditions makes it difficult to determine the spatial scale at which management practices are best assessed. We investigated these relationships in the Minnesota River Basin, which is divided into major watersheds and agroecoregions which are based on soil type, geologic parent material, landscape slope steepness, and climatic factors affecting crop productivity. We collected macroinvertebrate and stream habitat data from 68 tributaries among three major watersheds and two agroecoregions. We tested the effectiveness of the two landscape classification systems (i.e., watershed, agroecoregion) in explaining variance in habitat and macroinvertebrate metrics, and analyzed the relative influence on macroinvertebrates of local habitat versus regional characteristics. Macroinvertebrate community composition was most strongly influenced by local habitat; the variance in habitat conditions was best explained at the scale of intersection of major watershed and agroecoregion (i.e., stream habitat conditions were most homogeneous within the physical regions of intersection of these two landscape classification systems). Our results are consistent with findings of other authors that most variation in macroinvertebrate community data from large agricultural catchments is attributable to local physical conditions. Our results are the first to test the hypothesis and demonstrate that the scale of intersection best explains these variances. The results suggest that management practices adjusted for both watershed and ecoregion characteristics, with the goal of improving physical habitat characteristics of local streams, may lead to better basin-wide water quality conditions and stream biological integrity.

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1452. The inadequacy of the fish-bearing criterion for stream management.

Cummins, Kenneth W. and Wilzbach, Margaret A.

Aquatic Sciences 67(4): 486-491. (2005); ISSN: 1015-1621

Descriptors: commercial activities/ conservation measures/ freshwater habitat/ lotic water/ land zones/ Salmonidae: forestry/ timber harvest/ habitat management/ stream management/ fish bearing criterion/ juveniles/ intermittent streams/ headwater streams/ United States/ Pisces, Actinopterygii, Salmoniformes/ chordates/ fish/ vertebrates

Abstract: Dependence on the fish-bearing and non-fish-bearing designation in determining the regulation of stream management is questioned. The importance of intermittent, ephemeral, and very small first order channels as suppliers of invertebrates and detritus to permanently flowing, receiving streams that support juvenile salmonids warrant their protection during timber harvest. Small gravel bed roads serve many of the same functions as the small intermittent and ephemeral headwater channels. Therefore, many could be managed like small stream channels and eligible for exclusion from road decommissioning actions. Among the invertebrates inhabiting headwater streams, many have specific adaptations to low and seasonal flows. Given these considerations, it is clear that criteria other than the presence or absence of juvenile salmonids need to be considered in managing forested watersheds.

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1453. Influence of forest and rangeland management on anadromous fish habitat in western North America: Effects of livestock grazing.

Platts, W. S. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station; General Technical Report PNW-124, 1981. 25 p.

Notes: ISSN 0368-6224.

NAL Call #: aSD11.A46

Descriptors: North America/ grazing lands/ rangeland management/ forestry management/ fish populations
This citation is from AGRICOLA.

1454. Influence of habitat, water quality, and land use on macro-invertebrate and fish assemblages of a southeastern coastal plain watershed, USA.

Sawyer, J. A.; Stewart, P. M.; Mullen, M. M.; Simon, T. P.; and Bennett, H. H.

Aquatic Ecosystem Health and Management 7(1): 85-99. (2004); ISSN: 14634988.

Notes: doi: 10.1080/14634980490281353.

Descriptors: instream habitat/ land use/ multivariate/ Invertebrata/ *Pisum sativum*

Abstract: Most states in the U.S. are currently developing methods for assessing the integrity of aquatic habitats through the development of regional biocriteria. While multimetric indices have been used to show community composition, pollution tolerance, species diversity, and trophic structure with a combined index, the specific environmental factors that drive biological communities may be better explained through the use of multivariate statistical techniques. Macroinvertebrate and fish assemblages were sampled along with water quality, landuse and qualitative and quantitative habitat assessments from forty-nine sites throughout the Choctawhatchee-Pea, a southeastern U.S. watershed. Multivariate statistical analyses of habitat, water quality, and land-use data were used to determine the relationship between environmental variables and the dependent biological variables, macroinvertebrate and fish community structure. Sampling of biological and environmental data showed that there was a great deal of homogeneity within the watershed, which complicated the task of identifying environmental influences on biological assemblages. Macro-invertebrate and fish assemblages of the Choctawhatchee-Pea watershed were similar in their response to environmental conditions with water chemistry having the greatest relationship to macro-invertebrate and fish community structure followed by instream habitat and land use.

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1455. Influence of instream and landscape-level factors on the distribution of Topeka shiners *Notropis topeka* in Kansas streams.

Schrank, S. J.; Guy, C. S.; Whiles, M. R.; and Brock, B. L. *Copeia* (2): 413-421. (2001); ISSN: 00458511

Descriptors: abundance/ population decline/ spatial distribution/ stream/ United States/ *Micropterus salmoides*/ *Notropis topeka*

Abstract: The Topeka shiner *Notropis topeka* has declined in abundance throughout its historical range in the central U.S. As a result, this minnow was listed as federally endangered in 1999. The objective of our study was to quantitatively assess instream physical, chemical, and

biological parameters and landscape-level factors influencing the distribution (i.e., extant or extirpated) of Topeka shiners. We sampled 26 streams in the Flint Hills region of Kansas: 12 sites where Topeka shiners are extant; and 14 sites where they are extirpated. Multivariate analysis of variance was used to test whether variables were different between extant and extirpated sites. Mean catch per effort of largemouth bass in stream pools was higher at extirpated sites, and species diversity by trophic guild and richness in stream pools were higher at extirpated sites. Stepwise logistic regression was used to develop a model to predict whether Topeka shiners were extant or extirpated. Number of small impoundments per watershed area, catch per effort of largemouth bass *Micropterus salmoides* in pools, and length of pool were the only significant variables in the logistic model. Our model correctly classified 83% of extant sites and 85% of extirpated sites. In a landscape-level analysis of 111 streams, only number of small impoundments per watershed area was significant in the logistic model. These results provide predictive tools to assess instream and landscape-level characteristics for habitat management and possible reintroduction of Topeka shiners in Kansas Flint Hills streams.

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1456. Influence of intensive rotational grazing on bank erosion, fish habitat quality, and fish communities in southwestern Wisconsin trout streams.

Lyons, J.; Weigel, B. M.; Paine, L. K.; and Undersander, D. J.

Journal of Soil and Water Conservation 55(3): 271-276. (2000)

NAL Call #: 56.8 J822 ; ISSN: 0022-4561

Descriptors: rotational grazing/ stream erosion/ streams/ habitats/ water quality/ *Oncorhynchus mykiss*/ depth/ sediments/ width/ Wisconsin

This citation is from AGRICOLA.

1457. Influence of stream characteristics and grazing intensity on stream temperatures in eastern Oregon.

Maloney, S. B.; Tiedemann, A. R.; Higgins, D. A.; Quigley, T. M.; and Marx, D. B.

Portland, OR: Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture; General Technical Report-PNW 459, 1999. 19 p.

http://www.fs.fed.us/pnw/pubs/gtr_459.pdf

Descriptors: forested watersheds/ grazing management strategies/ grazing intensity/ fisheries/ fish habitat/ chinook salmon/ steelhead trout/ cutthroat trout/ Dolly Varden trout
Abstract: Stream temperatures were measured during summer months, 1978 to 1984, at 12 forested watersheds near John Day, Oregon, to determine temperature characteristics and assess effects of three range management strategies of increasing intensity. Maximum temperatures in streams of the 12 watersheds ranged from 12.5 to 27.8 oC. Maximum stream temperatures on four watersheds exceeded 24 oC, the recommended short-term maximum for rainbow trout (*Oncorhynchus mykiss*) and chinook salmon (*O. tshawytscha*). Streams with greater than 75 percent stream shade maintained acceptable stream temperatures for rainbow trout and chinook salmon. Lowest temperatures were observed in streams from ungrazed watersheds. Although highest temperatures were

observed in the most intensively managed watersheds (2.8 hectares per animal unit month), the effect of range management strategy was not definitive. It was confounded by watershed characteristics and about 100 years of grazing use prior to initiation of this study. This citation is from Treeseearch.

1458. Influences of upland and riparian land use patterns on stream biotic integrity.

Snyder, C. D.; Young, J. A.; Vilella, R.; and Lemarie, D. P. *Landscape Ecology* 18(7): 647-664. (2003)

NAL Call #: QH541.15.L35 L36; ISSN: 0921-2973

Descriptors: commercial activities/ reproduction/ ecology/ habitat utilization/ abiotic factors/ land zones/ Pisces: Urban land use patterns/ streams/ farming and agriculture/ agricultural activity/ reproduction/ agricultural and urban land use patterns/ trophic structure/ community structure/ habitat preference/ West Virginia/ Opequon Creek Watershed/ ecology and reproduction/ Pisces/ chordates/ fish/ vertebrates

Abstract: We explored land use, fish assemblage structure, and stream habitat associations in 20 catchments in Opequon Creek watershed, West Virginia. The purpose was to determine the relative importance of urban and agriculture land use on stream biotic integrity, and to evaluate the spatial scale (i.e., whole-catchment vs riparian buffer) at which land use effects were most pronounced. We found that index of biological integrity (IBI) scores were strongly associated with extent of urban land use in individual catchments. Sites that received ratings of poor or very poor based on IBI scores had >7% of urban land use in their respective catchments. Habitat correlations suggested that urban land use disrupted flow regime, reduced water quality, and altered stream channels. In contrast, we found no meaningful relationship between agricultural land use and IBI at either whole-catchment or riparian scales despite strong correlations between percent agriculture and several important stream habitat measures, including nitrate concentrations, proportion of fine sediments in riffles, and the abundance of fish cover. We also found that variation in gradient (channel slope) influenced responses of fish assemblages to land use. Urban land use was more disruptive to biological integrity in catchments with steeper channel slopes. Based on comparisons of our results in the topographically diverse Opequon Creek watershed with results from watersheds in flatter terrains, we hypothesize that the potential for riparian forests to mitigate effects of deleterious land uses in upland portions of the watershed is inversely related to gradient. © Thomson Reuters Scientific

1459. Innovative static self-cleaning screen protects fish and removes debris at irrigation diversions.

Strong, J. J. and Weir, R. K.

In: *Challenges Facing Irrigation and Drainage in the New Millennium: Proceedings of the U.S. Committee on Irrigation and Drainage*. Fort Collins, CO; 427-436; 2000.

Descriptors: irrigation/ rivers/ water management/ fish/ environmental impact

Abstract: Recent concerns in the USA about the environmental effects of river diversion structures for irrigation systems has prompted the development of new structures that prevent fish (both migratory and non-migratory) from entering irrigation canals where they would otherwise be lost. The diversion structure for the Flathead

Irrigation Project, in a remote location of Montana, USA was developed to be reliable, cost-effective, maintenance-free and not to require electric supply. A suitable screening system was developed utilizing linear array of concave screen panels, installed along the crest of small dams or diversion structures. As the water flows over the screen, a portion flows through to the irrigation system and the remainder flows across the screen surface carrying aquatic life safely downstream.

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1460. Instream investigations in the Beaver Creek watershed in west Tennessee, 1991-95.

Byl, T. D. and Carney, K. A.

Denver, CO: USGS Branch of Information Services; U.S. Geological Survey Water-Resources Investigations Report 96-4186, 1996. 34 pp.

Descriptors: agricultural practices/ agricultural runoff/ best management practices/ BMPs/ herbicides/ interagency cooperation/ nonpoint pollution sources/ path of pollutants/ pollution monitoring/ riparian vegetation/ rivers/ stream pollution/ suspended sediments/ Tennessee/ Beaver Creek/ water pollution control/ water quality control/ watersheds/ wetlands

Abstract: The U.S. Geological Survey (USGS), in cooperation with the Tennessee Department of Agriculture, began a long-term scientific investigation in 1989 to evaluate the effect of agricultural activities on water quality and the effectiveness of agricultural best management practices in the Beaver Creek watershed, West Tennessee. In 1993 as a part of this study, the USGS, in cooperation with the Natural Resources Conservation Service, Shelby County Soil Conservation District, and the Tennessee Soybean Promotion Board, began an evaluation of the physical, chemical, biological and hydrological factors that affect water quality in streams and wetlands, and instream resource-management systems to treat agricultural nonpoint-source runoff and improve water quality. The purpose of this report is to present the results of three studies of stream and wetland investigations and a study on the transport of aldicarb from an agricultural field in the Beaver Creek watershed. A natural bottomland hardwood wetland and an artificially constructed wetland were evaluated as instream resource-management systems. These two studies showed that wetlands are an effective way to improve the quality of agricultural nonpoint-source runoff. The wetlands reduced concentrations and loads of suspended sediments, nutrients, and pesticides in the streams. A third paper documents the influence of riparian vegetation on the biological structure and water quality of a small stream draining an agricultural field. A comparison of the upper reach lined with herbaceous plants and the lower reach with mature woody vegetation showed a more stable biological community structure and water-quality characteristics in the woody reach than in the herbaceous reach. The water-quality characteristics monitored were pH, temperature, dissolved oxygen, and specific conductance. The herbaceous reach had a greater diversity and abundance of organisms during spring and early summer, but the abundance dropped by approximately 85 percent during late summer. A fourth study describes the transport of aldicarb and its metabolites-aldicarb sulfoxide and aldicarb sulfone-in runoff at a small stream draining a cotton field. During 1991 to 1995, aldicarb and its metabolites were detected in runoff events. The highest

concentrations occurred when aldicarb was applied to the field just hours before a rain storm. Aldicarb was not detectable in runoff a few weeks after application. The metabolites of aldicarb were detectable for 76 days after application. These studies demonstrate streambank vegetation and wetlands have a significant influence on stream water quality. The importance of weather conditions to herbicide application and runoff also is evident. This information can be used by resource managers to sustain and improve our Nation's streams for future generations.
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1461. An integrated approach to stream restoration on the Upper Little Colorado River, Arizona.

Valencia, Ruth A.; Wirtanen, Mark; and Moody, Tom
Ecological Society of America Annual Meeting, Proceedings 87: 286-287(2002)
NAL Call #: QH540.E365.

Notes: Meeting abstract; 87th Annual Meeting of the Ecological Society of America and the 14th Annual International Conference of the Society for Ecological Restoration, Tucson, Arizona, USA; August 04-09, 2002.
Descriptors: conservation/ terrestrial ecology: ecology, environmental sciences/ Upper Little Colorado River Watershed Partnership/ erosion/ grazing/ integrated restoration approach/ multiple land ownership/ native riparian vegetation/ riparian corridors/ riparian restoration/ sedimentation/ stream restoration/ water supply/ wildlife habitat

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1462. Integrating stream bioassessment and landscape ecology as a tool for land use planning.

Bailey, Robert C.; Reynoldson, Trefor B.; Yates, Adam G.; Bailey, John; and Linke, Simon
Freshwater Biology 52(5): 908-917. (2007);
ISSN: 0046-5070

Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ Canada/ Macroinvertebrata: habitat management/ land use planning/ stream bioassessment/ landscape ecology/ land use planning/ community structure/ benthos/ environmental indicators/ streams/ benthic communities/ British Columbia/ Fraser River Basin/ invertebrates

Abstract: 1. Bioassessment has evolved significantly from a method of deciding whether an ecosystem exposed to stressors should 'pass' or 'fail' (or how badly it fails). Society wants some notion of what has caused any observed degradation of ecosystems, and what management strategies might improve degraded ecosystems. Managers also want to predict what negative or positive effects different land use strategies will have on the component ecosystems of a landscape, including lakes and streams. 2. Here we illustrate an approach to providing these tools to managers with data from a bioassessment study of streams in the Fraser River Basin of British Columbia, Canada. 3. Landscape scale descriptors of both the natural (e.g. catchment size, surficial geology) and stressor (e.g. hard rock mines, forest harvest) environment of each site were used to define the natural and stressor environments of each of the 242 stream sites. 4. We classified 206 reference (relatively unexposed to human activity) sites using their benthic macroinvertebrate community composition, and then discriminated among the faunally defined groups with landscape scale descriptors of the

natural environment of the sites. 5. This discriminant function model allowed us to predict which group each of the test sites would be in if it were in reference condition, and then measure the relationship between the amount of human activity and the biota in each of these groups. 6. These relationships were turned into projections of what will happen to a stream ecosystem's biota if the stressor environment is either improved or degraded. These projection models form the basis of evidence-based land use planning that takes into account the health of freshwater ecosystems.
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1463. Integrating the stream and its valley: Land use change, aquatic habitat, and fish assemblages (North Carolina).

Scott, M. C.
Athens, GA: University of Georgia, 2001.

Descriptors: fishery management/ interspecific relationships/ multiple use of resources/ resource management/ rivers/ watersheds/ North Carolina
Abstract: Streams integrate landscape processes across multiple spatial and temporal scales. Human activities have extensively altered landscapes in North America, with serious consequences for aquatic ecosystems. I investigated land use in southern Appalachian watersheds to identify proximate effects on stream habitat and ultimate effects on fish assemblage structure and organization. I examined how catchment land use type, extent, spatial pattern, and history affect physical and chemical characteristics of streams, and how instream factors (i.e., habitat) influence distribution and abundance of stream fishes. Field data were used to test predicted relationships and to construct empirical models of relationships among landscape and stream variables. Forest cover accounted for the most variation in nearly all models, supporting predictions of nutrient enrichment, thermal pollution, and sedimentation caused by landscape disturbance. Physicochemical models fit better when landscape predictors were catchment-wide rather than localized, indicating cumulative impacts. Four faunal associations were identified across the landscape. Three classes were dominated by endemic Appalachian highland fishes, forming a continuous gradient in assemblage structure from smaller, cooler, higher-elevation streams to larger, warmer, lower- elevation streams. A fourth association was characterized by non-endemic fishes where habitats were affected by nutrients and sediment in association with forest cover loss in streamside buffers and high density of buildings and roads. Endemic, small-bodied (low fecundity), cool- water trophic specialists that depend on coarse substrate for spawning declined where stream habitats were modified. They were supplanted by cosmopolitan, large- bodied (long-lived, high-fecundity), warmwater trophic generalists that do not require rocky substrates for successful spawning. Streams draining urbanizing catchments, or those that had been severely disturbed in the past, had lower ratios of endemic to widespread taxa even though riparian buffers were largely forested, suggesting legacy effects from past catchment disturbance. Replacement of unique locally-adapted taxa with widespread generalized species has been termed biological homogenization, and may severely affect regional and continental biodiversity, particularly in regions with rich

endemic faunas such as the Southeast. Research identifying functional responses to cumulative effects of landscape change is needed to promote proactive conservation at the watershed scale, management that is critical to maintaining the integrity of aquatic habitat and biodiverse communities.

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1464. Invertebrate biodiversity in agricultural and urban headwater streams: Implications for conservation and management.

Moore, A. A. and Palmer, M. A.
Ecological Applications 15: 1169-1177. (Aug. 2005)
NAL Call #: QH540.E23

Descriptors: aquatic invertebrates/ biodiversity/ species diversity/ aquatic habitat/ land use/ streams/ agricultural watersheds/ urban areas/ riparian buffers/ best management practices/ BMPs/ water pollution/ aquatic insects/ Maryland/ pollution
This citation is from AGRICOLA.

1465. Invertebrate community and stream substrate responses to woody debris removal from an ice storm-impacted stream system, NY USA.

Warren, Dana R. and Kraft, Clifford E.
Hydrobiologia 568: 477-488. (2006)
NAL Call #: 410 H992; ISSN: 0018-8158

Descriptors: ecology/ population dynamics/ freshwater habitat/ lotic water/ abiotic factors/ physical factors/ land zones/ Macroinvertebrata: community structure/ habitat substrate/ community responses/ woody debris removal/ ice storm impacted streams/ population density/ distribution within habitat/ physical factors/ climate and weather/ New York/ Adirondack Mountains/ Rocky Branch Watershed/ invertebrates

Abstract: We assessed the influence of ice-storm-derived debris dams on aquatic macroinvertebrates and stream substrates in a high-gradient watershed in the eastern Adirondack Mountains of New York State. Using a modification of electrofishing techniques, invertebrates were collected once before (June 2000) and once after (June 2001) wood removal from the downstream reach in each of six pairs of reaches (second and third-order streams). Stream substrates were also mapped in 2000 and 2001 to evaluate shifts in dominant substrates within a reach following wood removal. The following metrics were used to compare the invertebrate communities before and after wood removal: genera similarity, Shannon-Weiner equitability, taxa richness, dominant taxon, percent dominance and functional feeding group relative abundance. The changes in removal reaches were evaluated relative to changes in upstream reference reaches using a Before-After Control-Impact (BACI) design and analysis. Stream substrates did not change significantly in response to wood removal, although a trend toward coarser substrates was observed following removal. Following wood removal, the relative proportion of grazers increased upstream and downstream from removed dams in all streams; however, comparisons of other metrics indicated no significant response to removal. Invertebrate responses to wood removal were lower than expected, perhaps due to the presence of abundant boulder-formed pools in this high gradient system.

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1466. Landscape and local influences on the biotic integrity of fish communities in Ohio headwater streams.

McCollum, Donna S.
Oxford, OH: Miami University, 2004.

Descriptors: abiotic factors/ anthropogenic factors/ biodiversity/ catchment area/ community composition/ ecosystem disturbance/ environmental protection/ geomorphology/ prediction/ primary production/ riparian environments/ river basin management/ species diversity/ watersheds/ Ohio

Abstract: Stream ecosystems are holistic systems that incorporate disturbances and abiotic influences at many spatial and temporal scales. This view supports a three-tiered model of variables that determine biotic integrity in streams, with causes and effects flowing from large-scale to fine-scale processes. Tier One characteristics include variables important at the scale of geomorphological processes and land use over entire watersheds. These variables largely determine Tier Two factors, abiotic conditions in a stream reach. Tier Two variables, in turn, largely structure the Tier Three variables, the stream's biotic communities. Through field studies and GIS analysis, relationships among these three tiers of variables were examined in this research to explore the question of how agriculture exerts its influence on stream fishes. This study investigated 27 streams, in two ecoregions and the transition area, or ecotone, between them, in south-central Ohio. The study design allowed questions to be asked concerning the relative influence of geomorphology and land use in varied landscapes, as well as relative impacts of watershed versus riparian land use. The region also contained relatively equal proportions of three types of agriculture (hay, row crops, and pasture) allowing the study to address the question of which land use might be most harmful to stream fish. This study supported the importance of row crop agriculture, finding it to be the most degrading type of agriculture for stream fish, but also found pasture to be an important causal factor in stream community degradation. This study also supported the importance of riparian buffers, finding riparian agriculture to be more degrading than agriculture over the entire watershed. A more interesting finding is the suggestion that a minor amount of nutrient enrichment from agricultural land use may benefit streams that are naturally oligotrophic. A possible mechanism could be increased primary production, which increases macroinvertebrate density, and provides a larger food base for fishes. This study also reports the possible existence of a biodiversity hotspot in the transitional region between the two ecoregions. Some evidence exists that greater habitat heterogeneity increases species richness, suggesting a possible cause for higher biodiversity in this ecotonal region. Since habitat heterogeneity over whole streams was not measured in this study, both the existence and mechanism of such a hotspot needs more study. A final conclusion is that geomorphology and agricultural land use may be equally important in structuring stream conditions, and thus, biological stream communities. This study illustrates the difficulties associated with overlapping causes and effects in complex systems such as streams and their catchments. Several variables in the study reported here required examination at multiple scales and with multiple statistical techniques in order to understand relationships that varied across different regions. The effects of a particular agricultural

variable were not always equal in the diverse landscapes of southern Ohio. Lotic ecologists must examine a variety of ecoregions, and incorporate a variety of scales with a variety of analytic tools, if predictive stream ecology is to become a reality.

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1467. Landscape characteristics, land use, and coho salmon (*Oncorhynchus kisutch*) abundance, Snohomish River, Wash., U.S.A.

Pess, George R.; Montgomery, David R.; Steel, E. Ashley; Bilby, Robert E.; Feist, Blake E.; and Greenberg, Harvey M. *Canadian Journal of Fisheries and Aquatic Science* 59(4): 613-623. (2002)

NAL Call #: 442.9 C16J; ISSN: 0706-652X

Descriptors: freshwater ecology: ecology, environmental sciences/ human ecology: anthropology/ population studies/ wildlife management: conservation/ abundance/ habitat/ land use/ landscape characteristics/ population density/ population restoration

Abstract: We used temporally consistent patterns in the spatial distribution of returning adult coho salmon (*Oncorhynchus kisutch*) to explore relationships between salmon abundance, landscape characteristics, and land use patterns in the Snohomish River watershed, Wash. The proportion of total adult coho salmon abundance supported by a specific stream reach was consistent among years, even though interannual adult coho salmon abundance varied substantially. Wetland occurrence, local geology, stream gradient, and land use were significantly correlated with adult coho salmon abundance. Median adult coho salmon densities in forest-dominated areas were 1.5-3.5 times the densities in rural, urban, and agricultural areas. Relationships between these habitat characteristics and adult coho salmon abundance were consistent over time. Spatially explicit statistical models that included these habitat variables explained almost half of the variation in the annual distribution of adult coho salmon. Our analysis indicates that such models can be used to identify and prioritize freshwater areas for protection and restoration.
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1468. Landscape influences on stream ecosystems: Implications for restoration and management.

Moerke, Ashley Heather

Notre Dame, IN: University of Notre Dame, 2004.

Descriptors: anthropogenic factors/ biodiversity/ community composition/ conservation/ environmental factors/ environmental impact/ habitat/ habitat improvement/ land use/ resource management/ restoration/ river basins/ sedimentation/ water quality/ watersheds/ Indiana, South Bend, Juday Creek

Abstract: The structure and function of streams and rivers worldwide continue to be degraded by human activities including land-use change. To reverse this trend, basic ecological research is needed to evaluate environmental factors influencing streams at multiple spatial scales and to restore streams that are impaired by these factors. Three integrated studies were conducted—a landscape assessment, statewide restoration survey, and restoration case study—to strengthen the scientific framework of stream restoration. A comparative study of 22 Michigan streams elucidated relationships among multiple environmental factors, spatial scales, and stream response variables in a mixed land-use river basin. Water quality was influenced

primarily by regional factors, whereas stream habitat and fishes were influenced by both local and regional factors. Overall, anthropogenic factors (e.g., land use) explained the most variation in stream conditions. Forested streams had the least degraded water quality, habitat, and fish communities whereas agricultural streams lacking buffers were the most degraded. Urban streams and agricultural streams with buffers generally were intermediate in response. A statewide survey of reach-scale stream restorations assessed the nature and extent of restoration in Indiana. The survey identified commonalities across all restorations assessed, including the type of restoration, project goals, and structures installed. In general, stream relocation was the most common type of restoration. However, project evaluation was uncommon and most monitoring was not appropriate for evaluating the goals of the restoration. A long-term assessment of an Indiana stream restoration (Juday Creek) provided additional insights into improvements for future restoration and monitoring designs. Biological responses to the restoration varied with time, taxon, and endpoint measured, which emphasizes that monitoring efforts should incorporate long-term assessments of a suite of biological and physical parameters. Additionally, continued sedimentation from upstream threatened the long-term persistence of habitat and biological integrity, which suggests that restorations should target the scale (e.g., watershed) at which the degradation occurs. This integrated approach identified factors and spatial scales controlling midwestern streams, common restoration approaches used, and the effectiveness of those approaches. This information will help resource managers determine the most appropriate scales and approaches to manage and restore midwestern streams.

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1469. Landscape models to understand steelhead (*Oncorhynchus mykiss*) distribution and help prioritize barrier removals in the Willamette Basin, Oregon, USA.

Steel, E. Ashley; Feist, Blake E.; Jensen, David W.; Pess, George R.; Sheer, Mindi B.; Brauner, Jody B.; and Bilby, Robert E.

Canadian Journal of Fisheries and Aquatic Science 61(6): 999-1011. (2004)

NAL Call #: 442.9 C16J; ISSN: 0706-652X

Descriptors: conservation measures/ reproduction/ reproductive behavior/ behavior/ ecology/ population dynamics/ land zones/ *Oncorhynchus mykiss*: habitat management/ stream barrier removal/ prioritization using landscape models of redd distribution and density/ breeding site/ redds/ migration/ population density/ distribution within habitat/ prediction using landscape models/ implications for prioritizing stream barrier removal/ animal constructions/ Oregon/ Willamette River Basin/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates
Abstract: We use linear mixed models to predict winter steelhead (*Oncorhynchus mykiss*) redd density from geology, land use, and climate variables in the Willamette River basin, Oregon. Landscape variables included in the set of best models were alluvium, hillslope 6%, landslide-derived geology, young (40 years) forest, shrub vegetation, agricultural land use, and mafic volcanic geology. Our approach enables us to model the temporal correlation between annual redd counts at the same site while extracting patterns of relative redd density across sites that

are consistent even among years with varying strengths of steelhead returns. We use our model to predict redd density (redds per kilometre) upstream of 111 probable migration barriers as well as the 95% confidence interval around the redd density prediction and the total number of potential redds behind each barrier. Using a metric that incorporates uncertainty, we identified high-priority barriers that might have been overlooked using only stream length or mean predicted fish benefit and we clearly differentiated between otherwise similar barriers. We show that landscape features can be used to describe and predict the distribution of winter steelhead redds and that these models can be used immediately to improve decision-making for anadromous salmonids.

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1470. Large wood addition for aquatic habitat rehabilitation in an incised, sand-bed stream, Little Topashaw Creek, Mississippi.

Shields, F. D.; Knight, S. S.; and Stofleth, J. M. *River Research and Applications* 22(7): 803-817. (2006)
NAL Call #: TC530.R43 ; ISSN: 1535-1459

Descriptors: aquatic communities/ aquatic environment/ dead wood/ environmental degradation/ erosion/ erosion control/ habitats/ rehabilitation/ species richness/ stream flow/ streams/ willows/ fishes/ *Salix*

Abstract: Large wood (LW) is a key component of stream habitats, and degraded streams often contain little wood relative to less-impacted ones. Habitat rehabilitation and erosion control techniques that emphasize addition of natural wood in the form of individual elements or structures are increasingly popular. However, the efficacy of wood addition, especially in physically unstable, warmwater systems is not well established. The effects of habitat rehabilitation of Little Topashaw Creek, a sinuous, sand-bed stream draining 37 km² in northwest Mississippi are described herein. The rehabilitation project consisted of placing 72 LW structures along eroding concave banks of a 2-km reach and planting 4000 willow cuttings in sandbars opposite or adjacent to the LW structures. Response was measured by monitoring flow, channel geometry, physical aquatic habitat and fish populations in treated and untreated reaches for 2 years before and 4 years after rehabilitation. Initially, LW structures reduced high flow velocities at concave bank toes. Progressive failure of the LW structures and renewed erosion began during the second year after rehabilitation, with only 64% of the structures and about 10% of the willow plantings surviving for 3 years. Accordingly, long-term changes in physical habitat attributable to rehabilitation were limited to an increase in LW density. Fish biomass increased in the treated reach, and species richness approximately doubled in all reaches after rehabilitation, suggesting the occurrence of some sort of stressful event prior to our study. Fish community composition shifted toward one typical of a lightly degraded reference site, but similar shifts occurred in the untreated reaches downstream, which had relatively high levels of naturally occurring LW. Large wood is a key component of sand-bed stream ecosystems, but LW addition for rehabilitation should be limited to sites with more stable beds and conditions that foster rapid woody plant colonization of sediment deposits.

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1471. Large woody debris and its influence on macroinvertebrate assemblages in southeastern coastal plain streams, USA.

Bhattarai, S. and Mullen, M. W. *Southeastern Biology* 53(2): 215-216. (2006);
ISSN: 1533-8436

Descriptors: freshwater streams/ stream ecology/ woody debris/ macroinvertebrates/ macroinvertebrate abundance/ Choctawhatchee River/ habitat structures/ habitat complexities/ rivers/ lakes/ freshwater environments/ Alabama

Abstract: Large woody debris (LWD) has important structural and functional roles in streams, but there is little research to support this view in the southeastern coastal plains. This study surveyed 35 stream reaches in the Choctawhatchee River watershed of southeastern Alabama. These reaches were broadly classified into three distinct categories: urban, forested and mixed. Large woody debris characteristics and functions were quantified. Pool, sediment characteristics, and drainage areas of each reach were measured along with assessment of macroinvertebrate assemblages. Statistical analyses of LWD, pool, sediment, drainage and macroinvertebrate data were used to examine the relationship among LWD characteristics and functions, pool, drainage and sediment characteristics, and biological variables. There were significant differences in LWD number and volume among the three site categories. These differences apparently resulted in a higher frequency of pools, sediment storage sites and woody debris storage sites, and more ecologically important, heterogeneous habitat in forested streams that contained higher number and volume of LWD. Large woody debris positively influenced macroinvertebrate assemblages and partially abated the negative effect of fine sediment on macroinvertebrates, as indicated by significant positive correlations among LWD, pools and biological variables and an apparent increase in the complexity of in-stream habitat.

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1472. Large woody debris and land management in California's hardwood-dominated watersheds.

Opperman, J. J. *Environmental Management* 35(3): 266-277. (2005)
NAL Call #: HC79.E5E5 ; ISSN: 0364152X.

Notes: doi: 10.1007/s00267-004-0068-z.

Descriptors: debris jams/ large woody debris/ Mediterranean-climate streams/ private land/ steelhead/ debris/ forestry/ hardwoods/ land use/ surveys/ debris-jam frequency/ hardwood-dominated watersheds/ land management/ large woody debris (LWD)/ watersheds/ watershed management/ wood debris/ conservation of natural resources/ environment design/ rivers/ water supply/ forestry/ hardwoods/ land use/ surveys/ water sheds/ Coniferophyta/ *Oncorhynchus mykiss*/ Salmonidae

Abstract: Although large woody debris (LWD) has been studied extensively in conifer-dominated watersheds, relatively little is known about LWD in hardwood-dominated watersheds. Field surveys of 32 hardwood-dominated stream reaches in northern coastal California revealed that levels of LWD varied with land ownership and that living trees strongly influenced debris jam formation. Almost half of the channel-spanning debris jams, which stored the most wood and were most likely to form a pool, were formed behind a key piece that was still living. These living key

pieces might provide greater longevity and stability than would otherwise be expected from hardwood LWD.

Compared to streams on private land, streams on public land had significantly greater LWD loading and debris-jam frequency. Land management practices that remove wood from streams might be contributing to the degradation of salmonid habitat in California's hardwood-dominated watersheds. © 2005 Springer Science+Business Media, Inc.

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1473. Least-desired index for assessing the effectiveness of grass riparian filter strips in improving water quality in an agricultural region.

Kosnicki, Ely and Sites, Robert W.

Environmental Entomology 36(4): 713-724. (2007)

NAL Call #: QL461.E532; ISSN: 0046-225X

Descriptors: methods and techniques/ conservation/ agronomy: agriculture/ freshwater ecology: ecology, environmental sciences/ least desired index/ LDI, laboratory techniques/ grass riparian filter strip/ grfs, field equipment/ water quality/ stream/ sedimentation/ biotic integrity

Abstract: Unprotected streams within the agricultural Midwest region of the United States are subject to sedimentation, nutrification, and agricultural chemicals. Grass riparian filter strips (GRFSs) have been implemented as a best management practice to minimize sedimentation and associated materials that are harmful to aquatic ecosystems; however, few studies have examined the benthic community response to CRFS installation. This study introduces a least-desired index (LDI) multimetric approach of evaluating benthic communities in response to GRFS installation. LDI was determined in a reciprocal fashion to that of a benthic macroinvertebrate index of biotic integrity (B-IRI). When reference conditions are not available for the use of B-IRI, anti-reference sites, representing least-desired conditions, can be used in constructing an LDI. A B-IRI and LDI were constructed in the Claypan Till Plains Subsection of Missouri and comparatively used to evaluate two test sites where tall fescue GRFS were installed. Five metrics were used to develop the B-IRI and six for the LDI. The LDI tended to be more conservative at evaluation in comparison to the B-IRI. Paired t-tests showed that LDI and B-IRI were significantly different at scoring test sites. The LDI assessed both test sites as showing no response to GRFS installation, whereas the B-IRI suggested moderate improvement. The LDI was considered to be a better index for evaluation because the streams used to develop the B-IRI were not suitable reference sites. An argument for the use of chironomid based metrics in low gradient agricultural streams is presented.

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1474. Literature review on the effects of rip-rap on fish and fish habitat with habitat management implications.

Quigley, J. T. and Harper, D. J.

Canadian Manuscript Report of Fisheries and Aquatic Sciences 2701: 1-76, X-XI. (2004); ISSN: 0706-6473.

Notes: Literature review.

Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ North America/ Canada/ Pisces: habitat management/ streambank protection with rip rap/ impact on populations/ impact of streambank protection with rip rap/ community structure/

population dynamics/ stream/ British Columbia/ Pisces/ chordates/ fish/ vertebrates

Abstract: This study provides habitat management staff in the Pacific Region of Fisheries and Oceans Canada (DFO) with the most recent information on the range of potential effects of rip-rap on fish and fish habitat in order to improve decision making and regional consistency. The effects of rip-rap on fish and fish habitat were investigated through a literature review and an evaluation of over 20 years of environmental impact monitoring data in British Columbia. At a local scale, positive and negative effects of rip-rap on fish and fish habitat were found. Positive effects tended to occur with applications of rip-rap in degraded systems that had excessive erosion problems, particularly where it was combined with other habitat management strategies. Negative effects of rip-rap applications were related to the loss of natural habitat, as vegetated natural banks almost universally provided superior habitat than rip-rapped sites. In fact, our study suggested that sites with only 14% of their site length vegetated provided higher habitat value than rip-rapped sites. Watershed scale effects include restricted lateral channel migration, decreased natural sediment deposition, reduced recruitment of gravel and large woody debris, hydrological changes (such as reduced ability to attenuate flood peaks) and reduced heterogeneity of habitat. These effects are largely negative and potentially cumulative in nature. The effects from rip-rap should not be considered solely on a site specific basis. Impacts to landscape-level ecological and hydrological processes should be considered during the assessment of proposed rip-rap projects. Short term management recommendations: 1. DFO should be precautionary in the use of rip-rap, and only consider it as an option in degraded systems that are devoid of riparian vegetation and subject to excessive erosion. 2. DFO should encourage the use of alternative streambank stabilization methods, such as bio-engineering approaches (Adams 2003; MELP 2000), that may provide a greater value to fish habitat. 3. The application of rip-rap at vegetated sites will likely result in a loss of productive capacity and should be Authorized pursuant to Section 3 5(2) of the Fisheries Act provided the impacts from the proposed development cannot be fully mitigated. 4. If rip-rap is the only viable alternative for streambank protection, and is to be applied at a scale large enough to potentially affect river processes, DFO should require a hydrological assessment. The impact assessment should consider landscape-level ecological and hydrological processes, and downstream cumulative impacts to the watershed. For Authorized rip-rap streambank protection projects, DFO should require compensation, including additional techniques other than simply re-vegetating the site. Consideration should be given to off-channel habitat development to compensate for the loss of potential for natural off-channel habitat development. Rigorous monitoring and maintenance programs should be implemented to ensure compensation success. Long-term management recommendations: 6. Dialogue with other levels of government and industry groups responsible for linear development (pipelines, railway, highways, etc.) should be initiated and maintained to develop strategies for protection of watersheds from excessive application of rip-rap as a bank protection technique. 7. Long term plans for river migration corridors should be developed. These plans should incorporate flood control solutions as alternatives to channelization.

Examples include setback dykes at anticipated problem areas, stepped levees, greenbelts, meander zones, riparian conservation easements, subdivision regulations, building codes and zoning ordinances. A pro-active approach to planning can increase the range of solutions available, and avoid dealing with projects on an emergency basis where potential solutions can be limited. 8. A coordinated education and awareness initiative should be undertaken targeting all private and industrial landowners and stakeholders within and adjacent to river migration corridors. The value of natural riparian vegetation in terms of both stream bank protection and fish habitat should be promoted to reduce unnecessary riparian removal and subsequent activities that result in an overall hardening of stream banks within a watershed without due consideration of its overall impact. 9. The effectiveness of alternate bio-engineering approaches to streambank protection should be quantified using a scientific monitoring and assessment program. 10. Long term field research should be conducted to fill the information gap on cumulative watershed level impacts resulting from extensive rip-rapping.

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1475. Livestock grazing.

Platts W. S. and Meehan W. R.

In: Influences of forest and rangeland management on salmonid fishes and their habitats.

Bethesda: American Fisheries Society, 1991; pp. 389-423.

NAL Call #: SH167.S17I53 1991

Descriptors: grazing/ livestock/ rangeland management/ forestry management/ fish populations/ salmonid/ fish ecology

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1476. Livestock grazing effects on southwestern streams: A complex research problem.

Rinne, J. N.

In: Riparian ecosystems and their management:

Reconciling conflicting uses, General Technical Report-RM 120/ Johnson, R. Roy ; Ziebell, Charles D.; Patton, David R.; Ffolliott, Peter F.; and Hamre, R. H.; Fort Collins, Colo.: Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, 1985. pp. 295-299.

Notes: Conference held April 16-18, 1985 in Tuscon, Ariz.

NAL Call #: aSD11.A42

Descriptors: livestock/ habitats/ fish/ grazing/ riparian buffers/ streams/ New Mexico

This citation is from AGRICOLA.

1477. Livestock grazing, golden trout, and streams in the Golden Trout Wilderness, California: Impacts and management implications.

Knapp, R. A. and Matthews, K. R.

North American Journal of Fisheries Management 16(4): 805-820. (1996)

NAL Call #: SH219.N66; ISSN: 0275-5947

Descriptors: freshwater fish/ population density/ water quality/ land use/ California/ canopy shading/ livestock/ grazing/ trout/ ecological effects/ resources management/ freshwater fish/ fluvial morphology/ plant populations/ vegetation cover/ fishery management/ predators/ *Oncorhynchus aguabonita*/ degradation/ physical properties/ environmental effects

Abstract: Impacts of livestock grazing on California golden trout *Oncorhynchus mykiss aguabonita* and their habitat were studied inside and outside of livestock exclosures in the Golden Trout Wilderness, California. In two consecutive years, the majority of stream physical characteristics showed large differences between grazed and ungrazed areas, and the directions of these differences were consistent with the recovery of exclosed streams and riparian areas from impacts caused by livestock grazing. Ungrazed areas consistently had greater canopy shading, stream depths, and bank-full heights and smaller stream widths than grazed areas. California golden trout were very abundant in the study sites; their densities and biomasses were among the highest ever recorded for stream-dwelling trout in the western United States. California golden trout density and biomass per unit area were significantly higher in ungrazed than in grazed areas in three of four comparisons. Differences between grazed and ungrazed areas were less consistent when density and biomass were calculated on the basis of stream length. Our results suggest that current levels of livestock grazing are degrading the stream and riparian components of the study meadows to the detriment of golden trout populations.

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1478. Livestock grazing management impacts on stream water quality: A review.

Agouridis, C. T.; Workman, S. R.; Warner, R. C.; and Jennings, G. D.

Journal of the American Water Resources Association 41(3): 591-606. (2005)

NAL Call #: GB651.W315; ISSN: 1093474X

Descriptors: agriculture/ environmental impacts/ nonpoint source pollution/ sustainability/ water quality/ stream flow/ best management practices/ BMPs/ climatic regions/ livestock grazing management/ stream water quality/ agricultural runoff/ animals/ hydraulics/ rivers

Abstract: Controlling agricultural nonpoint source pollution from livestock grazing is a necessary step to improving the water quality of the nation's streams. The goal of enhanced stream water quality will most likely result from the implementation of an integrated system of best management practices (BMPs) linked with stream hydraulic and geomorphic characteristics. However, a grazing BMP system is often developed with the concept that BMPs will function independently from interactions among controls, climatic regions, and the multifaceted functions exhibited by streams. This paper examines the peer reviewed literature pertaining to grazing BMPs commonly implemented in the southern humid region of the United States to ascertain effects of BMPs on stream water quality. Results indicate that the most extensive BMP research efforts occurred in the western and midwestern U.S. While numerous studies documented the negative impacts of grazing on stream health, few actually examined the success of BMPs for mitigating these effects. Even fewer studies provided the necessary information to enable the reader to determine the efficacy of a comprehensive systems approach integrating multiple BMPs with pre-BMP and post-BMP geomorphic conditions. Perhaps grazing BMP research should begin incorporating geomorphic information about the streams with the goal of achieving sustainable stream water quality.

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1479. Livestock grazing relationships with fisheries.

Burton, T. A. and Kozel, S. J.

In: Proceedings of a symposium on sustaining rangeland ecosystems. Eastern Oregon State College, La Grande, Oregon. Edge, W. D. and Olsen-Edge, S. L. (eds.); Vol. Special Report 953.

Corvallis, Ore.: Oregon State University Extension Service; pp. 140-145; 1996.

NAL Call #: 100 Or3M no.953

Descriptors: forest ecology/ forest management/ water quality/ grassland management/ riparian forests/ riparian vegetation/ grasslands/ riparian grasslands/ management/ environmental degradation/ erosion/ grazing/ grazing intensity/ fisheries/ vegetation types

Abstract: The importance of appropriate management of riparian grasslands for maintaining the quality of aquatic habitats is emphasized. Recent estimates for W. USA have indicated that 66% of Bureau of Land Management riparian areas are not functioning properly or are functioning at risk and that 22% of US Forest Service riparian areas are not meeting forest plant objectives for proper condition. Grazing management may have a major effect on aquatic ecosystems. In the Bear Valley Basin, Idaho, use of early-season low intensity grazing by cattle reversed the downward trend in stream bank stability and substrate sedimentation, increasing the survival of the endangered chinook salmon (*Oncorhynchus tshawytscha*).

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1480. Livestock influences on riparian zones and fish habitat: Literature classification.

Larsen, R. E.; Krueger, W. C.; George, M. R.; Barrington, M. R.; Buckhouse, J. C.; and Johnson, D. E. *Journal of Range Management* 51(6): 661-664. (1998)

NAL Call #: 60.18 J82; ISSN: 0022-409X.

Notes: Literature review.

Descriptors: classification/ grazing/ riparian vegetation/ habitats/ field experimentation/ experimental design/ streams/ riparian grasslands

Abstract: A key was used to classify articles about livestock influences on riparian zones and fish habitat into 3 classes: papers that contained original data, those that were commentary, and reports about methodology such as classification systems, policies, and monitoring criteria. Four hundred and twenty-eight of the total articles were directly related to grazing impacts on riparian zones and fish habitat. Only 89 of these grazing impact articles were classified as experimental, where treatments were replicated and results were statistically valid. This analysis revealed several limitations of riparian grazing studies that included: (1) inadequate description of grazing management practices or treatments, (2) weak study designs, and (3) lack of pre-treatment data.

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1481. The long-term effectiveness of fish habitat restoration practices: Lawrence Creek, Wisconsin.

Champoux, O.; Biron, P. M.; and Roy, A. G.

Annals of the Association of American Geographers 93(1): 42-54. (Mar. 2003)

Descriptors: animal morphology/ aquatic habitat/ bank erosion/ channel flow/ channel morphology/ deterioration/ environmental impact/ feeding behavior/ fish management/ fluvial morphology/ freshwater fish/ geomorphology/ grazing/ habitat/ habitat improvement/ moraines/ pools/

rehabilitation/ rivers/ stream discharge/ trout/ Salmonidae/ Wisconsin

Abstract: Although many streams in North America have been rehabilitated to improve the habitat of salmonids, little is known about the long-term impacts of such practices on salmonid habitats and on river dynamics. The success of these improvement schemes is often assessed a short time after the work is completed and is usually based on changes in the targeted biological populations. This article examines the long-term effects of bank-cover deflectors on the physical fish habitat and on the channel morphology. The study was conducted on Lawrence Creek, a small stream in Wisconsin, where trout habitat had been affected negatively by intense cattle grazing. Data on the physical habitat and on channel morphology were collected on a 600-m-long reach in 1963 (immediately prior to the rehabilitation work), in 1966, and in 1999. In the upstream section, the channel flows through a moraine deposit where bed material is coarser than the material of the outwash plain found in the downstream portion of the reach. Results indicate that fish habitat in 1999 was better than in 1963 but has deteriorated substantially since 1966. Pool area increased from 267 m² to 625 m² between 1963 and 1966, but has decreased to 488 m² since then. Most of this deterioration, however, is concentrated in the morainic section. In the outwash plain, the deflectors are still in good condition, and the area occupied by pools has remained constant since 1966. In the morainic section, most structures are no longer efficient and the channel is unstable due to high bed-shear stress values, which entrain bed and bank erosion. Effective long-term rehabilitation schemes should therefore carefully consider the varying sensitivity of river reaches due to different geomorphic contexts.

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1482. Macroinvertebrate assemblage change in a small eastern Oregon stream following disturbance by grazing cattle.

Reed, T.

Journal of Freshwater Ecology 18(2): 315-320. (2003)

NAL Call #: QH541.5.F7J68; ISSN: 0270-5060

Descriptors: zoobenthos/ macrofauna/ grazing/ sampling/ ecosystem disturbance/ aquatic insects/ community composition/ population structure/ rivers/ biotic factors/ herbivores/ Chironomidae/ Ephemeroptera/ Oregon/ cattle/ midges/ mayflies

Abstract: Badger Creek (Ochoco National Forest, Oregon) was sampled before and after cattle arrived and on July 31 in a reach of stream where cattle were present and a reach where they were not. Index values and ordination of these samples indicates that seasonality and local conditions are important drivers in macroinvertebrate community composition. In both a three month survey and the single date sampling, disturbance by grazing cattle was correlated with more Chironomidae larvae and fewer mayflies, indicating that cattle create an environment conducive to the macroinvertebrate assemblage compositions found in low oxygen, organically enriched systems.

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1483. Macroinvertebrate communities in agriculturally impacted southern Illinois streams: Patterns with riparian vegetation, water quality, and in-stream habitat quality.

Stone, Mandy L.; Whiles, Matt R.; Webber, Jeremy A.; Williard, Karl W.; and Reeve, John D.

Journal of Environmental Quality 34(3): 907-917. (May 2005)

NAL Call #: QH540.J6

Descriptors: agriculture/ aquatic habitat/ aquatic insects/ biomass/ copepods/ dominant species/ drainage ditches/ environmental quality/ forests/ habitat preferences/ harbors/ headwaters/ macroinvertebrates/ mollusks/ oligochaetes/ organic matter/ orthophosphates/ pollution monitoring/ population density/ riparian land/ riparian vegetation/ rivers/ silt/ streams/ structure/ substrates/ vegetation/ water quality/ water chemistry/ water quality/ zoobenthos/ Chironomidae/ Copepoda/ Mollusca/ Physella/ Sphaerium/ Illinois

Abstract: Relationships between riparian land cover, in-stream habitat, water chemistry, and macroinvertebrates were examined in headwater streams draining an agricultural region of Illinois. Macroinvertebrates and organic matter were collected monthly for one year from three intensively monitored streams with a gradient of riparian forest cover (6, 22, and 31% of riparian area). Bioassessments and physical habitat analyses were also performed in these three streams and 12 other nearby headwater streams. The intensively monitored site with the least riparian forest cover had significantly greater percent silt substrates than the sites with medium and high forest cover, and significantly higher very fine organics in substrates than the medium and high forested sites. Macroinvertebrates were abundant in all streams, but communities reflected degraded conditions; noninsect groups, mostly oligochaetes and copepods, dominated density and oligochaetes and mollusks, mostly *Sphaerium* and *Physella*, dominated biomass. Of insects, dipterans, mostly Chironomidae, dominated density and dipterans and coleopterans were important contributors to biomass. Collector-gatherers dominated functional structure in all three intensively monitored sites, indicating that functional structure metrics may not be appropriate for assessing these systems. The intensively monitored site with lowest riparian forest cover had significantly greater macroinvertebrate density and biomass, but lowest insect density and biomass. Density and biomass of active collector-filterers (mostly *Sphaerium*) decreased with increasing riparian forest. Hilsenhoff scores from all 15 sites were significantly correlated with in-stream habitat scores, percent riparian forest, and orthophosphate concentrations, and multiple regression indicated that in-stream habitat was the primary factor influencing biotic integrity. Our results show that these "drainage ditches" harbor abundant macroinvertebrates that are typical of degraded conditions, but that they can reflect gradients of conditions in and around these streams.

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1484. Macroinvertebrate community responses to selection logging in riparian and upland areas of headwater catchments in a northern hardwood forest.

Kreutzweiser, D. P.; Capell, S. S.; and Good, K. P.

Journal of the North American Benthological Society 24(1): 208-222. (2005)

NAL Call #: QL141.F7; ISSN: 08873593.

Notes: doi: 10.1899/0887-3593(2005)024<0208:MCRTSL>2.0.CO;2.

Descriptors: northern hardwood forests/ selection logging/ stream insect communities/ community structure/ ecological impact/ macroinvertebrate/ riparian forest/ selective logging/ stream/ Insecta/ Riparia

Abstract: Aquatic insect communities were examined in 2 streams at different selection logging intensities in headwater catchments of a northern hardwood forest. Insect communities of these streams were compared to those of a nearby reference stream (no harvesting) over a 2-y pre- and 3-y post-logging period. The experimental catchments were logged by a mechanical harvester and cable skidders, one at a low-intensity (29% basal area removal) and the other at a moderate-intensity (42% basal area removal) harvesting rate. There were no riparian reserves or buffer zones, but logging was conducted in compliance with a riparian code of practice (3-m setback from stream edges) and other best management practices. Changes in community structure, community metrics, or relative abundance of discriminatory taxa attributable to logging impacts were not detected at the low-intensity site. Some deviations from reference and pre-logging trends in community structure, multivariate dispersion, and population levels of discriminatory taxa were detected at the moderate-intensity site after the logging. These deviations were mainly driven by small, but usually significant, increases in abundance of 5 gatherer taxa. The increases in abundance of gatherer taxa appeared to be a response to a significant increase (~2.5x) in streambed deposition of fine particulate organic material at that site. However, the shifts in community structure and changes in abundance of these taxa at the moderate-intensity site were not larger than some natural changes in abundance among other taxa at the reference site over the 5-y study. The increases in abundance of some taxa at the moderate-intensity site may indicate a logging impact, but the changes were small and there were no indications of reciprocal declines among other taxa. It appears that selection logging at up to 42% basal area removal in compliance with the riparian code of practice and other good management practices largely mitigated harmful alterations to stream habitat and insect communities in these northern hardwood forest catchments. © 2005 by The North American Benthological Society. © 2008 Elsevier B.V. All rights reserved.

1485. Macroinvertebrate community structure and function associated with large wood in low gradient streams.

Johnson, Lucinda B.; Breneman, Dan H.; and Richards, Carl

River Research and Applications 19(3): 199-218. (2003)

NAL Call #: TC530.R43

Descriptors: biogeography: population studies/ freshwater ecology: ecology, environmental sciences/ Invertebrata, Animalia/ macroinvertebrate (Invertebrata): common, clinger, sprawler, swimmer/ Michigan/ Minnesota/

agricultural regions/ behavior/ channel flow/ community function/ community structure/ dominant substrate composition/ feeding characteristics/ forested stream ecosystems/ habitat types/ large woody debris/ local diversity/ low gradient streams/ multiple habitat qualitative sampling approach/ regional patterns/ trophic characteristics/ wood abundance/ wood distribution

Abstract: Large woody debris (wood) plays a number of important roles in forested stream ecosystems. Wood in streams provides habitat and flow refugia for fish and invertebrates, and is a site of biofilm production that serves as food for grazing organisms. Logs added to streams are rapidly colonized by invertebrates, and this habitat alteration is accompanied by changes in community composition and functional processes. A multiple habitat, qualitative sampling approach was employed to evaluate macroinvertebrate communities associated with wood habitats in 71 stream reaches in central Michigan and southeastern Minnesota, two agricultural regions in the midwestern United States. Macroinvertebrate taxa were classified with respect to behaviour (e.g. sprawler, clinger, swimmer), as well as trophic/feeding characteristics. These traits were used to examine community structure as a function of wood abundance and distribution. Although wood is not abundant in these streams and logs are generally small in size, wood is a very important habitat in both Michigan and Minnesota: 86% and 95% of the total taxa encountered at Michigan and Minnesota study sites, respectively, were found in wood habitats. Differences in regional patterns in the distribution of taxa across habitats were observed between Michigan and Minnesota. These are believed to result from differences in the number of habitat types available, and the dominant substrate composition. Local invertebrate diversity increased in Michigan, but not Minnesota, with the presence of wood habitats in streams. The presence of wood at a site increased the average taxa richness by 15 and 10 taxa in Michigan and Minnesota, respectively. Macroinvertebrate behavioural attributes and functional traits associated with wood habitats suggest that community traits may vary due to both local difference in flow and the location of wood in the channel.

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1486. Macroinvertebrate response to logging in coastal headwater streams of Washington, U.S.A.

Haggerty, S. M.; Batzer, D. P.; and Jackson, C. R.
Canadian Journal of Fisheries and Aquatic Science 61(4): 529-537. (2004)
 NAL Call #: 442.9 C16J; ISSN: 0706-652X
Descriptors: commercial activities/ ecology/ population dynamics/ freshwater habitat/ lotic water/ abiotic factors/ land zones/ Macroinvertebrata: forestry/ logging/ community responses/ biomass/ logging effects/ community structure/ population density/ stream/ coastal headwater streams/ community responses to logging/ physical factors/ sediment composition and accretion rates/ Washington/ coastal mountain ranges/ invertebrates
Abstract: We examined the effects of logging on macroinvertebrate assemblages in first-order streams of four coniferous watersheds in Washington's Coastal Mountain ranges. Each watershed contained three to four first-order streams that were placed into one of three treatment types: clear-cut logging, operational buffer-strip (2.5-21 m) logging, or uncut reference streams. Prelogging

baseline data on macroinvertebrate assemblages, channel morphology, sediment composition, sediment accretion rates, and water temperatures were collected from each stream in summer 1998. Logging operations were conducted the next winter and spring. Streams were resampled in summer 1999, within 1 year of logging, and summer 2000, 1+ years after logging. Preexisting treatment differences did not exist in 1998, indicating that postharvest treatment differences could be attributed to logging operations. In 1999, densities of macroinvertebrate collectors, densities and biomass of macroinvertebrate shredders, and accretion rates of organic sediments were greater in clear-cut and buffered streams than uncut references. These differences diminished by 2000. An increase in collecting and shredding macroinvertebrate is not a typical response to logging and may reflect the fact that logged streams became buried under slash, increasing detrital food supplies for these organisms. The narrow buffers used for this study did not prevent macroinvertebrate community changes associated with logging.

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1487. Management alternatives to enhance water quality and ecological function of channelized streams and drainage canals.

Evans, R. O.; Bass, K. L.; Burchell, M. R.; Hinson, R. D.; Johnson, R.; and Doxey, M.
Journal of Soil and Water Conservation 62(4): 308-320. (July 2007-Aug. 2007)
 NAL Call #: 56.8 J822
Descriptors: constructed wetlands/ floodplains/ drainage channels/ stream channels/ drainage water/ water management/ watershed hydrology/ water quality/ plant communities/ macroinvertebrates/ wildlife habitats/ ecological function/ best management practices/ BMPs/ North Carolina/ irrigation and drainage/ wildlife conservation
 This citation is from AGRICOLA.

1488. Managing the Columbia River: Instream flows, water withdrawals, and salmon survival.

National Research Council, Water Science and Technology Board
 Washington, DC: National Academy Press; 268 p. pp. (2004).
http://www.nap.edu/catalog.php?record_id=10962
Descriptors: anadromous species/ commercial fishing/ dams/ ecological effects/ environment management/ habitats/ hydrological regime/ instream flow/ man-induced effects/ nature conservation/ population dynamics/ rare species/ regulated rivers/ river basins/ river flow/ rivers/ salmon/ selective withdrawal/ stream flow/ survival/ water budget/ United States/ Columbia R.
Abstract: For thousands of years, North America's Columbia River salmon runs were the most abundant on Earth. The salmon evolved in a setting of many long- and short-term environmental changes and disruptions. With the introduction of an industrial-based economy to the region in the late nineteenth century, the scale and rate of environmental variability in the basin changed. The creation of impoundments on the Columbia River and its tributaries, dam operations, commercial fishing, logging, diversions for irrigated agriculture, and human population growth have altered the Columbia's presettlement flow regime and have reduced the quality of salmon habitat across the river basin.

There have been attendant declines--including some extinctions--in the populations of all resident salmon species. Many of these salmon are currently listed as threatened and endangered pursuant to the federal Endangered Species Act. Annual salmon and steelhead returns to the Columbia River estuary are estimated to have been as high as 16 million fish per year during the late 1800s. The returns have dwindled over time, dropping to near 1 million fish per year in the 1990s. These numbers rebounded in the late 1990s and early 2000s, largely because that time frame coincided with a period of favorable ocean condition for salmon. The majority of returns today consist of hatchery-reared fish.

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1489. Minimum habitat requirements for establishing translocated cutthroat trout populations.

Hartig, Amy L. and Fausch, Kurt D.

Ecological Applications 12(2): 535-551. (2002)

NAL Call #: QH540.E23; ISSN: 1051-0761

Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ abiotic factors/ land and freshwater zones/ *Oncorhynchus clarki* (Salmonidae): release and relocation programmes/ translocation/ minimum habitat requirements/ establishing populations/ habitat utilization/ streams/ abiotic factors/ Colorado/ New Mexico/ establishing translocated populations/ Salmonidae/ Salmoniformes, Actinopterygii, Pisces/ chordates/ fish/ vertebrates

Abstract: Translocation is an important management strategy in conservation programs for endangered or threatened species, including native cutthroat trout (*Oncorhynchus clarki*) in the western United States. Most subspecies of cutthroat trout have declined to <5% of their historical range, and both historical and translocated populations now persist in small isolated fragments of habitat. Success rates for translocations of fishes are generally <50%, and habitat quality or quantity are frequently cited as the cause of failure. Therefore, we conducted field surveys of stream-scale habitat and measured basin-scale habitat using a Geographic Information System for 27 streams where two subspecies of cutthroat trout were translocated in Colorado and New Mexico, to identify specific habitat attributes that contribute to the success of translocations. We used polytomous logistic regression to develop models that predict three categories of cutthroat trout translocation success (high, low, absent) from habitat attributes at two spatial scales. Models based on stream-scale habitat attributes indicated that cold summer water temperature, narrow stream width, and lack of deep pools limited translocations of cutthroat trout. Cold summer temperatures are known to delay spawning and prolong egg incubation, which reduces the growth of fry and likely limits their overwinter survival. Furthermore, small streams with few deep pools may lack the space necessary to permit overwinter survival of a sufficient number of individuals to sustain a population. Models based on basin-scale habitat were not as effective as stream-scale habitat models for distinguishing among translocation sites with high, low, or absent population status but indicated that a minimum watershed area of 14.7 km² was useful as a coarse filter for separating sites with high numbers of cutthroat trout from those with low or absent status. Watersheds larger than this are expected to encompass low-elevation habitat that provides warmer

summer temperatures and to have relatively wide stream channels of sufficient length to provide an adequate number of deep pools. These results indicate that the appropriate scale of habitat measurement for predicting cutthroat trout translocation success in fragmented watersheds is at the patch rather than landscape scale, which is similar to results for other salmonids and vertebrate taxa in general.

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1490. Monitor and protect Wigwam River bull trout for Koocanusa Reservoir: Skookumchuck Creek juvenile bull trout and fish habitat monitoring program.

Cope, R. S.

Portland, OR: Bonneville Power Administration; BPA Report DOE/BP 00005672-8, 2004. i-vii, 1-40.

Notes: 2002-2003 annual report, project no. 200000400; Related report: DOE/BP-00005672-5.

<http://pisces.bpa.gov/release/documents/documentviewer.aspx?pub=R00005672-8.pdf>

Descriptors: conservation/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ North America/ Canada/ Pisces: conservation measures/ habitat monitoring program/ annual research report/ stream/ British Columbia/ Skookumchuck Creek/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates

Abstract: The Skookumchuck Creek juvenile bull trout (*Salvelinus confluentus*) and fish habitat monitoring program is a co-operative initiative of the British Columbia Ministry of Water, Land, and Air Protection and Bonneville Power Administration. The objective was to develop a better understanding of juvenile bull trout and Westslope cutthroat trout recruitment and the ongoing hydrologic and morphologic processes, especially as they relate to spawning and rearing habitat quality. This report provides a summary of results obtained to date. In 2003, several minor modifications were made to the three Skookumchuck Creek index sites permanently established in 2002. Sites one and three were extended by 210 m and 100 m, respectively, and the bankfull height was lowered slightly for all three index sites. These changes resulted in a better fit among index sites between observed bankfull indicators, bankfull cross-sectional area, estimated bankfull discharge and estimated water velocity. However, the 2003 bankfull discharge estimates generated from the estimated cross-sectional area and "roughness" or manning's n were lower than return frequency estimates. This discrepancy was most likely due to a combination of; 1) the actual return frequency was lower than 1.5, and 2) bankfull elevation was under-estimated slightly. A fourth index site was permanently established in Sandown Creek in 2003. This site was added to represent juvenile rearing habitat, within a sub-basin that supports a major proportion of the current forest harvesting activity. Bull trout represented 49.6% of the juvenile catch in 2003. Although the percentage of the total catch was lower for bull trout in 2003, the total catch of bull trout fry was notably higher and this resulted in higher mean annual density estimates across all index sites. This was especially true for site three, where densities were significantly higher in 2003 (16.4 fish/100 m²). Higher densities were attributed to improved survival based on the significantly larger size of fry in 2003, and the comparatively warm and dry winter and spring of 2002-2003. The decrease in catch composition of bull trout in 2003 was due to a corresponding increase in Westslope cutthroat trout

catch. Westslope cutthroat trout fry were captured exclusively in sites two and three (the bull trout spawning reaches). The capture of cutthroat trout fry in 2003 but not in 2002 was thought to represent an earlier date of emergence due to warmer water temperatures. Juveniles were captured in all sample sites, however, Sandown Creek captures represented 76.7% of all juvenile captures. The corresponding juvenile Westslope cutthroat trout density (4.62 fish/100 m²) was the highest recorded in the bull trout and fish habitat monitoring program. In 2003, snorkel surveys were conducted on mainstem kookumchuck Creek index sites to target deep, mid-channel habitat that was not effectively sampled using existing electrofishing techniques. Sub-adult and adult Westslope cutthroat trout dominated this habitat. Densities were 3.1 and 3.2 fish/100 lineal m for sites one and three, respectively, while site two densities were 8.6 fish/100 lineal m. The very high densities of adult cutthroat trout within site two were attributed to habitat quality and in particular, the abundance of deep pool habitat. The range of morphological stream types for the mainstem Skookumchuck Creek encompass the stable and resilient spectrum (C3(1), C3). In general, Skookumchuck Creek can be characterized by stability and habitat heterogeneity. These reaches, with their high sinuosity, frequent deep pools, and high quality spawning and rearing habitat contain high densities of bull trout and Westslope cutthroat trout. Sandown Creek, in contrast, appears to be undergoing a successional evolution from an F4 stream type to a C4 stream type to accommodate changes or alterations to sediment supply. Disturbance indicators suggest increased sediment supply resulted in channel aggradation and infilling. The previously over-widened bed of the F4 stream type is now the elevation of the new floodplain for the C4 stream type, which gradually incises through the aggraded streambed. Although disturbed, Sandown Creek maintains high habitat value and the high juvenile Westslope cutthroat trout densities can be attributed to the high frequency of large woody debris (LWD) and associated LWD cover in pools. When compared to other bull trout and Westslope cutthroat trout systems, a strong case can be made that the Skookumchuck Creek bull trout and Westslope cutthroat trout represent a significant and stable population. The upper Skookumchuck Creek watershed remains relatively pristine, and maintains high water quality and high habitat capability. After eighty years of forest development and public access within the Skookumchuck Creek watershed, conservative forest harvesting levels that preserved the riparian ecosystem, and angling regulations designed to limit harvest, appear to have been successful in preventing habitat degradation or over-exploitation of the fishery.
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1491. Monitoring the effectiveness of restoration works on walleye spawning beds and of the best management practices on a small dairy operation in eastern Ontario. Lavictoire, M.
In: 49th Annual Conference on Great Lakes Research: The Changing Environment of the Great Lakes. Windsor, Ontario; 2006.
Descriptors: best management practices/ BMPs/ density/ freshwater fish/ habitat improvement/ larvae/ monitoring/ nature conservation/ pollution monitoring/ rehabilitation/ restoration/ river basin management/ sampling/ spawning/

zoobenthos/ walleye/ British Isles, England, Cornwall/ Canada, Ontario, Raisin R./ North America, Great Lakes
Abstract: Although many groups are implementing restoration activities, relatively few are monitoring the effects of these works. Work is being conducted in eastern Ontario to assess the success of restoration activities. Walleye spawning bed rehabilitation was completed on the Raisin River and Hoople Creek. Monitoring of egg densities was completed between 1985 and 2003 on Raisin, and in 1985 and 2004 on Hoople. Larvae densities were compared between the two watercourses in 2005. The results showed a decrease in the egg densities on the Raisin and an increase on Hoople. The number of walleye larvae captured on Hoople was higher than that on the Raisin. This suggests that while rehabilitation on Hoople has been successful, the Raisin spawning beds remain impaired. The effectiveness of best management practices (BMPs) of cattle operations is currently being monitored on a tributary to the Beaudette River, Cornwall. Background data was gathered at 6 stations during summer/fall of 2005. This data included benthic macroinvertebrate and fish communities sampling, water quality, channel morphology and riparian characteristics. The BMPs were implemented in the fall/winter of 2005. Sampling of the six stations will continue for an additional 3 years to monitor the success of the rehabilitation projects.
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1492. Natural wood recruitment versus stream habitat restoration: Habitat and wild trout responses in streams of the White Mountain National Forest. Prout, M. W. and Milot, G.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.; Vol. 133.; pp. 155; 2003.
Descriptors: conservation/ biomass/ boulders/ channel aggradation/ channel scouring/ natural wood recruitment/ second growth forests/ species abundance/ stream habitat restoration/ stream morphology/ upland stream: habitat/ valley streams: habitat
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1493. The Newfoundland Small Stream Buffer Study Phase 1: Impacts of current forest harvesting practices on stream habitat and biota. Decker, R. C.; Scruton, D. A.; Meade, J. D.; Clarke, K. D.; and Cole, L. J.
Canadian Technical Report of Fisheries and Aquatic Sciences(2449): i-ix, 1-64. (2003); ISSN: 0706-6457
Descriptors: forestry/ freshwater ecology: ecology, environmental sciences/ wildlife management: conservation/ forest harvesting/ applied and field techniques/ Department of fisheries and Oceans, Canada/ Newfoundland small Stream Buffer Study, Phase 1/ community composition/ habitat characteristics/ sedimentation rate/ stream/ temperature
Abstract: The Newfoundland Small Stream Buffer Study Phase 1 was initiated and carried out by the Department of Fisheries and Oceans, Canada on the island of Newfoundland. Similar research was conducted in New Brunswick and British Columbia. The objective was to study the impacts of forest harvesting on salmonids and their habitat. Twelve stream reaches from 3 different watersheds subjected to forest harvesting were sampled during the summer of 2000. Salmonids studied were brook trout

(*Salvelinus fontinalis*) and Atlantic salmon (*Salmo salar*). Other variables measured during this study included sedimentation rates, temperature regime, benthic invertebrate community composition, riparian buffer composition, stream habitat characteristics, and large woody debris. These results were then analyzed and related to the different forestry treatments. These treatments included a control stream (no cuffing), treatment 1 stream reach (recent cutting, 20 m riparian buffer) and treatment 2 and treatment 3 (older cut areas, less than 20 m riparian buffer). In the control and treatment 1 reaches results from the sediment sampling, benthic invertebrate sampling, and temperature data were mixed. In one watershed forest harvesting did significantly increase the amount of sediment entering the treatment 1 reach while the other 2 watersheds did not yield any significant increase in sedimentation after cutting. Benthic invertebrates were significantly less abundant in treatment 1 reaches than in control stream reaches. Treatment 1 reach was significantly warmer than the control in one watershed while there was no significant difference in another watershed. Brook trout in treatment 1 reaches were larger than brook trout in control reaches while in treatment 2 and treatment 3 streams they were significantly smaller than those in control and treatment 1 stream reaches. Atlantic salmon size relationships were opposite to brook trout; the smallest salmon inhabiting control streams and the largest in streams impacted by older harvest events (treatment 3).
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1494. No-till improves stream ecosystem quality.

Yates, A. G.; Bailey, R. C.; and Schwindt, J. A.
Journal of Soil and Water Conservation 61(1):
14-19. (2006)

NAL Call #: 56.8 J822

Descriptors: mu-basin/ benthic macroinvertebrates/ habitat/ no-till/ southern Ontario/ stream quality/ tillage systems/ water quality

Abstract: No-till cropping systems have become very common in North America over the past two decades. The effects of no-till on stream quality, however, have not been studied at watershed scales. We measured habitat and stream water quality and sampled the benthic macroinvertebrate community in 32 small (100 to 1400 ha, 247 to 3,460 ac) subwatersheds that exhibited a gradient of the proportion of land under no-till cropping systems to determine relationships between the use of no-till and stream quality. Increased use of no-till systems resulted in improvements in habitat and water quality and the benthic macroinvertebrate community. Based on these results we concluded that increased use of no-till cropping systems by farmers has a positive effect on the quality of streams in agroecosystems.

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1495. On debris flows, river networks, and the spatial structure of channel morphology.

Bigelow, P. E.; Benda, L. E.; Miller, D. J.; and Burnett, K. M.
Forest Science 53(2): 220-238. (Apr. 2007)

NAL Call #: 99.8 F7632

Descriptors: streams/ stream channels/ landforms/ water erosion/ fish/ habitats/ spatial data/ dead wood/ landslides/ alluvium/ rivers/ classification/ sediment deposition/ watershed hydrology/ forested watersheds/ sediments/ drainage basins/ Oregon/ debris fans/ fish bearing streams/

stream classification/ debris deposition/ habitat typing/ natural resources, environment, general ecology, and wildlife conservation/ water resources and management/ pollution/ soil conservation/ forestry related

Abstract: We evaluated the morphological effects of debris flows from headwater streams in larger, fish-bearing channels of the central Oregon Coast Range, including their influence on fans, wood recruitment, and channel morphology. Continuous channel surveys (6.4 km) were conducted in third- through fifth-order streams (drainage area < 10 km² and slope <7%) where debris fan effects at confluences were most evident. This basin size contains the majority of channels (67%) in the central Coast Range with gradients that are used by coho salmon (*Oncorhynchus kisutch* Walbaum). The close spacing between headwater tributaries susceptible to debris flows (118 m average) resulted in long continuous sections of fish-bearing streams that were bordered by debris fans (103 m average) and debris fans impinging on 54% of the total channel length surveyed. Debris flows also supplied the majority of wood (58% of pieces) to the surveyed fish-bearing channels. The highest values of large wood, boulders, and channel gradients were associated with debris fans at confluences with headwater tributaries, while deeper sediment deposits were often associated with fans but also extended up and downstream from fans. The spacing and network pattern of debris flow-prone headwater tributaries influenced the spatial structure of channel morphology and aquatic habitats leading to a high degree of physical heterogeneity and patchiness in channel environments. Our study contributes to a growing emphasis on the role of tributary confluences in structuring channel morphology and aquatic habitats in mountain drainage basins and argues for including a confluence component to stream classification and habitat typing schemes. This citation is from AGRICOLA.

1496. Pesticides in stream sediment and aquatic biota: Distribution, trends, and governing factors.

Nowell, L. H.; Capel, P. D.; and Dileanis, P. D.
Boca Raton, Florida: Lewis Publishers; 1001 p. (1999).
Notes: Includes bibliographical references (p. 867-946) and index.

NAL Call #: TD427.P35N68 1999; ISBN: 1566704693 .

Descriptors: Pesticides---Environmental aspects---United States/ Organochlorine compounds---Environmental aspects---United States/ Water---pollution---United States/ Contaminated sediments---United States/ Aquatic organisms, Effect of water pollution on---United States
This citation is from AGRICOLA.

1497. PHABSIM analysis of a straight trapezoidal reach and a highly sinuous reach in a low-order agricultural stream in the Midwest.

Tompkins, M. R. and Herricks, E.

Hydroecologie appliquee 14(1): 175-192. (2004)

Descriptors: channels/ fish/ fluvial morphology/ freshwater fish/ geomorphology/ habitat/ restoration/ river fisheries/ rivers/ simulation/ stream flow/ Pisces/ Unites States, Midwest

Abstract: The PHABSIM model (Physical HABitat SIMulation Model) was applied to adjacent straight trapezoidal and highly sinuous reaches in a third order agricultural drainage stream in East-Central Illinois. A 30 year flow record was used to generate weighted usable

area (WUA) estimates for six warmwater fish species for each reach. Supplementing PHABSIM analysis, detailed surveys provided planimetric maps of each reach, and regular fish sampling both supported the selection of species modeled with PHABSIM and provided data for PHABSIM evaluation. Analysis of the 30-year WUA estimates supported the development of metrics for fish community analysis, and the analysis of selected fish species populations in each reach. Six monthly fish collections in each reach provided a basis for and a detailed description of the fish communities in each reach. Metrics developed for four of the six species modeled were positively related to the relative differences in numbers of fish present between the two reaches.

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1498. Physico-chemical and biological responses of streams to restoration of riparian pastures.

Walsh, M. C.

University Park, PA: Penn State, 2002.

Notes: Degree: M.S.; Wildlife Coop. Unit Report

Descriptors: bottom characteristics/ disturbance/ fishes, freshwater/ grazing/ habitat changes invertebrates/ nitrogen/ population density erosion/ riparian habitat/ sedimentation/ shores and banks fences/ stream improvement/ streams/ temperature, environment phosphorus/ trout, brown/ water flow/ water, chemical properties/ water, physical properties/ Pennsylvania/ Centre County

Abstract: Objective was to quantify the effects of streambank fencing and stabilization in central Pennsylvania. Stream responses were measured across a spectrum of variables. Fish communities, macroinvertebrate communities, stream temperatures, channel morphology, substrate composition, and water quality were evaluated and compared to pre- restoration conditions. Study area was located within the Spring Creek watershed, which included three study basins: Spring Creek, Cedar Creek and Slab Cabin Run.

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1499. Potential trout population response to reduced riparian buffer widths in north Georgia.

Jones, Krista L.; Poole, Geoffrey C.; Meyer, Judy L.; Bumback, William R.; and Kramer, Elizabeth A.

In: Proceedings of the 2005 Georgia Water Resources Conference. Athens, GA.; 2005.

Notes: Meeting abstract.

http://cms.ce.gatech.edu/gwri/uploads/proceedings/2005/JonesKristaL_GAWR2005_Abstract.pdf

Descriptors: aquatic habitat/ deforestation/ environmental effects/ fish populations/ freshwater fish/ population dynamics/ riparian land/ river basins/ streams/ trout/ water temperature/ *Oncorhynchus mykiss*/ *Salmo trutta*/ Georgia

Abstract: The Georgia State Legislature reduced the width of mandatory-forested riparian buffers along the State's trout streams from 100 ft to 50 ft in 2000. This research evaluated the potential response of trout populations to this reduction in buffer width by: 1) quantifying the relationships between riparian forest conditions, in-stream habitat, and young-of-the-year rainbow and brown trout (*Oncorhynchus mykiss* and *Salmo trutta*); 2) applying these quantified relationships at the stream segment and stream network scales to determine the efficacy of 50-ft buffers for protecting in-stream habitat; 3) examining existing forest

conditions along the stream network; and 4) assessing the existing thermal alteration of trout streams. Stream temperatures were consistently and negatively related to percent riparian forest cover and elevation; in this study landscape, riparian forest cover overwhelms the influence of basin forest cover in determining stream temperature. Fine sediment in riffles was negatively related to percent riparian forest cover and maximum reach velocity. Biomass of young-of-the-year trout (< 150 mm in total length) was negatively related to stream temperature, riffle embeddedness, and maximum reach depth. When these relationships were applied at the stream segment scale, we found that reducing forested buffers from 100 ft to 50 ft would increase stream temperatures by 1.6 to 2.3 degree C, depending on summer weather conditions, and increase riffle embeddedness scores by 4.2 points across a range of maximum stream velocity. As a consequence of these seemingly small increases in stream temperature and riffle embeddedness, the biomass of young-of-the-year trout would be reduced by 81% to 88%, depending on elevation and summer weather conditions. Within the trout stream network, 63% of stream segments are likely to support reproducing trout populations with the presence of a 100-ft buffer; this percentage drops to 9% with a 50-ft buffer. These quantitative analyses at both the stream segment and trout stream network scales imply that a 50-ft buffer is not effective at maintaining the in-stream conditions necessary for self-sustaining trout populations. Due to existing disturbance of riparian forests, substantial alteration of the thermal conditions of trout streams has occurred along the trout stream network in North Georgia. Further deforestation of riparian areas will increase the warming of trout streams. The ability of Georgia's mountain streams to maintain self-sustaining trout populations is reduced because of the warmer stream temperatures and increased fine sediment delivery associated with a reduction in riparian buffer width to 50 ft.

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1500. Practices for livestock grazing and aquatic habitat protection on western rangelands.

May, B. E. and Davis, B.

In: Proceedings of the Wildlife-Livestock Relationships Symposium. Coeur D'alene, Idaho. Peek, James M. and Dalke, P. D. (eds.)

Moscow, Idaho: Forest, Wildlife and Range Experiment Station, University of Idaho; pp. 271-278; 1982.

NAL Call #: SF84.84.W5 1981

Descriptors: wildlife/ livestock/ grazing/ aquatic habitat/ rangelands

1501. A preliminary review of NOAA's community-based dam removal and fish passage projects.

Lenhart, C. F.

Coastal Management 31(1): 79-98. (2003);

ISSN: 08920753

Descriptors: anadromous fish/ dam removal/ fish passage/ habitat restoration/ dams/ ecosystems/ environmental protection/ fisheries/ river basin projects/ stream ecosystem/ coastal zones/ dam/ fish/ fishpass structure/ habitat restoration/ river management/ *Oncorhynchus*

Abstract: Dams and other stream blockages prevent anadromous fish from accessing large areas of key habitat. The NOAA Community-Based Restoration Program (CRP) supports habitat restoration projects, including 53 dam

removal and fish passage projects from 1996 to 2002. This article provides a preliminary review of the biological benefits provided by the first 18 CRP dam removal and fish passage projects supported between 1996 and 1999. These 18 projects improved access to over 160 km of river habitat for many anadromous fish species, especially river herring (*Alosa* spp.) on the east coast and salmonids (*Oncorhynchus* spp.) on the west coast. While fish ladders provide targeted fish species access to key habitat areas, dam removal can improve the health of entire stream ecosystems and provide fish passage to fish species unable to utilize ladders. The CRP complements existing federal regulatory programs by providing a cooperative process at the local level that can restore habitats efficiently and effectively while encouraging long-term stewardship. © 2008 Elsevier B.V. All rights reserved.

1502. Preliminary study of the effects of headwater riparian reserves with upslope thinning on stream habitats and amphibians in western Oregon.

Olson, Deanna H. and Rugger, Cynthia

Forest Science 53(2): 331-342. (2007)

NAL Call #: 99.8 F7632; ISSN: 0015-749X

Descriptors: commercial activities/ ecology/ population dynamics/ terrestrial habitat/ land zones/ Amphibia: forestry/ upslope thinning and headwater riparian reserves/ effect on riparian community structure and population density/ community structure/ forest stream riparian habitat/ effect of forestry practices/ population density/ forest and woodland/ stream riparian habitat/ effect of forestry practices on community structure and population density/ riparian habitat/ forest streams/ Oregon/ United States, western region/ forestry practices effect on riparian community structure and population density/ Amphibia/ amphibians/ chordates/ vertebrates

Abstract: We conducted a preliminary examination of the responses of stream amphibians and instream habitat conditions to alternative riparian buffer zones with forest thinning upslope. Pre and posttreatment surveys were carried out on 68 headwater stream reaches (including 23 unthinned reference reaches) at 11 sites in western Oregon. Streams were in managed conifer stands, 40 to 80 years old, where the thinning treatment reduced stands from 600 trees per hectare (tph) to 200 tph. Treatments consisted of four widths of riparian buffers approximately 6, 15, 70, and 145 m on each side of streams. Over three study years, 3,131 individuals of 13 species were detected. For the more common instream and bank species analyzed, capture rates persisted posttreatment with no negative treatment effect from thinning with any of the buffer widths. More animals were detected after thinning in treatment reaches compared to reference reaches for rough-skinned newts (*Taricha granulosa* Skilton) occurring on stream banks, and for instream coastal giant salamanders (*Dicamptodon tenebrosus* Baird and Girard). Treatment effects on instream habitat parameters were not detected. Interannual variation was evident for western red-backed salamanders (*Plethodon vehiculum* Cooper), and several habitat conditions including pool-riffle ratio, stream spatial intermittency, stream width, and down wood. Overall, riparian buffers with moderate upslope thinning (200 tph) seemed to have retained the aquatic vertebrate community along channels among sites in the first 2 years posttreatment; however, several limitations of the study

reduce the inference of the findings, and these preliminary results are best interpreted as hypotheses for further investigation.

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1503. Production from wood duck nest boxes as a proportion of the harvest in Massachusetts.

Heusmann, H. W.

Wildlife Society Bulletin 28(4): 1046-1049. (2000)

NAL Call #: SK357.A1W5; ISSN: 00917648

Descriptors: Aix sponsa/ harvest/ Massachusetts/ nest box/ population/ wood duck/ habitat management/ nest/ productivity/ waterfowl/ Aix sponsa

Abstract: Many state wildlife agencies participate in habitat management practices to increase waterfowl populations, including the use of nest boxes. Measuring the result of such a program is often difficult. One way to assess the success is to measure production against harvest. The Massachusetts Division of Fisheries and Wildlife maintains more than 1,700 wood duck (*Aix sponsa*) nest boxes located throughout the state. More than half the boxes were used by wood ducks in 1998. I calculated that 4,300 wood ducks were fledged from state boxes compared to a state harvest of 5,500 wood ducks. When non-state boxes are considered, wood duck nest boxes in Massachusetts may produce as many wood ducks as are harvested in the state, or more. Large-scale nest box programs in appropriate areas can contribute substantially to fall populations. © 2008 Elsevier B.V. All rights reserved.

1504. Quantifying expected ecological response to natural resource legislation: A case study of riparian buffers, aquatic habitat, and trout populations.

Jones, Krista L.; Poole, Geoffrey C.; Meyer, Judy L.;

Bumback, William; and Kramer, Elizabeth A.

Ecology and Society 11(2): Unpaginated. (2006).

<http://www.ecologyandsociety.org/vol11/iss2/art15/>

Descriptors: commercial activities/ ecology/ population dynamics/ freshwater habitat/ lotic water/ land zones/ Salmoninae: forestry/ logging of riparian buffer zones/ 15-meter river buffer/ prediction/ biomass/ abundance/ model/ biomass/ population size/ river/ Georgia/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates

Abstract: Regulations governing the management of streamside vegetation (riparian buffers) lie at a nexus between environmental, social, and land development interests, and can yield especially contentious debates among stakeholders. In 2001, the State Legislature of Georgia, USA, took up this debate; the Legislature reduced the minimum width of mandatory-forested riparian buffers along designated trout streams from ~30 m (100 ft) to ~15 m (50 ft), and commissioned this study to assess the expected response of existing trout populations. Because our research was designed to provide rigorous and accessible data for informing this management debate, this research may serve as a general template for other studies designed to inform regulatory and management decisions. We established and quantified relationships among riparian forests, aquatic habitat (stream temperature and riffle embeddedness), and trout reproductive success (biomass of young trout). We used these relationships to determine the expected impacts of the buffer width reduction on aquatic habitat and trout reproductive success at the

stream segment and stream network scales, and assessed associated uncertainty. When compared with stream segments having 30-m wide buffers, our analysis indicated that individual stream segments with 15-m wide buffers have: 1) higher peak temperatures (average peak stream temperatures during the warmest week of the year increase by $\approx 2.0 \pm 0.3^\circ\text{C}$, depending on summertime climate conditions); and 2) more fine sediments (fines in riffle habitats increase by approximately 25% of the observed inter-study-site range). The data show that trout populations will respond markedly to these habitat changes. Linear regression models and an associated Monte Carlo uncertainty assessment document an expected 87% reduction in young trout biomass, with a 95% confidence interval ranging from a 66% reduction to a 97% reduction. A landscape assessment showed that 63% of Georgia's 2nd- to 5th-order trout stream segments could maintain stream temperatures likely (>50% probability) to support young trout in streams bordered by 30-m wide forested riparian buffers. Less than 9% of those streams (only those at the highest elevations) would maintain such temperatures with 15-m wide riparian buffers. As young trout are indicative of trout reproductive success, our results portend substantial reductions or elimination of trout populations in northern Georgia streams where vegetated riparian buffer widths are reduced to 15 m.

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1505. Rangeland grazing as a source of steroid hormones to surface waters.

Kolodziej, E. P. and Sedlak, D. L.
Environmental Science and Technology 41(10): 3514-3520. (2007); ISSN: 0013936X.

Notes: doi: 10.1021/es063050y.

Descriptors: androgen/ estrogen/ gestagen/ water/ water pollutant/ androgens/ estrogens/ progestins/ water/ water pollutants, chemical

Abstract: Cattle and other livestock excrete endogenous steroid hormones, including estrogens, androgens, and progestins; therefore, allowing grazing livestock direct access to surface waters can result in the release of steroids in agricultural watersheds. Elevated concentrations of steroids are problematic because low concentrations of certain steroids can affect fish reproduction. To assess the occurrence and transport of steroids arising from grazing cattle, gas chromatography-tandem mass spectrometry (GC/MS/MS) was used to quantify a suite of estrogens, androgens, and progestins in small creeks impacted by rangeland grazing. Steroids were detected in 86% of samples from rangeland creeks where cattle had direct access to the water, with concentrations as high as 44 ng/L observed shortly after rain events at the beginning of the winter wet season. Estrogens were present at concentrations above the predicted no-effect concentrations for fish in 10-20% of the samples, and androstenedione was detected at concentrations higher than response thresholds for pheromonal communication in fish. The results suggest that, in certain cases, measures such as stream fencing in rangeland areas to limit direct discharge of animal wastes to surface waters or better manure management practices might be merited to protect ecosystem health.

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1506. Reach- and catchment-scale determinants of the distribution of freshwater mussels (Bivalvia: Unionidae) in south-eastern Michigan, U.S.A.

Mcrae, S. E.; Allan, J. D.; and Burch, J. B.
Freshwater Biology 49(2): 127-142. (2004); ISSN: 00465070

Descriptors: catchment/ freshwater mussels/ habitat/ land-use/ Unionidae/ agricultural catchment/ bivalve/ channel morphology/ freshwater environment/ relative abundance/ spatial distribution/ species richness/ streamflow/ water quality/ Michigan/ Raisin River/ Bivalvia/ Unionidae

Abstract: 1. We investigated the diversity and distribution of freshwater mussels at 40 sites in an agricultural catchment, the River Raisin in south-eastern Michigan, to relate mussel assemblages and individual taxa to reach and catchment-scale variables. Unionids were surveyed by timed searches in 100-m reaches, and in-stream and riparian habitat were quantified as well as flow, water chemistry and channel morphology. Land use/cover and surficial geology were determined for site subcatchments and riparian buffers. 2. Some 21 mussel species were found overall; richness ranged from 0 to 12 living species per site. From the upper to middle to lower catchment, the number of individuals, number of species, Shannon-Weaver diversity and relative abundance of intolerant unionids all declined significantly. 3. Four groupings based on overall mussel diversity and abundance were significantly related to reach-scale habitat variables. The richest mussel assemblages were associated with sites with higher overall habitat quality, greater flow stability, less fine substratum, and lower specific conductance. 4. Stepwise multiple regressions revealed that the distribution and abundance of the total mussel assemblage, as well as the most common species, could be predicted from a combination of reach- and catchment-scale variables ($R^2 = 0.63$ for total mussels, $R^2 = 0.51-0.86$ for individual species). 5. Flow stability, substratum composition and overall reach habitat quality were the most commonly identified reach-scale variables, and measures of surficial geology were the most effective catchment-scale variables. The spatial pattern of geology is likely to be responsible for the diversity gradient from the upper to the lower catchment. 6. Prior studies, attempting to explain mussel distributions from local habitat features alone, have found relatively weak relationships. By employing a combination of reach- and catchment-scale habitat variables, this study was able to account for a substantial amount of the spatial variability in mussel distributions.

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1507. Reach-scale effects of riparian forest cover on urban stream ecosystems.

Roy, Allison H.; Faust, Christina L.; Freeman, Mary C.; and Meyer, Judith L.

Canadian Journal of Fisheries and Aquatic Science 62(10): 2312-2329. (Oct. 2005)

NAL Call #: 442.9 C16J

Descriptors: aquatic habitat/ biomass/ forest canopy/ catchment areas/ chlorophyll a/ density/ ecosystems/ fisheries/ foods/ hardwood/ invertebrates/ macroinvertebrates/ particle size/ protection/ salamanders/ standing crops/ streams/ water column/ *Campostoma oligolepis*/ Caudata/ Georgia

Abstract: We compared habitat and biota between paired open and forested reaches within five small streams (basin

area 10-20 km²) in suburban catchments (9%- 49% urban land cover) in the Piedmont of Georgia, USA. Stream reaches with open canopies were narrower than forested reaches (4.1 versus 5.0 m, respectively). There were no differences in habitat diversity (variation in velocity, depth, or bed particle size) between open and forested reaches. However, absence of local forest cover corresponded to decreased large wood and increased algal chlorophyll a standing crop biomass. These differences in basal food resources translated into higher densities of fishes in open (9.0 individuals ·m⁻²) versus forested (4.9 individuals ·m⁻²) reaches, primarily attributed to higher densities of the herbivore *Camptostoma oligolepis*. Densities of terrestrial invertebrate inputs were higher in open reaches; however, trends suggested higher biomass of terrestrial inputs in forested reaches and a corresponding higher density of terrestrial prey consumed by water column feeding fishes. Reach-scale biotic integrity (macroinvertebrates, salamanders, and fishes) was largely unaffected by differences in canopy cover. In urbanizing areas where catchment land cover drives habitat and biotic quality, management practices that rely exclusively on forested riparian areas for stream protection are unlikely to be effective at maintaining ecosystem integrity.

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1508. Recovery of prairie fish assemblages at the transition from channelized to nonchannelized: Implications for conservation of natural channels.

Vokoun, Jason C. and Rabeni, Charles F.

Natural Areas Journal 23(4): 349-355. (2003)

NAL Call #: QH76.N37; ISSN: 0885-8608

Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ Pisces: disturbance by man/ stream channelization/ habitat management/ community structure/ Missouri/ Central Dissected Till Plains/ Pisces/ chordates/ fish/ vertebrates
Abstract: Fish assemblages were systematically sampled along the transition from channelized to unchannelized reaches in seven streams in northern Missouri, USA. Streams ranged in size from 4th to 8th order and were located in the Central Dissected Till Plains including the Grand, Chariton, Salt, and Fabius watersheds. Maximum species richness was reached 3-5 km downstream from the end of channelization. A limited core group of 10 species was present at most of the sites (channelized and unchannelized locations), and a diverse group of 45 species was present at relatively few sites (rarely channelized locations). The core group consisted largely of tolerant, omnivorous species and contained no top carnivores. The 45-species diverse group included a greater proportion of intolerant, benthic invertivorous, lithophilous, and carnivorous species. The effect of channelization extended well into unchannelized reaches and should be considered by conservation planners.

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1509. A reference-based framework for evaluating the ecological condition of stream networks in small watersheds.

Rheinhardt, Richard D.; Brinson, Mark M.; Christian, Robert R.; Miller, Kevin H.; and Meyer, Greg F.

Wetlands 27(3): 524-542. (2007)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: assessment/ coastal plain/ restoration/ functions/ indicators/ riparian/ reference framework/ North Carolina

Abstract: Nine field indicators were identified for evaluating the hydrologic, biogeochemical, and/or habitat functioning of stream channels, riparian zones, or both. We ranked condition from "relatively unaltered" to "severely altered" for each of the identified indicators based on the range of conditions actually encountered among reference sites in the Coastal Plain of North Carolina, USA. The rankings provided a framework for developing a narrative used for scoring condition of the indicators at the scale of a reach (100-m-long x 60-m-wide segment). Reach condition was then derived by aggregating indicator scores, which were weighted by the number of functions with which each indicator was affiliated. Watershed-scale assessments were conducted by sampling randomly chosen first- to fourth-order reaches within stream networks at the density of approximately one 100-m reach per 1.0 km² of watershed drainage area. We used the association between indicators and hydrologic, biogeochemical, and habitat functions to obtain aggregated, weighted scores for channel and riparian zone condition. We used both aggregated network scores and mean indicator scores to compare condition among stream networks. At a reach scale, scores of indicators suggest strategies for restoration. At the watershed scale, aggregate scores showed differences among stream networks that could be used to prioritize restoration efforts and monitor change over time.

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1510. Regeneration of native trees and wetlands: Results of an unplanned, twenty year experiment in the Colorado River Delta, Mexico.

Nagler, P. L. and Glenn, E. P.

2007 AGU Joint Assembly Proceedings (2007).

Notes: Invited poster presentation; Presented at 2007 AGU Joint Assembly on 22-25 May 2007 in Acapulco, Mexico.

Descriptors: wetlands/ habitat restoration/ cottonwood/ willow/ avian habitat

Abstract: Historically, cottonwood and willow trees were common on the Lower Colorado River, although quantitative estimates of their former abundance are not available. During the past hundred years, dams and flow regulation have altered the riparian habitat to favor dominance by exotic saltcedar and other salt-tolerant shrubs over the floodplain. It is widely assumed that, once established, saltcedar competitively excludes native trees, and that removal of saltcedar will be necessary as part of restoration programs. We studied the regeneration of cottonwood and willow trees in the presence of saltcedar in the delta of the Colorado River in Mexico from 1992 to 2002 in response to flood releases from the U.S. Flood releases of 50 cms to 750 cms in El Nino years of 1993, 1997-1998 and 2000 each germinated cohorts of trees amidst saltcedar stands and in bare soil scoured by the floods. During their establishment year, these trees rooted into the shallow aquifer under the river channel, and became dominant age classes of trees in subsequent years. Low-volume administrative spills (water ordered by irrigators but not used) provided a nearly perennial run of water in the river in non-flood years. The large and small flows created a rich avian habitat, containing backwaters, marsh areas, and a multi-stored canopy of native trees, saltcedar and

other shrubs. Bird density and diversity in this river stretch are higher than has been reported anywhere else on the Lower Colorado River. The acreage of cottonwood and willow trees in the delta might be as high today as was reported in a 1904 timber survey before the era of dams and agriculture. The main threats to the ecosystem are fires, many deliberately set, timber harvesting, and vegetation clearing projects. Although surface flows are needed to wash salts from the riverbanks, germinate seeds, and enhance avian habitat, the main water source for the trees is the regional aquifer maintained by irrigation of the surrounding agricultural fields in the valley. In this agro-ecosystem, riparian and wetland habitats benefit greatly from agricultural inefficiencies and the vagaries of climate related to El Nino cycles.

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1511. Relation between fish communities and riparian zone conditions at two spatial scales.

Lee, K. E.; Goldstein, R. M.; and Hanson, P. E.

Journal of the American Water Resources Association 37(6): 1465-1474. (Dec. 2001)

NAL Call #: GB651.W315

Descriptors: abiotic factors/ agricultural watersheds/ agriculture/ catchment areas/ community composition/ comparison studies/ ecological effects/ ecology/ ecosystems/ environment management/ fish populations/ freshwater fish/ habitat improvement/ population structure/ riparian vegetation/ riparian environments/ riparian zone/ river basins/ spatial distribution/ species diversity/ species diversity/ streams/ streams (in natural channels)/ vegetation cover/ water management/ water quality (natural waters)/ watershed management/ watersheds/ Minnesota/ Minnesota River

Abstract: The relation of fish community composition to riparian cover at two spatial scales was compared at 18 streams in the agricultural Minnesota River Basin. The two spatial scales were: (1) local riparian zone (a 200 meter wide buffer extending 2 to 3 kilometers upstream of the sampling reach); and (2) the upstream riparian zone (a 200 m wide buffer on the mainstem and all perennial tributaries upstream of the sampling reach). Analysis of variance indicated that streams with wooded-local riparian zones had greater fish species richness (means = 20 and 15, respectively) and Index of Biotic Integrity (IBI) scores (means = 40 and 26, respectively) than streams with open-local riparian zones. Streams with wooded-upstream riparian zones tended (were not statistically significant) to have greater numbers of species (means = 19 and 15, respectively) and IBI scores (means = 33 and 28, respectively) than streams with open-upstream riparian zones. There was no significant interaction between the riparian zone conditions at the two scales. This study suggests that maintenance of wooded riparian cover along streams could be effective in maintaining or improving fish community composition in streams draining heavily agricultural areas.

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1512. Relation of desert pupfish abundance to selected environmental variables in natural and manmade habitats in the Salton Sea Basin.

Martin, B. A. and Saiki, M. K.

Environmental Biology of Fishes 73(1): 97-107. (2005)

Descriptors: abundance/ community composition/ dissolved oxygen/ drainage water/ ecological distribution/ environmental effects/ environmental factors/ grain size/ habitat/ introduced species/ man-induced effects/ nature conservation/ predators/ rare species/ salinity effects/ sediment texture/ water quality/ *Cyprinodon latifasciatus*/ *Cyprinodon macularius*/ Salton Sea/ California

Abstract: The relation between abundance of desert pupfish, *Cyprinodon macularius*, and selected biological and physicochemical variables in natural and manmade habitats within the Salton Sea Basin were assessed. Field sampling in a natural tributary, Salt Creek, and three agricultural drains captured eight species including pupfish (1.1% of the total catch), the only native species encountered. According to Bray-Curtis resemblance functions, fish species assemblages differed mostly between Salt Creek and the drains (i.e., the three drains had relatively similar species assemblages). Pupfish numbers and environmental variables varied among sites and sample periods. Canonical correlation showed that pupfish abundance was positively correlated with abundance of western mosquitofish, *Gambusia affinis*, and negatively correlated with abundance of porthole livebearers, *Poeciliopsis gracilis*, tilapias (*Sarotherodon mossambica* and *Tilapia zillii*), longjaw mudsuckers, *Gillichthys mirabilis*, and mollies (*Poecilia latipinna* and *Poecilia mexicana*). In addition, pupfish abundance was positively correlated with cover, pH, and salinity, and negatively correlated with sediment factor (a measure of sediment grain size) and dissolved oxygen. Pupfish abundance was generally highest in habitats where water quality extremes (especially high pH and salinity, and low dissolved oxygen) seemingly limited the occurrence of nonnative fishes. This study also documented evidence of predation by mudsuckers on pupfish. These findings support the contention of many resource managers that pupfish populations are adversely influenced by ecological interactions with nonnative fishes.

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1513. Relation of instream habitat and physical conditions to fish communities of agricultural streams in the northern Midwest.

Talmage, Philip J.; Perry, James A.; and Goldstein, Robert M.

North American Journal of Fisheries Management 22(3): 825-833. (2002)

NAL Call #: SH219.N66 ; ISSN: 0275-5947

Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ abiotic factors/ land zones/ Pisces: habitat management/ stream restoration/ instream habitat and physical conditions/ importance/ Minnesota and North Dakota/ community structure/ instream habitat and physical influences/ stream/ agricultural streams/ environmental influences/ physical factors/ community structure correlations/ Minnesota/ Minnesota River basin and Red River/ North Dakota/ Red River/ Pisces/ chordates/ fish/ vertebrates

Abstract: Fish, instream habitat, and physical stream conditions were surveyed in 29 agricultural streams in the

Red River of the North basin during summer 1994 and the Minnesota River basin during summer 1997. Our goal was to determine which instream habitat and physical conditions should be considered for stream restoration. Principle components analysis identified six axes that explained 79% of the total variability in instream habitat and physical conditions. Percent run, percent boulder, percent woody debris, percent overhanging vegetation, percent sand, and frequency of erosion were the variables best associated with these axes. Multiple linear regression analysis of the instream habitat and physical conditions explained 14-50% of the variability in fish community composition. Managers of agricultural warmwater streams in the northern Midwest should emphasize these six instream habitat and physical conditions, and the factors that influence them, during stream restoration.

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1514. Relation of riparian buffer strips to in-stream habitat, macroinvertebrates and fish in a small Iowa stream.

Isenhardt, Thomas M.

Journal of the Iowa Academy of Science 113(1-2): 49-55. (2006)

NAL Call #: Q11.J68; ISSN: 0896-8381

Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ Macroinvertebrata/ Pisces: habitat management/ riparian buffer strips/ stream community structure effects/ community structure/ effect of riparian buffer strips/ stream/ Iowa/ Bear Creek/ Pisces/ chordates/ fish/ invertebrates/ vertebrates

Abstract: Macroinvertebrate and fish habitat is often degraded as a result of agriculture. Riparian buffer strips are commonly used to counteract the negative effects of agriculture in headwater streams. We assessed the relation of multi-aged riparian buffer strips to in-stream habitat, macroinvertebrate and fish assemblages in an Iowa stream. In-stream habitat, macroinvertebrates, and fish were sampled from two buffered sites and two unbuffered sites, with the greatest substrate, water depth, and velocity heterogeneity occurring in buffered sites. The highest macroinvertebrate richness (11) as well as fish species richness (14), diversity (1.99) and IBI score (37) were found in the site buffered the longest. Habitat heterogeneity and fish community richness and diversity were greater in buffered sites than unbuffered sites making them possible indicators with which short-term stream recovery can be measured.

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1515. Relations between biotic integrity and physical habitat in the Embarras River Basin, Illinois.

Holtrop, A. M. and Fischer, R. U.

Journal of Freshwater Ecology 17(3): 475-483. (2002)

NAL Call #: QH541.5.F7J68; ISSN: 02705060

Descriptors: habitat quality/ index method/ species richness/ stream/ water quality/ habitat quality/ organismal community/ river basin/ United States

Abstract: This study investigated the relationship between a habitat quality index and stream fish assessment indices used to evaluate stream quality in an agricultural setting. Fish data and stream habitat quality data were collected from 13 sampling localities within the Embarras River basin. Habitat quality was measured using a stream habitat

assessment procedure, a qualitative index comprised of 15 metrics. Stream quality was determined by fish species richness and an index of biotic integrity (IBI). Multiple regression analysis identified pool quality, bank vegetation, and width-to-depth ratio as the best estimators of IBI. These variables were used in creating a model for predicting IBI. This model demonstrates the potential for predicting the biotic integrity of a stream fish community from commonly collected, and often readily available, habitat data. Thus, models which use habitat information may be an important management tool which will allow for the rapid prediction of the biotic integrity of a stream, and thus permit intensive management practices to be focused on critical sites within a stream basin.

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1516. Relationship between landuse and stream conditions in the Karsted Upper Green River watershed of Kentucky.

Meier, Ouida W.; Meier, Albert J.; and Grubbs, Scott
Ecological Society of America Annual Meeting, Proceedings 88 (2003)

NAL Call #: QH540.E365.

Notes: 88th Annual Meeting of the Ecological Society of America held jointly with the International Society for Ecological Modeling - North American Chapter, Savannah, Georgia, USA; August 03-08, 2003.

Descriptors: biodiversity/ conservation/ freshwater ecology/ ecology, environmental sciences/ geographic information system/ GIS, applied and field techniques/ Conservation Reserve Enhancement Program [CREP]/ USDA/ aquatic ecosystems/ aquatic faunal community/ cropland/ habitat parameters/ karsted upper watershed/ land use/ pasture/ riparian buffers/ river basin/ stream conditions/ total suspended solids/ turbidity/ waste contamination/ water quality

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1517. Relationship of riparian buffer type to water temperature in the driftless area ecoregion of Minnesota.

Blann, Kristen; Nerbonne, Julia Frost; and Vondracek, Bruce

North American Journal of Fisheries Management 22(2): 441-451. (2002)

NAL Call #: SH219.N66; ISSN: 0275-5947

Descriptors: conservation measures/ habitat/ freshwater habitat/ lotic water/ abiotic factors/ physical factors/ land zones/ *Salvelinus fontinalis*: habitat management/ riparian buffer type management/ water temperature relations/ reintroduction implications/ release and relocation programs/ reintroduction/ stream/ temperature/ Minnesota/ Goodhue County/ Wells Creek/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates

Abstract: We used the U.S. Fish and Wildlife Service's Stream Network Temperature Model to examine the role of riparian buffer type in mediating summer water temperatures for the reintroduction of brook trout *Salvelinus fontinalis* into Wells Creek, a tributary to the Mississippi River located in southeastern Minnesota. Stream temperatures measured from 23 July to 3 September 1997 were used to calibrate the model, evaluate existing temperatures, generate simulations for different shade conditions and channel morphologies, and generate simulations for "average" and "warm" summers (we define

a warm summer as one that is 2.8°C above the 30-year mean). The simulations indicated that successional buffers (grasses and forbs) provided as much shade as wooded buffers in streams with a width less than 2.5 m. With a low width:depth ratio, the successional buffer vegetation mediated mean temperature as well as the wooded buffer when discharge was held constant. At a discharge characteristic of our study reach, the mean temperature would be about the same along a successional buffer as in a wooded buffer if the wooded vegetation also led to widening of the stream channel. However, wooded buffers had a significantly higher percentage of shade than grazed or successional buffers. In general, temperatures in an average year decreased along the wooded reaches and increased slightly along the successional and grazed buffer areas. The differences in measured weekly mean maximum temperatures may be as great as 2.5°C across riparian buffer types. Maximum temperatures across all riparian types would be higher during warmer than average years, even with 50% shade along the stream. Shade provided by successional and woody vegetation may serve to moderate maximum temperatures and may be sufficient for the reintroduction of brook trout if other conditions improve.
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1518. Relationship of wooded riparian zones and runoff potential to fish community composition in agricultural systems.

Stauffer, J. C.; Goldstein, R. M.; and Newman, R. M. *Canadian Journal of Fisheries and Aquatic Science* 57: 307-316. (2000)
NAL Call #: 442.9 C16J.
http://article.pubs.nrcnrc.gc.ca/RPAS/RPViewDoc?_handler_=HandleInitialGet&calyLang=eng&journal=cjfas&volume=57&articleFile=f99-197.pdf
Descriptors: fish community composition/ forested buffers/ riparian zones/ biodiversity/ agricultural runoff
Abstract: The relationship of fish community composition to riparian cover and runoff potential was investigated in 20 streams in the agricultural Minnesota River Basin during the summer of 1997. Analysis of variance indicated significant differences in fish community composition due to both riparian cover (wooded versus open) and runoff potential (high or low). Streams with wooded riparian zones had higher index of biological integrity (IBI) scores, species richness, diversity, and percentages of benthic insectivores and herbivores than streams with open riparian zones. Streams with low runoff potential had higher IBI scores and species richness than streams with high runoff potential. The riparian cover and runoff potential interaction was marginally significant with respect to IBI scores and species richness, suggesting a weak interaction between the two factors. Although both factors were important, riparian cover influenced fish community composition more than runoff potential in these streams, indicating that local factors (close to the stream) dominated landscape- or basin-level factors. [Authors]
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1519. Relationships between land use and stream ecosystems: A multistream assessment in southwestern Michigan.

Moerke, A. H. and Lamberti, G. A.
In: American Fisheries Society Symposium: Landscape Influences on Stream Habitats and Biological Assemblages.; Vol. 48.; 323-338; 2006.
Descriptors: agricultural runoff/ aquatic habitat/ assessments/ catchment area/ ecosystems/ fish populations/ freshwater fish/ geographical distribution/ land use/ land use/ population density/ riparian land/ stream pollution/ streams/ urbanization/ water quality/ water quality/ Pisces/ Michigan, Kalamazoo
Abstract: Ecologists recognize that surrounding land use can influence the structure and function of aquatic ecosystems, but few studies have explicitly examined the relative effects of different types of land use on stream ecosystems. We quantified the relationships between different land uses (forested, urban, agricultural with or without riparian buffers) and stream physicochemical variables and resident fish assemblages in 21 southwestern Michigan streams. These streams were located within a single basin (Kalamazoo River) and ecoregion to minimize differences in natural landscape conditions. Streams responded to a gradient of land use, with forested streams having the least degraded water quality, physical habitat, and fish assemblages, and agricultural streams lacking buffers being the most degraded. Urban and agricultural streams with buffers displayed characteristics intermediate to forested and agricultural streams lacking buffers. In general, habitat complexity and water quality declined across this land-use gradient from forested to agricultural streams, whereas fish density, richness, and dominance by tolerant species increased along the land-use gradient. Although urban streams had lower percentages of altered land use (i.e., <40% urban) in their catchments compared to agricultural streams (i.e., >50% agriculture), both land uses appeared to have similar detrimental effects on streams suggesting higher per unit area impacts of urbanization on streams. The presence of forested riparian buffers along agricultural streams increased the complexity of instream habitat, but resulted in few benefits to fish assemblages, suggesting that stream water quality in altered landscapes may be constraining fish assemblages more than physical habitat.
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1520. The residence time of large woody debris in the Queets River, Washington, USA.

Hyatt, Timothy L. and Naiman, Robert J.
Ecological Applications 11(1): 191-202. (2001)
NAL Call #: QH540.E23; ISSN: 1051-0761
Descriptors: conservation measures/ ecology/ habitat utilization/ habitat/ freshwater habitat/ lotic water/ land and freshwater zones/ Salmonidae: habitat management/ instream large woody debris/ residence time significance/ habitat preference/ habitat suitability/ river/ Washington/ Olympic Mountains/ Queets River/ residence time/ habitat enhancement effects/ Salmonidae/ Salmoniformes, Actinopterygii, Pisces/ chordates/ fish/ vertebrates
Abstract: Instream large woody debris (LWD) provides several critical functions in riverine ecosystems, including sediment and nutrient retention, salmonid habitat enhancement, and stable colonization sites for incipient floodplain vegetation. In this study, the size and species

composition of LWD in the Queets River, Washington, USA, were examined and compared with the size and species composition of forest trees from which they originated, in order to determine a depletion rate for LWD in the active channel. Increment cores from instream LWD were crossdated against cores from riparian conifers to estimate the year each LWD piece was recruited to the river channel. Debris pieces that were decayed or otherwise incompetent to provide cores were dated using standard ¹⁴C techniques. Hardwood species (*Alnus rubra*, *Populus trichocarpa*, and *Acer macrophyllum*) were better represented among riparian forests than among instream LWD, and conifers (*Picea sitchensis*, *Tsuga heterophylla*, *Pseudotsuga menziesii*, and *Thuja plicata*) were better represented among LWD than in the adjacent riparian forest, suggesting that hardwoods were depleted from the channel faster than conifers. The depletion rate of coniferous LWD from the channel followed an exponential decay curve in which 80% of LWD pieces were <50 yr old, although some pieces have remained for up to 1400 yr. Although most wood is depleted from the channel within 50 yr, some wood is apparently buried in the floodplain and exhumed centuries later by lateral channel migration. The calculated depletion constant of 0.030 is equivalent to a half-life of ≈20 yr, meaning that virtually all of the wood will have disappeared within 50 yr. This rapid depletion suggests that harvesting large conifers from the riparian zones of large streams could have adverse impacts within three to five decades.

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1521. Response of fish communities to cropland density and natural environmental setting in the Eastern Highland Rim Ecoregion of the lower Tennessee River Basin, Alabama and Tennessee, 1999.

Powell, Jeffrey R. U. S. Geological Survey; Water Resources Investigations report: WRI 02-4268, 2003. 48 p. <http://pubs.usgs.gov/wri/wri024268/pdf/wri024268.pdf>
Descriptors: agriculture/ Alabama/ bacteria/ Chordata/ coliform bacteria/ dissolved materials/ dissolved oxygen/ drainage basins/ Eastern Highland Rim Ecoregion/ ecology/ environmental effects/ land cover/ land use/ nutrients/ oxygen/ pH/ Pisces/ principal components analysis/ species diversity/ statistical analysis/ streams/ surface water/ Tennessee/ Tennessee River/ United States/ USGS/ Vertebrata/ water quality

© American Geological Institute

1522. Response of leaf retention to in-stream restoration: A measure of stream processes in assessing habitat management success.

Huusko, A.; Maki, Petays A.; Vehanen, T; and Kotamaa, J *Proceedings, American Fisheries Society Annual Meeting* 133: 331-332. (2003).

Notes: Conference: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.

Descriptors: forestry/ freshwater ecology: ecology, environmental sciences/ wildlife management: conservation/ community diversity/ ecosystem productivity/ fish production/ habitat management success/ habitat responses/ headwater streams/ in stream restoration/ leaf retention/ log drives/ physical habitat structure/ rapids sections/ restoration projects/ restoration success/ stream channel structure/ stream enhancement/ stream processes

© Thomson Reuters Scientific

1523. Response of unionid mussels to dam removal in Koshkonong Creek, Wisconsin (USA).

Sethi, S. A.; Selle, A. R.; Doyle, M. W.; Stanley, E. H.; and Kitchel, H. E.

Hydrobiologia 525: 157-165. (2004)

NAL Call #: 410 H992; ISSN: 0018-8158

Descriptors: dams/ mortality/ population density/ removal/ reservoirs/ sand/ sediment/ silt/ mussels

Abstract: Dam removal is a potentially powerful tool for restoring riverine habitats and communities. However, the effectiveness of this tool is unknown because published data on the effects of dam removal on in-stream biota are lacking. We investigated the effects of a small dam removal on unionid mussels in Koshkonong Creek, Wisconsin (USA). Removal of the dam led to mortality both within the former impoundment and in downstream reaches. Within the former reservoir, mortality rates were extremely high (95%) due to desiccation and exposure. Mussel densities in a bed 0.5 km downstream from the dam declined from 3.80 ± 0.56 mussels m^{-2} in fall 2000 immediately after dam removal to 2.60 ± 0.48 mussels m^{-2} by summer 2003. One rare species, *Quadrula pustulosa*, was lost from community. Mortality of mussels buried in deposited silt was also observed at a site 1.7 km below the dam. Silt and sand increased from 16.8 and 1.1% of total area sampled in fall 2000 to 30.4 and 15.9%, respectively, in summer 2003. Total suspended sediment concentrations in the water column were always higher downstream from the reservoir than upstream, suggesting that transport and deposition of reservoir sediments likely contributed to downstream mussel mortality. Thus, while benefits of the dam removal included fish passage and restoration of lotic habitats in the former millpond, these changes were brought about at some cost to the local mussel community. Pre-removal assessments of potential ecological impacts of dam removal and appropriate mitigation efforts should be included in the dam removal process to reduce short-term negative ecological effects of this restoration action.

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1524. Responses of organic matter and macroinvertebrates to placements of boulder clusters in a small stream of southwestern British Columbia, Canada.

Negishi, Junjiro N. and Richardson, John S.

Canadian Journal of Fisheries and Aquatic Science 60(3): 247-258. (2003)

NAL Call #: 442.9 C16J; ISSN: 0706-652X

Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ North America/ Canada/ Macroinvertebrata: habitat management/ Boulder cluster placement/ effect on organic matter retention and community structure/ community structure/ effect of boulder cluster placement/ stream/ British Columbia/ Coast Range Mountains/ Spring Creek/ invertebrates

Abstract: Diversity and productivity of stream food webs are related to habitat heterogeneity and efficiency of energy retention. We tested the hypothesis that experimental boulder placements in a second-order stream would increase diversity and abundance of macroinvertebrates by restoring detrital retention and habitat heterogeneity. Two relatively natural, upstream, reference reaches and a downstream treatment reach with a relatively straight channel and less woody debris were studied for 3 months before and 1.2 years after the placement of six boulder

clusters in the treatment reach. Mean velocity and its coefficient of variation increased in the treatment reach (140 and 115%, respectively), whereas the reference reaches remained relatively unchanged after the placements. Enhanced particulate organic matter storage (550%) was accompanied by increased total macroinvertebrate abundance (280%) in the treatment reach, converging with those of the reference reaches almost 1 year after the treatment. Detritivorous taxa numerically dominated the macroinvertebrate community, the total densities of which were best predicted by the fine fraction of organic matter biomass at microhabitat scale. However, the effect of boulder clusters on taxonomic richness was negligible. Our findings suggest that boulder clusters can be used at least as a short-term means to restore macroinvertebrate productivity in detritus-based stream systems.

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1525. Responses of stream breeding amphibians to riparian buffers in headwater streams: Ameliorating the effects of regeneration harvest.

Pollett, Kathleen L.

Northwestern Naturalist 84(2): 111. (2003)

NAL Call #: QL671.M8; ISSN: 1051-1733

Descriptors: streams/ breeding/ amphibians/ riparian buffers/ Northwest Forest Plan/ Pacific Northwest/ Washington

Abstract: Anthropogenic disturbance resulting from natural resource extraction is a major component of the Pacific Northwest landscape. The implementation of the Northwest Forest Plan in 1994 mandated increased riparian buffers on streams, including non-fishbearing streams on federal lands. In addition, Washington State has recently begun requiring buffers adjacent to non-fishbearing streams on state and private lands. These buffers can be as narrow as 50 ft. The effectiveness of buffers this size is largely untested on perennial non-fishbearing streams. In this study the effectiveness of small buffers was assessed by sampling streams for amphibians and collecting information on abiotic variables. A total of 40 streams between Mount St Helens and the Columbia River Gorge (T6N R3E to T2N R8E) were sampled. Twelve of these streams were buffered (width = 12 to 20 m, tree age 35 to 50), ten were unbuffered (no trees more than 10 y old left in the riparian zone), ten were in forests 35 to 50 y old, and eight were surrounded by unmanaged stands. Preliminary results suggest that these narrow buffers have higher abundances of *Rhyacotriton cascadae* than unbuffered streams, whereas abiotic variables and abundances of *Dicamptodon* spp. were similar. *Ascaphus trueii* was not found in sufficient abundance to include in the analysis. Differences in *R. cascade* abundance between unmanaged streams and those in the three management treatments appear to be more substantial than between buffered and unbuffered streams.

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1526. Restoration of degraded riverine/riparian habitat in the Great Basin and Snake River regions.

Platts, W. S. and Jensen, S. E.

In: *Wetland Creation and Restoration: The Status of the Science*. Covelo, Calif.: Island Press, 1990; pp. 367-404.

Notes: ISBN: 1559630450.

NAL Call #: QH541.5.M3W462

Descriptors: habitat restoration/ riparian land/ stream restoration/ water resources management/ wetland restoration/ environmental impact/ planting management/ riparian waters/ soil-water-plant relationships/ water resources development/ watershed management/ wildlife habitats

Abstract: Riverine/riparian habitat (RRH) includes interdependent aquatic (riverine) and streamside (riparian) resources that are valuable for fish and wildlife habitat, flood storage and desynchronization, nutrient cycling and water quality, recreation, and heritage values. RRH includes resources both wetter and drier than stipulated for wetlands. Whereas the 'natural or achievable state' of a riparian habitat may be wetland, the 'existing state' may be non-wetland because of natural or anthropogenically-induced changes in the hydrologic character of RRH. There are many different types of RRH, each with distinctive structure, function, and values. Restoration commonly requires: planning to identify preliminary goals and a general approach; baseline assessments and inventories; designs from which the feasibility of accomplishing goals can be assessed; evaluation to assure compliance with designs; and monitoring of variables important to goals and objectives. The goals, approach, and design of restoration projects must be tailored to each type of RRH. Some general elements important to restoration of degraded RRH are: establishment of hydrologic conditions compatible with project goals; efficient handling of soil and substrates in construction; selection and propagation of plants suited to the site and project goals; evaluation of features to enhance habitat for target species; maintenance and control of impacts; and scheduling construction to reflect site constraints and goals.

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1527. A review of aquatic impact associated with turbidity.

Edwards, C. J.

In: *Technical workshop on sediments: Proceedings*.

Corvallis, Oregon

Washington, D.C.: Terrene Institute; pp. 109-112; 1993.

NAL Call #: QE571.T42 1992

Descriptors: erosion/ sediment/ turbidity/ logging/ logging effects/ aquatic organisms

This citation is from AGRICOLA.

1528. A review of stream restoration techniques and a hierarchical strategy for prioritizing restoration in Pacific Northwest watersheds.

Roni, P.; Beechie, T. J.; Bilby, R. E.; Leonetti, F. E.; Pollock, M. M.; and Pess, G. R.

North American Journal of Fisheries Management 22(1): 1-20. (2002)

NAL Call #: SH219.N66; ISSN: 0275-5947.

Notes: Literature review.

Descriptors: aquatic animals/ habitats/ marine environment/ marine fishes/ streams/ water conservation/

water resources/ watershed management/ watersheds/ fishes/ Pacific Northwest/ United States/ vertebrates/ Chordata/ animals

Abstract: Millions of dollars are spent annually on watershed restoration and stream habitat improvement in the Pacific Northwest States of the USA in an effort to increase fish population. It is generally accepted that watershed restoration should focus on restoring natural processes that create and maintain habitat rather than manipulating instream habitats. However, most process-based restoration is site-specific, that is, conducted on a short stream reach. To synthesize site-specific techniques into a process-based watershed restoration strategy, we reviewed the effectiveness of various restoration techniques at improving fish habitat and developed a hierarchical strategy for prioritizing them. The hierarchical strategy we present is based on three elements: (1) principles of watershed processes; (2) protecting existing high-quality habitats; and (3) current knowledge of the effectiveness of specific techniques. Initially, efforts should focus on protecting areas with intact processes and high-quality habitat. Following a watershed assessment, we recommend that restoration focus on reconnecting isolated high-quality fish habitats, such as instream or off-channel habitats made inaccessible by culverts or other artificial obstructions. Once the connectivity of habitats within a basin has been restored, efforts should focus on restoring hydrologic, geologic (sediment delivery and routing), and riparian processes through road decommissioning and maintenance, exclusion of livestock, and restoration of riparian areas. Instream habitat enhancement (e.g., additions of wood, boulders, or nutrients) should be employed after restoring natural processes or where short-term improvements in habitat are needed (e.g., habitat for endangered species). Finally, existing research and monitoring is inadequate for all the techniques we reviewed, and additional, comprehensive physical and biological evaluations of most watershed restoration methods are needed.

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1529. A review of trout management in southeast Minnesota streams.

Thorn, W. C.; Anderson, C. S.; Lorenzen, W. E.; Hendrickson, D. L.; and Wagner, J. W.

North American Journal of Fisheries Management 17(4): 860-872. (1997)

NAL Call #: SH219.N66; ISSN: 0275-5947

Descriptors: fishery management/ sport fishing/ man-induced effects/ habitats/ trout/ fish management/ fishing/ stream biota/ watershed management/ *Salvelinus fontinalis*/ *Salmo trutta*/ Minnesota/ historical account/ sport fishing/ management/ watershed protection

Abstract: Agricultural development after 1850 in southeast Minnesota degraded instream habitat, and by 1900, the native brook trout *Salvelinus fontinalis* was extirpated from most streams. By the 1940s, after 60-70 years of stocking, the exotic brown trout *Salmo trutta* was the most common trout, but abundance was low and limited by lack of reproductive habitat. Soil conservation practices of the 1930s and 1940s and watershed management under Public Law (PL) 566 in the 1950s and 1960s reduced flooding, erosion, and sedimentation and increased infiltration and base flow. By the 1970s, brown trout reproduction was common, but abundance was still low. Fisheries managers

of the Minnesota Department of Natural Resources assumed that adult habitat limited abundance, so they improved instream habitat in streams with public access, which increased brown trout abundance in some streams. Experimental management since 1975 has shown that the lack of adult habitat did limit trout abundance. This management regime has also enabled the quantification of habitat quality and has developed a decision key for brown trout management. When land management has degraded stream habitat, land treatments, acquisition of riparian corridors, and instream management are necessary to rehabilitate habitat and provide recreational fisheries.
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1530. Riparian deforestation, stream narrowing, and loss of stream ecosystem services.

Sweeney, B. W.; Bott, T. L.; Jackson, J. K.; Kaplan, L. A.; Newbold, J. D.; Standley, L. J.; Hession, W. C.; and Horwitz, R. J.

Proceedings of the National Academy of Sciences 101(39): 14132-14137. (2004)

NAL Call #: 500 M762; ISSN: 00278424.

Notes: doi: 10.1073/pnas.0405895101.

Descriptors: deforestation/ riparian ecosystem/ conservation of natural resources/ ecosystem/ fresh water/ water movements/ riparia

Abstract: A study of 16 streams in eastern North America shows that riparian deforestation causes channel narrowing, which reduces the total amount of stream habitat and ecosystem per unit channel length and compromises in-stream processing of pollutants. Wide forest reaches had more macroinvertebrates, total ecosystem processing of organic matter, and nitrogen uptake per unit channel length than contiguous narrow deforested reaches. Stream narrowing nullified any potential advantages of deforestation regarding abundance of fish, quality of dissolved organic matter, and pesticide degradation. These findings show that forested stream channels have a wider and more natural configuration, which significantly affects the total in-stream amount and activity of the ecosystem, including the processing of pollutants. The results reinforce both current policy of the United States that endorses riparian forest buffers as best management practice and federal and state programs that subsidize riparian reforestation for stream restoration and water quality. Not only do forest buffers prevent nonpoint source pollutants from entering small streams, they also enhance the in-stream processing of both nonpoint and point source pollutants, thereby reducing their impact on downstream rivers and estuaries.

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1531. Riparian fencing, grazing, and trout habitat preference on Summit Creek, Idaho.

Keller, C. R. and Burnham, K. P.

North American Journal of Fisheries Management 2(1): 53-59. (1982)

NAL Call #: SH219.N66; ISSN: 0275-5947

Descriptors: grazing/ control/ abundance/ land use/ watersheds/ body size/ habitat selection/ electric fishing/ salmonidae/ *Salvelinus fontinalis*/ effects on/ riparian environments/ fencing/ electric fishing/ *Salmo gairdneri*/ Idaho, Summit Creek

Abstract: In 1975, 3.2 km of Summit Creek, Idaho were fenced by the Bureau of Land Management to exclude

livestock from the riparian area. Six stream sections were electrofished in 1979 to determine differences in trout abundance, size, and growth between grazed and ungrazed stream sections. Electrofishing stations were paired by habitat type. There were more trout in ungrazed sections than in grazed sections in all three habitat types sampled. With one exception, there were more catchable-sized (200 mm long or longer) rainbow trout (*Salmo gairdneri*) and brook trout (*Salvelinus fontinalis*) in the ungrazed area than in the grazed area. There was also evidence that the average size of the fish was less in grazed sections. Fish population data were not collected prior to fencing; therefore it cannot be firmly concluded that the trout population increased within the livestock enclosure as a result of fencing the riparian area. However, the combined results of previous trout habitat improvements documented for Summit Creek, as a result of the fencing, and this study support the conclusion that trout prefer stream areas in ungrazed habitat over grazed habitat.
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1532. Riparian forestry management and adult stream insects.

Briers, R. A. and Gee, J. H. R.

Hydrology and Earth System Sciences 8(3): 545-549. (2004); ISSN: 10275606

Descriptors: life history/ microclimate/ plantation/ riparian vegetation/ aquatic ecosystem/ forest management/ habitat structure/ insect/ microclimate/ riparian vegetation/ upland region/ Hexapoda/ Insecta/ Riparia

Abstract: The impacts of coniferous plantation forestry on the biology of upland streams in the UK are firmly established. Whilst benthic communities have been well studied, very little research has considered the impacts of riparian forestry management on adult stream insects, yet the essentially terrestrial adult (reproductive) phase may be important in determining the abundance and distribution of larval stages. Riparian vegetation has a potentially strong impact on survival and success of adult stages through alteration of microclimate, habitat structure and potential food sources, in addition to effects carried over from larval stages. Here, current riparian management strategies are analysed in the light of available information on the ecology of adult stream insects. On the whole, management practices appear to favour adult stream insects, although an increase in tree cover in riparian areas could be beneficial, by providing more favourable microclimatic conditions for adults. This conclusion is drawn based on rather limited information, and the need for further research into the effects of riparian forestry management on adult stream insects is highlighted. © EGU.

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1533. A riparian wildlife habitat evaluation scheme developed using GIS.

Iverson, Louis R.; Szafer, Diane L.; Baum, Sharon E.; and Cook, Elizabeth A.

Environmental Management 28(5): 639-654. (2001)

NAL Call #: HC79.E5E5; ISSN: 0364-152X.

<http://www.springerlink.com/content/02helrpgau6xlfxf2/fulltext.pdf>

Descriptors: wildlife/ ecosystems/ riparian habitat/ rivers/ techniques/ GIS/ succession/ management/ habitat surveys/ habitat management/ landscape ecology/ wildlife habitat/ spatial analysis/ landscape ecology/ riparian

habitat/ growth and development/ ecosystem/ fresh water/ conservation of natural resources [methods]/ environmental monitoring [methods]/ agriculture/ animals/ data collection/ environment/ forestry/ geography/ geology/ information systems/ models, biological/ Poaceae/ population dynamics/ urban population/ habitat evaluation/ waters/ Illinois

Abstract: To evaluate riparian habitat for wildlife, the authors used a geographic information system (GIS) that prioritized individual streams (for acquisition or management) by habitat ranking. They demonstrate this methodology for the Vermillion River basin in east-central Illinois, USA. Three data sets were used to evaluate land cover encompassing 300 m on either side of the streams: (1) the US Geological Survey's land use and land cover information (LUDA), (2) land cover manually digitized from the National High Altitude Photography (NHAP) program, and (3) Landsat Thematic Mapper (TM) data classified into land cover. Each of 30 tributaries in the study area was ranked for habitat according to the data contained in each data set, and results were compared. Habitat ranking schemes were devised and analysis performed for three species guilds: forest, grassland, and mixed successional species. TM and NHAP each differentiated habitat scores (for forest, grassland, and mixed successional guilds) among tributaries in a similar and suitable way, while LUDA was not suitable, due to the coarse resolution of the data. Overall, it was shown that the methodology is suitable to rank streams based on riparian habitat quality. Even though more work is needed to test and verify the method, the project has shown the potential for such techniques to assist in evaluating, tracking, and improving the management of riparian wildlife resources. The method can easily be applied over large areas such as states if TM-based land cover and stream data are available.
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1534. Riverine landscapes: Biodiversity patterns, disturbance regimes, and aquatic conservation.

Ward, J. V.

Biological Conservation 83(3): 269-278. (1998)

NAL Call #: S900.B5; ISSN: 0006-3207

Descriptors: aquatic conservation/ bank stabilization/ biodiversity patterns/ channelization/ disturbance regimes/ environmental gradient/ environmental heterogeneity/ flow regulation/ groundwater aquifers/ multiple interactive pathways/ riparian/ floodplain systems/ riverine landscapes/ upstream-downstream linkage

Abstract: The term riverine landscape implies a holistic geomorphic perspective of the extensive interconnected series of biotopes and environmental gradients that, with their biotic communities, constitute fluvial systems. Natural disturbance regimes maintain multiple interactive pathways (connectivity) across the riverine landscape. Disturbance and environmental gradients, acting in concert, result in a positive feedback between connectivity and spatio-temporal heterogeneity that leads to the broadscale patterns and processes responsible for high levels of biodiversity. Anthropogenic impacts such as flow regulation, channelization, and bank stabilization, by (1) disrupting natural disturbance regimes, (2) truncating environmental gradients, and (3) severing interactive pathways, eliminate upstream-downstream linkages and isolate river channels from riparian/floodplain systems and contiguous groundwater aquifers. These alterations interfere with

successional trajectories, habitat diversification, migratory pathways and other processes, thereby reducing biodiversity. Ecosystem management is necessary to maintain or restore biodiversity at a landscape scale. To be effective, conservation efforts should be based on a solid conceptual foundation and a holistic understanding of natural river ecosystems. Such background knowledge is necessary to re-establish environmental gradients, to reconnect interactive pathways, and to reconstitute some semblance of the natural dynamics responsible for high levels of biodiversity. The challenge for the future lies in protecting the ecological integrity and biodiversity of aquatic systems in the face of increasing pressures on our freshwater resources. This will require integrating sound scientific principles with management perspectives that recognize floodplains and groundwaters as integral components of rivers and that are based on sustaining, rather than suppressing, environmental heterogeneity.
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1535. The riverscape: A strategic perspective for restoring wild riverine fish populations.

Li, H. W.; Fausch, K. D.; Torgersen, C.E.; and Baxter, C. V. In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.; Vol. 133.; pp. 201; 2003.
Descriptors: freshwater ecology: ecology, environmental sciences/ cattle exclusion/ applied and field techniques/ flood pulse concept/ hyporheic corridor concept/ process domain concept/ river continuum concept/ serial continuity concept/ channel morphology/ conservation strategies/ fish movements/ geomorphology/ habitat management/ lentic systems/ population recovery/ riparian vegetation/ riverine environments/ riverscapes/ spatial scaling/ standing crops/ stream restoration/ stream riparian interactions/ temporal scaling/ trophic ecology/ wetlands: habitat
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1536. Salmon recovery in the Pacific Northwest: A summary of agricultural and other economic effects.

Aillery, Marcel P.
Washington, D.C.: U.S. Dept. of Agriculture, Economic Research Service, 1994. 10 p.
Notes: Caption title. "July 1994." Includes bibliographical references (p. 9).
NAL Call #: 1 Ag84Ab no.699
Descriptors: Salmon fisheries---Columbia River---Watershed/ Rare fishes---Columbia River---Watershed/ Wildlife conservation---Columbia River---Watershed
This citation is from AGRICOLA.

1537. A science-based approach for identifying temperature-sensitive streams for rainbow trout.

Nelitz, Marc A.; MacIsaac, Erland A.; and Peterman, Randall M.
North American Journal of Fisheries Management 27(2): 405-424. (2007)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: commercial activities/ conservation measures/ techniques/ freshwater habitat/ lotic water/ abiotic factors/ physical factors/ land zones/ North America/ Canada/ *Oncorhynchus mykiss*: forestry/ impact on stream temperature/ analysis technique and conservation relationships/ habitat management/ stream habitat management/ identification of temperature sensitive

streams/ forestry impact relationships/ ecological techniques/ temperature sensitive stream habitat identification/ forestry impact and conservation relationships/ stream/ forestry impact and conservation relationships/ temperature/ British Columbia/ Upper Fraser and Skeena Rivers/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates

Abstract: To regulate human-induced changes to fish habitat, resource managers commonly set standards based on maximum allowable changes. For example, new legislation in British Columbia (BC), Canada, calls for restrictions on harvesting of trees and related activities near temperature-sensitive streams. However, methods for designating such streams are still evolving. Our objective was to help develop such methods by (1) improving understanding of the temperature-dependent responses of fish and (2) devising improved methods for estimating the effects of forestry-related activities on stream temperature as well as the chance of exceeding upper temperature limits. Using previously published models, we found that for rainbow trout *Oncorhynchus mykiss* particular increases in stream temperature led to different effects on juvenile growth rate, egg survival rate, and resistance to mortality from diseases. In a separate analysis, to evaluate the chance that cumulative forestry activities will increase stream temperature by various amounts, we compiled Summer temperature data for 104 streams in central BC that reflected different watershed features, contrasting summer climates, and various levels of land use. A classification and regression tree analysis of a summer maximum weekly average temperature (MWAT) index grouped streams into six categories as a function of watershed size, watershed elevation, and air temperature. We then analyzed the remaining unexplained variation among stream temperature indices using Bayesian regression. We found high probabilities that increases in road density and the density of road crossings of streams within watersheds are associated with increases in residual temperature. For instance, a Bayesian regression indicated a 6-in-10 chance that the MWAT in our study area will increase by 1.25°C for a road density of 2 km/km² of watershed area and by 3.25°C for a road density of 4 km/km². These analyses illustrate some possible ways to help designate temperature-sensitive streams.
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1538. Seasonal movements, habitat use, aggregation, exploitation, and entrainment of saugers in the Lower Yellowstone River: An empirical assessment of factors affecting population recovery.

Jaeger, Matthew E.; Zale, Alexander V.; McMahon, Thomas E.; and Schmitz, Brad J.
North American Journal of Fisheries Management 25(4): 1550-1568. (2005)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: commercial activities/ behavior/ social behavior/ ecology/ land zones/ Sander canadensis: farming and agriculture/ irrigation canals/ leisure and sport/ angling/ aggregating behavior/ population dynamics/ population recovery dynamics/ influencing factors/ empirical assessment/ river/ distribution within habitat/ seasonal distribution and movements/ habitat utilization/ Montana/ Yellowstone River/ Huntley Diversion/ Pisces, Actinopterygii, Perciformes, Percidae/ chordates/ fish/ vertebrates

Abstract: Migratory barriers, habitat loss, entrainment in irrigation canals, and overexploitation, especially at times of aggregation, have been suggested to explain the failure of Yellowstone River saugers *Sander canadensis* to return to historical abundances after a late-1980s decline that was attributed to drought. These factors are thought to affect saugers throughout their range and migratory large-river fishes in general. We characterized the seasonal movement patterns, habitat use, and aggregation of saugers and estimated movement, exploitation, and irrigation canal entrainment rates to test these hypotheses. Saugers aggregated near spawning areas in spring and subsequently dispersed 5-350 km to upstream home locations, where they remained for the rest of the year. Upstream movement was not overtly restricted by low-head diversion dams. During the spawning period, terrace and bluff pools, which are unique geomorphic units associated with bedrock and boulder substrate, were positively selected, while all other habitat types were avoided. Tributary spawning was rare. After moving to home locations, saugers used most habitat types in proportion to their availability but selected reaches in specific geologic types that allowed formation of deep, long pools. Exploitation occurred primarily in early spring and late autumn. was low annually (18.6%), and was not related to aggregation. Annual survival was high (70.4%). Entrainment in one irrigation diversion accounted for more than half of all nonfishing mortality. Therefore, habitat loss and overexploitation probably did not prevent sauger recovery, as the absence of migratory barriers allowed adult saugers unrestricted access to widely separated and diverse habitats and did not induce artificial aggregation. In other systems, population declines attributed to overexploitation during periods of aggregation may therefore have been caused fundamentally by migration barriers that created artificial aggregations.
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1539. Setting an effective TMDL: Sediment loading and effects of suspended sediment on fish.

Vondracek, B.; Zimmerman, J. K. H.; and Westra, J. V. *Journal of the American Water Resources Association* 39(5): 1005-1015. (Oct. 2003)
NAL Call #: GB651.W315
Descriptors: agricultural watersheds/ catchment areas/ ecological effects/ fish/ freshwater fish/ lethal effects/ loading/ model studies/ mortality/ mortality causes/ pollution control/ pollution effects/ resuspended sediments/ sediment load/ sediment pollution/ sediments/ streams/ sublethal effects/ suspended load/ suspended sediments/ suspended particulate matter/ threshold levels/ threshold limits/ toxicity tests/ turbidimetry/ turbidity/ water pollution effects/ water quality standards/ water resources/ watersheds/ *Salmo trutta*/ Minnesota/ Chippewa River/ Wells Creek
Abstract: The Agricultural Drainage and Pesticide Transport model was used to examine the relationship between fish and suspended sediment in the context of a proposed total maximum daily load (TMDL) in two agricultural watersheds in Minnesota. During a 50-year simulation, Wells Creek, a third-order cold water stream, had an estimated 1,164 events (i.e., one or more consecutive days of estimated sediment loading) and the Chippewa River, a fourth-order warm water stream, had 906 events of measurable suspended sediment. Sublethal thresholds were exceeded for 970 events and lethal levels

for 194 events for brown trout in Wells Creek, whereas adult nonsalmonids would have experienced sublethal levels for 923 events and lethal levels for 241 events. Sublethal levels were exceeded for 756 events and lethal thresholds were exceeded for 150 events in the Chippewa River. Nonsalmonids would have experienced 15 events of mortality between 0 and 20 percent in Wells Creek. In the Chippewa River, there were 35 events of mortality between 0 and 20 percent and one event in which mortality could have exceeded 20 percent. The Minnesota Pollution Control Agency has proposed listing stream reaches as being impaired for turbidity at 25 NTU, which is approximately 46 mg suspended sediment/l. We estimated that 46 mg/l would be exceeded approximately 30 days in a year (d/yr) in both systems. A TMDL of 46 mg SS/l may be too high to ensure that stream fishes are not negatively affected by suspended sediment. We recommend that an indicator incorporating the duration of exposure be applied.
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1540. Southern two-lined salamanders in urbanizing watersheds.

Miller, Jennifer E.; Hess, George R.; and Moorman, Christopher E. *Urban Ecosystems* 10(1): 73-85. (2007)
NAL Call #: QH541.5.C6 U73; ISSN: 1083-8155
Descriptors: conservation measures/ ecology/ population dynamics/ habitat/ freshwater habitat/ lotic water/ land zones/ *Eurycea cirrigera*: disturbance by man/ stream habitats in urbanizing watersheds/ habitat management/ population size/ stream/ urbanizing watersheds/ North Carolina/ Wake County/ Amphibia, Lissamphibia, Caudata, Plethodontidae/ amphibians/ chordates/ vertebrates
Abstract: Forested riparian buffers are an increasingly common method of mitigating the negative effects of impervious surface cover on water quality and wildlife habitat. We sampled larval southern two-lined salamanders (*Eurycea cirrigera*) in 43 streams, representing the range of impervious surface cover and forested riparian buffer width across Wake County, NC, USA. Larval abundance decreased with increasing impervious surface cover in the upstream catchment, but was not affected by buffer width. This is likely a result of an incomplete buffer system and culverts or other breaches along streams. Larval abundance increased with detritus cover in the stream to a threshold and then decreased as detritus continued to increase. As percent pebble substrate in the stream increased, especially in perennial streams, larval salamander abundance also increased. We suspect salamanders were unable to migrate with the water column during dry periods in intermittent streams with sedimented interstices below the surface, resulting in low abundances. A combination of increased peak flows and sedimentation, reduced base flow, and chemical changes likely reduces the abundance of salamanders in urban and suburban streams. We suggest creation of catchment-wide, unbreached buffers to maintain the integrity of stream habitats in urbanizing watersheds.
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1541. Spatial variation in fish species richness of the upper Mississippi River system.

Koel, T. M.

Transactions of the American Fisheries Society 133(4): 984-1003. (2004)

NAL Call #: 414.9-Am3; ISSN: 00028487

Descriptors: wildlife management/ habitat restoration/ aquatic habitat quality/ aquatic habitat/ isolated habitats/ watershed management

Abstract: Important natural environmental gradients, including the connectivity of off-channel aquatic habitats to the main-stem river, have been lost in many reaches of the upper Mississippi River system, and an understanding of the consequences of this isolation is lacking in regard to native fish communities. The objectives of this study were to describe patterns of fish species richness, evenness, and diversity among representative habitats and river reaches and to examine the relationship between fish species richness and habitat diversity. Each year (1994-1999) fish communities of main-channel borders (MCB), side channel borders (SCB), and contiguous backwater shorelines (BWS) were sampled using boat-mounted electrofishing, mini-fyke-nets, fyke nets, hoop nets, and seines at a standardized number of sites. A total of 0.65 million fish were collected, representing 106 species from upper Mississippi River Pools 4, 8, 13, and 26; the open (unimpounded) river reach; and the La Grange Reach of the Illinois River. Within pools, species richness based on rarefaction differed significantly among habitats and was highest in BWS and lowest in MCB ($P < 0.0001$). At the reach scale, Pools 4, 8, and 13 consistently had the highest species richness and Pool 26, the open-river reach, and the La Grange Reach were significantly lower ($P < 0.0001$). Species evenness and diversity indices showed similar trends. The relationship between native fish species richness and habitat diversity was highly significant ($r^2 = 0.85$; $P = 0.0091$). These results support efforts aimed at the conservation and enhancement of connected side channels and backwaters. Although constrained by dams, pools with high native species richness could serve as a relative reference. The remnants of natural riverine dynamics that remain in these reaches should be preserved and enhanced; conditions could be used to guide restoration activities in more degraded reaches.
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1542. Spatially explicit estimates of erosion-risk indices and variable riparian buffer widths in watersheds.

Wissmar, R. C.; Beer, W. N.; and Timm, R. K.

Aquatic Sciences 66(4): 446-455. (2004); ISSN: 10151621.

Notes: doi: 10.1007/s00027-004-0714-9.

Descriptors: catchments/ erosive soils/ landscape/ protection/ riparian vegetation/ spatial/ streams/ environmental disturbance/ erosion/ habitat restoration/ land cover/ riparian vegetation/ watershed/ Washington/ riparia

Abstract: Strategies for protecting and restoring riparian and stream ecosystems commonly encounter uncertainties about natural processes and management practices that contribute to environmental disturbances. Improvements in management plans require landscape approaches that account for the explicit spatial distribution and variability of different land cover types that can contribute to unstable

conditions. We use a spatially explicit procedure to determine erosion-risk indices and variable riparian buffer widths in watersheds. The indices are based on land cover types that can contribute to erosion either alone or collectively. Land cover information (e.g., unstable soils, immature forest stands, roads, critical slope for land failure and rain-on-snow areas) was used to estimate erosion-risk indices. Erosion-risk indices increase with greater co-occurrences of contributing land covers. The procedure was used to identify erosion-prone areas in tributary watersheds of the Beckler-Rapid River drainage (260 km²), in the State of Washington, USA. A regression analysis of the relationship between mean sediment inputs to streams and erosion-risk indices of sixteen different watersheds indicated that erosion-risk indices explained 65% of the variation associated with sediment inputs to channels. Landscape maps of erosion-risk categories, based on ranges of erosion-risk indices, allowed spatially explicit definitions of stream reach lengths susceptible to different levels of erosion. Low to high-risk categories, and reach lengths vulnerable to erosion, also permitted the identification of the distribution of channels requiring protection by variable riparian buffers widths. The applicability of the procedure to other landscapes was demonstrated by estimating erosion risk-indices and variable riparian buffer widths for watersheds in the upper Cedar River drainage near Seattle, Washington. This approach allows watershed managers to use existing records and published information to address environmental problems within highly variable landscapes.
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1543. The stability of Piasa Creek fish assemblage.

Kerfoot, J. R. and Schaefer, J. F.

Transactions of the Illinois State Academy of Science 95 (Supplement): 152. (2002)

NAL Call #: 500 IL6; ISSN: 0019-2252.

Notes: Meeting abstract; 94th Annual Meeting of the Illinois State Academy of Science held April 19-20, 2002 in Edwardsville, IL.

Descriptors: freshwater ecology: ecology, environmental sciences/ pollution assessment control and management/ agriculture/ anthropogenic effects/ biological communities/ drainage practices/ fish assemblages: stability/ land use/ species abundance

Abstract: A survey of fishes of Piasa Creek, in Jersey, Madison and Macoupin counties, west central Illinois, was conducted in 1967 by Thomerson (1969). This survey consisted of 31 sites and 41 collections over 1 year. No stream fish assemblage at any one place can remain stable forever because biological communities are dynamic and fluctuating. Extensive agriculture practices have arisen over the last few decades along Piasa Creek, and this study will address what impact this has had on the assemblage over time. A second survey of the fish assemblage was conducted in the summer/fall of 2001. Collections were made at 25 of the original 31 sites. The changes in fish assemblages are important because they can help to detect any anthropogenic effects on the river system, and also many concepts in ecology rely on the ideas that populations achieve stability or that aquatic communities operate in a regular and predictable fashion. Also, in taking an inventory of the abundance of indicator species can help detect changes in the overall system. Data sets like ours that

detail changes in assemblages over periods of decades are rare. My hypothesis is that due to anthropogenic changes to the drainage and land use practices changes in assemblage have occurred.

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1544. The status of Atlantic salmon (*Salmo salar*): Populations and habitats.

Boisclair, Daniel

Canadian Journal of Fisheries and Aquatic Science 61(12): 2267-2410. (2004)

NAL Call #: 442.9 C16J; ISSN: 0706-652X

Descriptors: ecology/ habitat/ land zones/ North America/ Canada/ *Salmo salar*/ ecology/ habitat/ aquatic habitat/ Quebec/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates

Abstract: The important decline of Atlantic salmon (*Salmo salar*) across its range during the past three decades, despite numerous management and conservation programmes, is an alarming index of the vulnerability of this species. The following series of papers was produced to summarize current knowledge on specific interactions between biotic and abiotic variables that may contribute to determine the survival of Atlantic salmon. Evaluation of the challenges encountered in spawning grounds (siltation, oxygenation), nursery habitats (substrate, trophic interactions), overwintering habitats (flow conditions, winter feeding opportunities), and coastal and oceanic environments (water temperature, predators, parasites) suggest that all habitats required by Atlantic salmon and all processes that occur in each habitat represent a critical link that allows this species to persist. Management practices employed during artificial fish selection, incubation, and stocking also affect the success of restoration efforts. Because limiting factors may change in time and because our ability to intervene in specific habitats may be minimal, the only strategy within our reach may be to continue gathering information about processes that determine the fragility of Atlantic salmon and, in the light of our findings, to implement scientifically sound actions where and when possible.

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1545. Strategies for ecological restoration of the middle Rio Grande in New Mexico and recovery of the endangered Rio Grande silvery minnow.

Cowley, David E.

Reviews in Fisheries Science 14(1-2): 169-186. (2006); ISSN: 1064-1262

Descriptors: biogeography: population studies/ biodiversity/ wildlife management: conservation/ biodiversity/ aquatic ecosystem/ habitat restoration

Abstract: Issues relevant to management of and land aquatic ecosystems include: (1) a poor understanding of the extent and linkages of an aquatic ecosystem, (2) human population growth coupled with a highly variable water supply, (3) hydrologic modifications of rivers associated with dams, levees, canalizations, and diversions, (4) impairment of water quality, (5) alteration of vegetative communities of catchments and riparian zones, (6) introduction of invasive non-native species, and (7) imperiled native species. All of these issues occur in the Middle Rio Grande of New Mexico and the first six in combination have been responsible for the imperilment of its native aquatic biota. Pie extinction of two fish species,

extirpation of 13 others, and endangerment of the Rio Grande silvery minnow, a pelagic-spawning species with an enormous potential for recolonization of habitats, has been caused by a century of river and landscape modifications. Erosion from heavily grazed grasslands coupled with appropriation of surface flows for irrigation, both associated with human population expansion in New Mexico, led to increased sediment deposition in the Middle Rio Grande. Sediment deposition exacerbated problems due to flooding and droughts, which led to a series of political and technological actions that progressively extirpated most of the large-bodied native fishes and all but one of the pelagic-spawning minnows. Restoration of the Middle Rio Grande and recovery of the endangered silvery minnow will require many changes in the way humans use the river and its floodplain. If those changes occur they should consider the Rio Grande within a landscape context that includes strategies for humans to live in regions without damaging fragile lands and their aquatic ecosystems.

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1546. Stream characteristics and nonpoint pollution impacts on aquatic communities in the Lake Latonka watershed, Mercer County, Pennsylvania.

Brenner, Fred J.; Barber, Rebecca N.; and Walent, Jason S.

Journal of the Pennsylvania Academy of Science 79(2-3): 65-71. (2005)

NAL Call #: Q11.J682; ISSN: 1044-6753

Descriptors: ecology/ habitat/ freshwater habitat/ lotic water/ pollution/ abiotic factors/ land zones/ Macroinvertebrata/ Pisces: community structure/ water quality and habitat characteristics relationship/ stream/ pollution/ water quality/ community structure relationship/ chemical factors/ pollutants/ Pennsylvania/ Mercer County/ Lake Latonka/ Pisces/ chordates/ fish/ invertebrates/ vertebrates

Abstract: The composition of macroinvertebrate and fish communities were compared with water quality and habitat characteristics at two locations above and below Lake Latonka, Mercer County, Pennsylvania and for two tributaries to Coolspring Creek that discharge directly into the lake. Streams within the watershed have received drainage from surrounding farms and septic discharges since the lake was constructed in the early 1960's. Coliform bacteria, nutrient and suspended solids concentrations in streams were inversely correlated with the size and characteristics of both macroinvertebrate and fish communities, but stream habitat characteristics were positively correlated with these aquatic communities. For the streams with the Lake Latonka Development, stream habitat appears to be more important than water quality in determining the size and characteristics of macroinvertebrate and fish communities. The size and species composition of both the macroinvertebrate and fish communities were similar in Coolspring Creek above and below the lake suggesting that the dam did not have an adverse impact on the aquatic communities below the structure.

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1547. Stream corridor restoration: Principles, processes, and practices.

Federal Interagency Stream Restoration Working Group. USDA, Natural Resources Conservation Service, 1998.
Notes: Cooperative effort among fifteen Federal agencies and partners to produce a common reference on stream corridor restoration./ Shipping list no.: 99-0011-S./ "National engineering handbook (NEH), part 653"--Transmittal sheet./ "October 1998."/"August 26, 1998"--Transmittal sheet./ Includes bibliographical references and index.
http://www.nrcs.usda.gov/technical/stream_restoration/PDFFILES/ALL-SCRH-08-01.pdf
Descriptors: stream restoration/ habitat management/ biological communities/ agroecosystems/ environmental impact

1548. Stream corridor restoration research: A long and winding road.

Shields, F. D.; Cooper, C. M.; Knight, S. S.; and Moore, M. T.
Ecological Engineering 20(5): 441-454. (2003)
NAL Call #: TD1.E26; ISSN: 0925-8574
Descriptors: fishes/ habitats/ agriculture/ stream corridors/ drainage ditches/ groundwater/ rivers/ lakes/ ecology/ engineering/ civil engineering
Abstract: Stream corridor restoration research and practice is presented as an example of the application of ecology and engineering to solve a class of environmental problems. Interest and public investment in stream corridor restoration has increased sharply in developed nations over the last two decades, as evidenced by the volume of technical and refereed literature. However, real progress at the regional and national scale depends on successful research outcomes. Research addressing problems associated with stream corridor ecosystem restoration is beset by numerous problems. First, terms referring to restoration are loosely defined. Secondly, stream ecosystems are not amenable to rigorous experimental design because they are governed by a host of independent variables that are heterogeneous in time and space, they are not scalable, and their response times are often too long for human attention spans. These problems lead to poorly controlled or uncontrolled experiments with outcomes that are not reproducible. Extension of results to other sites or regions is uncertain. Social factors further complicate research and practice - riparian landowners may or may not cooperate with the experiment, and application of findings normally occurs through a process of suboptimal compromise. Economic issues, namely assigning costs for present and future ecosystem services that provide off-site benefits, further impede progress. Clearly, the situation calls for a hybrid approach between the rigor of the ecologist and the judgment and pragmatism of the engineer. This hybrid approach can be used to develop creative, low-cost approaches to address key factors limiting recovery.

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1549. Stream geomorphology and fish community structure in channelized and meandering reaches of an agricultural stream.

Frothingham, Kelly M.; Rhoads, Bruce L.; and Herricks, Edwin E.
Water Science and Application 4: 105-117. (2001).
<http://www.buffalostate.edu/geography/documents/frothingham%20et%20al%202001.pdf>
Descriptors: Actinopterygii/ agriculture/ bedforms/ biodiversity/ biota/ Champaign County, Illinois/ channel geometry/ channelization/ Chordata/ communities/ conservation/ controls/ cross sections/ Cypriniformes/ drainage/ ecology/ ecosystems/ Embarras River/ erosion/ fluvial features/ fluvial sedimentation/ geomorphology/ habitat/ human activity/ Illinois/ meanders/ Osteichthyes/ Pisces/ reclamation/ seasonal variations/ sedimentation/ sediments/ spatial variations/ streams/ Teleostei/ United States/ Vertebrata/ waterways
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1550. Stream geomorphology, bank vegetation, and three-dimensional habitat hydraulics for fish in midwestern agricultural streams.

Rhoads, Bruce L.; Schwartz, John S.; and Porter, Stacey
Water Resources Research 39(8): 2-13. (Aug. 2003).
Notes: ePaper no.: 1218.
Descriptors: agriculture/ bedforms/ biota/ Champaign County, Illinois/ channels/ drainage basins/ elevation/ Embarras River/ geomorphology/ hydrology/ Illinois/ Madden Creek/ Midwest/ Piatt County, Illinois/ river banks/ runoff/ Sangamon River/ streamflow/ streams/ United States/ vegetation/ Vermilion River/ watersheds
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1551. Stream habitat and fisheries response to livestock grazing and instream improvement structures, Big Creek, Utah.

Platts, W. S. and Nelson, R. L.
Journal of Soil and Water Conservation 40(4): 374-379. (1985)
NAL Call #: 56.8 J822 ; ISSN: 0022-4561
Descriptors: environmental degradation/ fisheries/ grazing/ habitat destruction/ livestock/ rangelands/ streams/ Utah
This citation is from AGRICOLA.

1552. Stream habitat restoration using large woody debris in the Green Mountain National Forest, Vermont.

Roy, S. R.; McKinley, D.; and Nislow, K. H.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations. Quebec, PQ, Canada; Vol. 133.; 155; 2003.
Notes: Poster summary # SP-19-09.
Descriptors: conservation/ Hankin Reeves Survey/ applied and field techniques: electrofishing/ forest resource management plans/ channel morphology/ geomorphology/ habitat management/ large woody debris [LWD]/ natural wood regimes/ restoration projects: implementation, monitoring, planning/ upland streams: habitat
Abstract: The effects of stream restoration on aquatic ecosystems.
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1553. Stream restoration practices in the southeastern United States.

Sudduth, Elizabeth B.; Meyer, Judy L.; and Bernhardt, Emily S.

Restoration Ecology 15(3): 573-583. (2007)

NAL Call #: QH541.15.R45R515; ISSN: 1061-2971

Descriptors: channel reconfiguration/ evaluation/ in-stream habitat improvement/ monitoring/ riparian management/ United States, southeastern region/ stream restoration/ water quality management/ United States

Abstract: We collected information on 860 stream restoration projects in four states in the southeastern United States-Georgia, Kentucky, North Carolina, and South Carolina-to gain a better understanding of the practice of stream restoration in this area of high aquatic biodiversity and rapid metropolitan expansion. This was completed as a part of the National River Restoration Science Synthesis, with the larger goal of understanding the state of the science of stream restoration. Stream restoration project density, goals, and monitoring rates varied by state, although southeastern monitoring rates were higher than in other parts of the country. North Carolina had the most projects in the Southeast, of which 36% were monitored. In-depth phone interviews with project managers from a random subsample of projects provided insights into the process of stream restoration. Land availability was the most common basis for site prioritization, and 49% of projects involved mitigation. Although 51% of projects were associated with a watershed assessment, only 30% of projects were done as part of a larger plan for the watershed. Projects were monitored using physical (77% of monitored projects), chemical (36%), and biological (86%) variables, although many projects were planned and ultimately evaluated based on public opinion. Our results suggest that stream restoration in the southeastern United States is at an exciting point where better incorporation of a watershed perspective into planning and establishment and evaluation of stated, measurable success criteria for every project could lead to more effective projects.

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1554. Stream restoration using new dam technology.

Griffin, G. B.

Land and Water 45(1): 12-16. (Jan. 2001-Feb. 2001)

NAL Call #: HD101.L36

Descriptors: aquatic habitat/ cattle/ dams/ environmental quality/ environmental restoration/ grazing/ habitat/ livestock/ morphology/ streams/ technology/ trout/ water management/ water quality/ North Carolina, Chaney Creek

Abstract: Silver Springs Ranch contains about twelve miles of spring creeks, each with multiple underground water sources issuing all along its bed. One of these is Chaney Creek, a main tributary of Silver Creek, a world-renowned trout-fishing stream. Cattle had been grazing on this ranch for over a hundred years and had seriously damaged Chaney Creek. Its banks had been broken down and the creek itself gradually widened. When ranch owner Tom O'Gara first saw Chaney Creek, its banks were bare dirt in many places, and the creek was as much as 80 feet wide, with an average depth of 3 to 4 inches. He was interested in restoring Chaney Creek, and began by removing livestock grazing from this part of the ranch. The cattle have been out for four years, and there has already been noticeable improvement. Nature would, over time, finish restoring Chaney Creek; however, Tom decided not to wait,

but instead to give nature a helping hand by restoring segments of the stream back to what was more likely its original channel width and meandering course. Focus would be on fish (specifically, trout) habitat and related aquatic life.

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1555. Stream vertebrates in managed headwater streams: Habitat associations of assemblages and species.

Olson, Deanna H.; Weaver, George W.; Ellenburg, Loretta L.; Hansen, Bruce; and Thompson, Rebecca

Northwestern Naturalist 81(2): 84-85. (2000)

NAL Call #: QL671.M8; ISSN: 1051-1733

Descriptors: *Ascaphus truei*/ *Dicamptodon tenebrosus*/ *Plethodon dunni*/ *Rhyacotriton cascadae*/ *Rhyacotriton variegatus*/ *Taricha granulosa*/ amphibians and reptiles/ habits-behavior/ distribution/ ecosystems/ forestry practices/ habitat management/ habitat surveys/ habitat use/ management/ microhabitat/ modeling/ riparian habitat/ rivers/ socio-economic studies/ techniques/ wildlife/ wildlife-habitat relationships/ Pacific giant salamander/ Cascades salamander/ southern Olympic/ salamanders/ tailed frog/ Dunn's salamander/ roughskin newt/ Oregon, Western

Abstract: A greater understanding of the ecology of headwater stream vertebrates in managed forest stands is needed for the refinement of forestry practices that manage for multiple resources, including species, habitats and socio-economic values. Pretreatment sampling for our Riparian Buffer Study in western Oregon has revealed distinct amphibian and fish assemblages corresponding to instream habitat gradients in headwaters. Habitat and faunal data were collected across 13 study basins and >140 headwater stream reaches; over 4,000 animals of 15 taxa have been sampled. Canonical correlations were calculated separately for instream species-assemblages, instream and bank fauna, and bank amphibians. Results identified several distinct species-assemblages, each with ranked habitat correlates. Assemblage patterns were more related to hydrological, topographic, and geomorphic habitat attributes (e.g. channel flow type and size, gradient) than fine scale microhabitat features (e.g. downed wood, substrate size). Generalized linear models (Poisson and logistic regression) of individual species-habitat relations were generated for seven taxa (trout spp., cottid spp., *Dicamptodon tenebrosus*, *Rhyacotriton variegatus*, *R. cascadae*, *Plethodon dunni*, *Ascaphus truei*, and *Taricha granulosa*). Results correspond to assemblage-associations. Our study shows the relatively restricted use of the uppermost nonfish-bearing stream channel by a unique amphibian assemblage dominated by torrent salamander species, currently a species of concern in the region. Our Riparian Buffer Study treatments are designed to advance the development of management approaches that have a high likelihood of persistence of such sensitive species within managed wetlands.

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1556. Streambank restoration effectiveness: Lessons learned from a comparative study.

Cooperman, M. S.; Hinch, S. G.; Bennett, S.; Branton, M. A.; Galbraith, R. V.; Quigley, J. T.; and Heise, B. A.

Fisheries 32(6): 278-291. (June 2007)

NAL Call #: SH1.F54

Descriptors: banks/ channels/ erosion/ evaluation/ experimental design/ grading/ habitat improvement/ habitats/ monitoring/ nature conservation/ riparian zone/ river banks/ salmon/ shrubs/ streams/ zoobenthos/ Canada, British Columbia

Abstract: Post-treatment effectiveness monitoring should be an integral part of stream restoration efforts, but it is often neglected due to lack of funds or insufficient project planning. Here we report results of an effectiveness evaluation of a streambank restoration program for salmon streams in the southern interior of British Columbia. Restoration involved treating eroding riverbanks with bank grading, riparian plantings, and installation of rock toes, rock-wood current deflectors, and livestock exclusion fencing. Absence of pre-treatment site characterization data necessitated comparing post treatment conditions at treated sites to conditions at untreated eroding control sites. We measured in-channel and riparian conditions plus invertebrate abundance and biomass at 16 sites treated between 1997 and 2002 and 11 nearby control sites. Treatment and control sites did not substantively differ in their habitat condition or aquatic macroinvertebrate abundances, although treated sites tended to have more shrubs along the outside bank, higher inside banks, and narrower wetted widths. Absence of statistical differences between treatment and control sites might be due to low statistical power, as >50 sites per group would need to be sampled for power to reach 0.8 at the effect sizes observed. Site specific channel gradient, a variable unaffected by restoration actions, was correlated with many of the variables we measured to characterize habitat condition, thereby confounding our ability to determine the magnitude of change relating to treatment efforts. Our results demonstrate the weaknesses of relying on a post-treatment, between-group comparison experimental design for restoration effectiveness monitoring. We suggest collection of pre-treatment data should be an essential part of the restoration process so more appropriate "before-after" experimental designs can be applied.

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1557. Summer and fall microhabitat utilization of juvenile bull trout and cutthroat trout in a wilderness stream, Idaho.

Spangler, R. E. and Scarnecchia, D. L.

Hydrobiologia 452: 145-154. (2001)

NAL Call #: 410 H992; ISSN: 00188158.

Notes: doi: 10.1023/A:1011988313707.

Descriptors: char/ fish ecology/ *Oncorhynchus clarki*/ *Salvelinus confluentus*/ trout/ ocean habitats/ stream flow/ microhabitat/ marine biology/ habitat use/ juvenile/ microhabitat/ salmonid/ United States

Abstract: Microhabitat use and availability were evaluated and compared between different size classes of juvenile resident bull trout (*Salvelinus confluentus*) and cutthroat trout (*Oncorhynchus clarki*) in a small wilderness stream within the South Fork Clearwater River basin, Idaho. The objective was to determine if utilization of measured habitat

characteristics changed from summer to late fall. Sampling of fish was conducted with night snorkeling. During the summer, smaller juvenile bull trout (<66 mm) total length (TL) were associated with shallow stream margins over coarse substrates. In the fall, they moved to significantly deeper, lower velocity water, and closer to cover ($p < 0.05$), but maintained their association with coarse substrates. During the summer, larger juvenile bull trout and larger juvenile cutthroat trout (66-130 mm TL) occupied significantly deeper water than smaller juvenile bull trout ($p < 0.05$). Generally, larger juvenile bull trout were found closer to the bottom and in lower velocity water than larger juvenile cutthroat trout ($p < 0.05$). In the fall, larger juvenile bull trout and larger juvenile cutthroat trout were associated with significantly deeper, lower velocity water located closer to cover than in summer ($p < 0.05$). However, cutthroat trout occupied slightly deeper water over finer substrates than bull trout. Deep water with low velocities evidently provide important rearing areas for large bull trout and large cutthroat trout in the fall. Land management practices that maintain such environments will benefit these species.
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1558. Surface water quality: Calibration of paired basins prior to streambank fencing of pasture land.

Galeone, D. G.

Journal of Environmental Quality 28(6): 1853-1863. (1999)

NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: catchment hydrology/ fencing/ pastures/ water quality/ communities/ equations/ manures/ nutrients/ pretreatment/ revegetation/ sediment/ streams/ trampling/ yields/ geological sedimentation/ losses from soil

Abstract: Streambank fencing is a best management practice that is targeted to reduce suspended sediment and nutrient inputs to streams by reducing direct inputs from animals, eliminating streambank trampling, and promoting streambank revegetation. A paired basin study was conducted in two small adjacent basins in Pennsylvania, USA, to determine the water quality effects of streambank fencing. This article documents the 3-yr calibration period between control and treatment basins prior to fence installation. Approx. 70% of land adjacent to streambanks in the study area is used as pasture. Nutrient quantities applied as manure, benthic-macroinvertebrate communities, and the physical habitat of each stream were similar in both basins. Total N, P, and suspended sediment yields measured at the outlet of each basin averaged ~56, 2.8, and 2650 kg/ha on an annual basis. For both basins, ~90% of the total N yield was attributable to dissolved NO₃-N and ~90% of the total N yield occurred during nonstormflow; conversely, ~90% of the total P yield was attributable to stormflow and 60 to 65% of the total P yield was suspended. Regression equations developed between both basins for low flow and stormflow samples for nutrients, suspended sediment, and discharge indicated a significant relation for most constituents. Pretreatment relation between basins for low flow and stormflow samples would need to change by 6 and 14% for total N concentrations and 24 and 9% for total P concentrations in order for streambank fencing to significantly affect water quality in the treatment basin.
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1559. Survey of livestock influences on stream and riparian ecosystems in the western United States.

Belsky, A. J.; Matzke, A.; and Uselman, S.
Journal of Soil and Water Conservation 54(1):
 419-431. (1999)

NAL Call #: 56.8 J822; ISSN: 0022-4561.

http://www.landsinfo.org/ecosystem_defense/Science_Documents/Belsky_et_al_1999.pdf

Descriptors: livestock/ water quality/ riparian land/ streams/ grazing/ environmental effects/ channel morphology/ arid lands/ riparian environments/ arid environments/ agricultural pollution/ agricultural runoff/ environmental impact/ water pollution/ river banks/ natural channels/ ecology/ arid regions/ United States, western region

Abstract: This paper summarizes the major effects of livestock grazing on stream and riparian ecosystems in the arid West. The study focused primarily on results from peer-reviewed, experimental studies, and secondarily on comparative studies of grazed versus naturally or historically protected areas. Results were summarized in tabular form. Livestock grazing was found to negatively affect water quality and seasonal quantity, stream channel morphology, hydrology, riparian zone soils, instream and streambank vegetation, and aquatic and riparian wildlife. No positive environmental impacts were found. Livestock also were found to cause negative impacts at the landscape and regional levels. Although it is sometimes difficult to draw generalizations from the many studies, due in part to differences in methodology and environmental variability among study sites, most recent scientific studies document that livestock grazing continues to be detrimental to stream and riparian ecosystems in the West.

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1560. Targeting conservation efforts in the presence of threshold effects and ecosystem linkages.

Wu, J. and Skelton-Groth, K.

Ecological Economics 42(1-2): 313-331. (2002)

NAL Call #: QH540.E26; ISSN: 09218009.

Notes: doi: 10.1016/S0921-8009(02)00104-0.

Descriptors: conservation policy/ correlated benefits/ fund allocation/ salmon restoration/ targeting criteria/ threshold effects/ nature conservation/ restoration ecology/ riparian zone/ salmonid/ targeting/ United States

Abstract: The prevailing federal policy of targeting conservation programs on the basis of physical criteria tends to ignore the threshold effect of conservation efforts and the correlation between alternative environmental benefits. In this article, we examine the extent to which conservation funds will be misallocated when threshold effects and correlated benefits are ignored. We show that targeting conservation efforts based on physical criteria or political equity concerns may actually lead to the lowest possible benefits to society from conservation expenditure. Ignoring correlated benefits may lead not only to misallocation of conservation funds among watersheds, but also to incorrect resources (e.g. land, streams) being targeted for conservation. The empirical analysis focuses on riparian habitat investments for salmon restoration in the Pacific Northwest. We show that a large portion of conservation benefits would be lost when threshold effects and correlated benefits are ignored, and argue that funds

should be allocated so that the total value of environmental benefits is maximized, not the total amount of resources protected.

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1561. Temporal and spatial assessment of water quality, physical habitat, and benthic communities in an impaired agricultural stream in California's San Joaquin Valley.

Hall, Lenwood W. and Killen, William D.

Journal of Environmental Science and Health: Part A 40(5): 959-989. (2005); ISSN: 1093-4529

Descriptors: biogeography: population studies/ freshwater ecology: ecology, environmental sciences/ water quality/ environmental degradation/ benthic community/ physical habitat

Abstract: The goal of this study was to characterize and discuss the relationships among water quality, physical habitat, and benthic community data collected annually over a three-year period (2000-2002) in an impaired agricultural stream (Orestimba Creek) in California's San Joaquin River watershed. Conductivity, pH, and turbidity were the most important water quality conditions influencing the various benthic metrics. Significantly higher flow conditions and lower dissolved oxygen values were reported in Orestimba Creek in 2001; increased turbidity conditions were reported in 2002. Channel alteration, riparian buffer, sediment deposition, and channel flow were the most important physical habitat metrics influencing the various benthic metrics. Higher total physical habitat scores were reported in 2001 when compared with 2002. The most dominant benthic taxa collected during all three years of sampling were oligochaetes and chironomids. Oligochaetes are found in stressful environments while chironomids can be either sensitive or tolerant to environmental stressors depending on the species. Populations of both daphnids and the exotic clam *Corbicula* were reported to increase over time. Both of these taxa are generally tolerant to most types of environmental degradation. The exception is that daphnids are highly sensitive to organophosphate insecticides. The % filterers increased over time, which suggests an increase in environmental disturbance. The % collectors decreased from 2000 to 2002, which suggests an improvement in environmental conditions. The presence of similar to 100 taxa in Orestimba Creek during each of the three years of sampling implies that benthic communities in this stream are fairly diverse, considering their ephemeral environment, but without a clear definition of benthic community expectations based on established reference conditions it is unknown if this water body is actually impaired.

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1562. Toward efficient riparian restoration: Integrating economic, physical, and biological models.

Watanabe, Michio; Adams, Richard M.; Wu, JunJie;

Bolte, John P.; Cox, Matt M.; Johnson, Sherri L.;

Liss, William J.; Boggess, William G.; and

Ebersole, Joseph L.

Journal of Environmental Management 75(2): 93-104. (2005)

NAL Call #: HC75.E5J6 ; ISSN: 0301-4797

Descriptors: conservation measures/ habitat/ freshwater habitat/ lotic water/ land zones/ comprehensive zoology:

habitat management/ habitat restoration/ stream riparian habitat/ analysis of models/ stream/ riparian habitat restoration/ Oregon/ Grand Ronde basin/ stream riparian habitat restoration

Abstract: This paper integrates economic, biological, and physical models to explore the efficient combination and spatial allocation of conservation efforts to protect water quality and increase salmonid populations in the Grande Ronde basin, Oregon. We focus on the effects of shade on water temperatures and the subsequent impacts on endangered juvenile salmonid populations. The integrated modeling system consists of a physical model that links riparian conditions and hydrological characteristics to water temperature; a biological model that links water temperature and riparian conditions to salmonid abundance, and an economic model that incorporates both physical and biological models to estimate minimum cost allocations of conservation efforts. Our findings indicate that conservation alternatives such as passive and active riparian restoration, the width of riparian restoration zones, and the types of vegetation used in restoration activities should be selected based on the spatial distribution of riparian characteristics in the basin. The relative effectiveness of passive and active restoration plays an important role in determining the efficient allocations of conservation efforts. The time frame considered in the restoration efforts and the magnitude of desired temperature reductions also affect the efficient combinations of restoration activities. If the objective of conservation efforts is to maximize fish populations, then fishery benefits should be directly targeted. Targeting other criterion such as water temperatures would result in different allocations of conservation efforts, and therefore are not generally efficient. © 2005 Elsevier Ltd. All rights reserved.

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1563. Trout habitat, abundance, and fishing opportunities in fenced vs unfenced riparian habitat along Sheep Creek, Colorado.

Stuber, R. J.

In: Riparian ecosystems and their management: Reconciling conflicting uses, General Technical Report-RM 120/ Johnson, R. Roy ; Ziebell, Charles D.; Patton, David R.; Ffolliott, Peter F.; and Hamre, R. H.; Fort Collins, Colo.: Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, 1985. pp. 310-314.

Notes: Conference held April 16-18, 1985 in Tuscon, Ariz. NAL Call #: aSD11.A42

Descriptors: riparian environments/ livestock/ river banks/ grazing/ abundance/ Salmo/ standing stock/ Colorado, Sheep Creek/ livestock

Abstract: Fencing was used to protect 40 hectares of riparian stream habitat along 2.5 km of Sheep Creek, Colorado, from adverse impacts due to heavy streamside recreation use and cattle grazing. Fish habitat within the fenced area was narrower, deeper, had less streambank alteration, and better streamside vegetation than comparable unfenced sections. Estimated trout standing crop was twice as great, and proportional stock density (PSD) was higher than in unfenced sections. There was a higher proportion of nongame fish present in unfenced

sections. Projected fishing opportunities within the fenced sections were double those estimated for a comparable length of unfenced habitat along the same stream.

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1564. Undamming rivers: A review of the ecological impacts of dam removal.

Bednarek, A. T.

Environmental Management 27(6): 803-814. (2001)

NAL Call #: HC79.E5E5; ISSN: 0364-152X

Descriptors: dams/ rivers/ environmental restoration/ river engineering/ restoration/ fluvial morphology/ habitat/ sediment transport/ ecosystem resilience/ environmental impact/ migratory species/ stream flow rate/ cost benefit analysis/ biota/ regulated rivers/ environmental quality/ sediment load/ streamflow/ alteration of flow/ Pisces/ fish passage/ dam removal/ reclamation/ protective measures and control/ environmental action/ ecological impact of water development

Abstract: Dam removal continues to garner attention as a potential river restoration tool. The increasing possibility of dam removal through the FERC relicensing process, as well as through federal and state agency actions, makes a critical examination of the ecological benefits and costs essential. This paper reviews the possible ecological impacts of dam removal using various case studies. Restoration of an unregulated flow regime has resulted in increased biotic diversity through the enhancement of preferred spawning grounds or other habitat. By returning riverine conditions and sediment transport to formerly impounded areas, riffle/pool sequences, gravel, and cobble have reappeared, along with increases in biotic diversity. Fish passage has been another benefit of dam removal. However, the disappearance of the reservoir may also affect certain publicly desirable fisheries. Short-term ecological impacts of dam removal include an increased sediment load that may cause suffocation and abrasion to various biota and habitats. However, several recorded dam removals have suggested that the increased sediment load caused by removal should be a short-term effect. Preremoval studies for contaminated sediment may be effective at controlling toxic release problems. Although monitoring and dam removal studies are limited, a continued examination of the possible ecological impacts is important for quantifying the resistance and resilience of aquatic ecosystems. Dam removal, although controversial, is an important alternative for river restoration.

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1565. Urbanization effects on stream fish assemblages in Maryland, USA.

Morgan, R. P. and Cushman, S. F.

Journal of the North American Benthological Society 24(3): 643-655. (2005)

NAL Call #: QL141.F7; ISSN: 08873593.

Notes: doi: 10.1899/0887-3593(2005)024[0643:UEOSFA]2.0.CO;2.

Descriptors: fish assemblages/ Maryland/ MBSS/ urbanization/ ichthyofauna/ index of biotic integrity/ stream/ urbanization/ Maryland

Abstract: We examined patterns in Maryland fish assemblages in 1st- through 3rd-order nontidal streams along an urbanization gradient in the Eastern Piedmont

(EP) and Coastal Plain (CP) physiographic ecoregions of Maryland, USA, using 1995 to 1997 and 2000 to 2002 data from the Maryland Biological Site Survey (MBSS). Major urbanization and other historical stressors occur in both ecoregions, and there is potential for further stress over the next 25 y as urbanization increases. We assigned each MBSS site (n = 544 streams) to a class of urbanization based on land cover within its upsite catchment. We compared observed fish abundance and species richness to the probable (expected) assemblages within each ecoregion, and also assessed the accuracy of the Maryland fish index of biotic integrity (FIBI) to indicate catchment urbanization. Relationships between urbanization and fish assemblages and FIBI varied between the 2 ecoregions. Assemblages in EP streams exhibited stronger relationships with urbanization than those in CP streams, particularly when urban land cover was >25% of the catchment. Across all EP stream orders (1st, 2nd, and 3rd), high urbanization was associated with low fish abundance and richness, low FIBI, and few intolerant fish species, resulting in assemblages dominated by tolerant species. Conservation practices minimizing urbanization effects on fish assemblages may be inadequate to protect sensitive fish species because of the invasiveness of urban development and stressors related to the urban stream syndrome. © 2005 by The North American Benthological Society.

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1566. Using historical biological data to evaluate status and trends in the Big Darby Creek Watershed (Ohio, USA).

Schubauer Berigan, M. K.; Smith, M.; Hopkins, J.; and Cormier, S. M.
Environmental Toxicology and Chemistry 19(4,pt.2): 1097-1105. (2000)
 NAL Call #: QH545.A1E58; ISSN: 0730-7268 [ETOCDK].
 Notes: In the Special Issue: Ecosystem Vulnerability. Paper presented at the American Society for Testing and Materials-U.S. Environmental Protection Agency-Society of Environmental Toxicology and Chemistry Symposium, August 17-20, 1998, Seattle, Washington. Includes references.

Descriptors: watersheds/ watershed management/ biological indicators/ trends/ Ohio

Abstract: Assessment of watershed ecological status and trends is challenging for managers who lack randomly or consistently sampled data, or monitoring programs developed from a watershed perspective. This study investigated analytical approaches for assessment of status and trends using data collected by the Ohio Environmental Protection Agency as part of state requirements for reporting stream quality and managing discharge permits. Fish and benthic macroinvertebrate metrics collected during three time periods (1979-1981, 1986-1989, 1990-1993) were analyzed for the mainstem of Big Darby Creek, a high-quality warm-water stream in central Ohio, USA. Analysis of variance of transformed metrics showed significant differences among time periods for six fish metrics. In addition, significant positive linear trends were observed for four metrics plus the index of biotic integrity score, and negative linear trends for two fish metrics. An analysis of a subset of sites paired by location and sampled over the three periods reflected findings using all available

data for the mainstem. In particular, mean estimates were very similar between the reduced and full data sets, whereas standard error estimates were much greater in the reduced subset. Analysis of serial autocorrelation patterns among the fish metrics over the three time periods suggests changes in the nature of stressors over time. A comparison within the most recent time period showed significantly better condition for Big Darby mainstem than for Hellbranch Run (the easternmost subwatershed), after adjusting for watershed size. The consistency of paired and nonrandomized results suggested that either type of data might be judiciously used for this watershed assessment. Results indicated that overall biological condition of the mainstem of the Big Darby Creek watershed has significantly improved since the early 1980s. This citation is from AGRICOLA.

1567. Using stream bioassessment protocols to monitor impacts of a confined swine operation.

Jack, J.; Kelley, R. H.; and Stiles, D.
Journal of the American Water Resources Association 42(3): 747-753. (2006)
 NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: best management practices/ BMPs/ bioindicators/ confined animal feeding operations/ CAFOs/ macroinvertebrates/ nonpoint source pollution/ water quality

Abstract: The processing of waste from confined animal feeding operations (CAFOs) presents a major environmental challenge. Treatment of waste and subsequent land application is a common best management practice (BMP) for these operations in Kentucky, USA, but there are few data assessing the effect of runoff from such operations on aquatic communities. The authors sampled a stream bordering a CAFO with a land application program to determine if runoff from the fertilized fields was adversely affecting stream communities. Water chemistry, periphyton, and macroinvertebrate samples from riffle habitats downstream of the CAFO were compared to samples collected from an upstream site and a control stream in 1999 and 2000. Riffle communities downstream of the fertilized fields had higher chlorophyll a levels than other sites, but there were no significant differences in macroinvertebrate numbers or in biometrics such as taxa richness among the sites. The BMP in place at this site may be effective in reducing this CAFO's impact on the stream; however, similar assessments at other CAFO sites should be done to assess their impacts. Functional measures such as nutrient retention and litter decomposition of streams impacted by CAFOs should also be investigated to ensure that these operations are not adversely affecting stream communities.

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1568. Using stream bioassessment to monitor best management practice effectiveness.

Vowell, J. L.
Forest Ecology and Management 143(1-3): 237-244. (2001)
 NAL Call #: SD1.F73; ISSN: 03781127.

Notes: doi: 10.1016/S0378-1127(00)00521-1.
Descriptors: benthic macroinvertebrates/ best management practices/ bioassessment/ BMP effectiveness/ logging/ nonpoint source pollution/ aquatic ecosystems/ environmental management/ assessment method/ streams/ United States

Abstract: A best management practices (BMPs) effectiveness study was conducted to evaluate Florida's BMPs for protecting aquatic ecosystems during intensive forestry operations. Sites were selected in major ecoregions of the state and each site was associated with a stream adjacent to intensive silviculture treatments. A stream bioassessment was conducted at each site before silviculture treatments, to determine a pre-treatment stream condition index (SCI). Sampling for the bioassessment was conducted at points along each stream, above and below the treatment area, to establish reference and test conditions. Silviculture treatments of clearcut harvesting, intensive mechanical site preparation and machine planting were then completed, during which all applicable BMPs were adhered to. One year after the first bioassessment and following the treatments, the sites were re-sampled at the same points. No significant difference in the SCI was observed between the reference and test portions of the streams that could be attributed to the treatments using BMPs. Hence, the results of the study support the hypothesis that proper application of BMPs provides protection to adjacent stream ecosystems.
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1569. Using stream macroinvertebrates to compare riparian land use practices on cattle farms in southwestern Wisconsin.

Weigel, B. M.; Lyons, J.; Paine, L. K.; Dodson, S. I.; and Undersander, D. J.

Journal of Freshwater Ecology 15(1): 93-106. (2000)
NAL Call #: QH541.5.F7J68; ISSN: 0270-5060

Descriptors: benthos/ riparian environments/ land use/ agriculture/ sedimentation/ environmental effects/ Invertebrata/ Wisconsin

Abstract: Vegetative riparian buffer strips are typically used to curb stream degradation due to cattle grazing, but intensive rotational grazing has shown promise as an alternative best management practice. The authors compared aquatic macroinvertebrate assemblages among stream segments within continuously grazed pastures, intensive rotationally grazed pastures, undisturbed grassy vegetative buffer strips, and undisturbed woody vegetative buffer strips. Macroinvertebrate and stream sedimentation data were collected from four streams in each land use category in two consecutive years. In an attempt to account for inherent watershed variability among streams, watershed condition was represented with a sample collected upstream of each treatment reach. Watershed condition tended to have greater influence on macroinvertebrate measures than local riparian land use. However, local riparian land use influences were apparent if watershed condition was statistically accounted for with analysis of covariance. Stream reaches with intensive rotational grazing tended to have macroinvertebrate assemblage characteristics intermediate of the buffer and continuously grazed reaches. Although we detected some differences in macroinvertebrate assemblages that apparently reflected very local land use, our results suggest the macroinvertebrates were mostly responding to large-scale watershed influences.

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1570. Utility of biological monitoring for detection of timber harvest effects on streams and evaluation of best management practices: A review.

Fortino, K.; Hershey, A. E.; and Goodman, K. J.
Journal of the North American Benthological Society 23(3): 634-646. (2004)

NAL Call #: QL141.F7; ISSN: 08873593.

Notes: doi: 10.1899/0887-3593(2004)023<0634:UOBMFD>2.0.CO;2.

Descriptors: biological monitoring/ multimetric/ predictive modeling/ timber harvest/ biomonitoring/ community structure/ management practices/ stream/ timber harvesting
Abstract: Best Management Practice (BMP) guidelines have been developed to reduce the negative impacts of timber harvest on streams. BMPs are widely implemented, but the effectiveness of timber harvest BMPs has not been evaluated using modern biological monitoring techniques. Most current biological monitoring is based on 1 of 2 main approaches: multimetric monitoring or predictive modeling. These approaches differ considerably, and their respective merits and failings have been debated extensively in the literature. Our review evaluated the ability of these biological monitoring approaches to detect timber harvest effects and to assess the effectiveness of BMPs. Both techniques detect impairment via changes in macroinvertebrate community structure, despite their differences in approach. Most of the negative effects of timber harvest result in changes in the macroinvertebrate community, so we have concluded that both techniques should be effective for the evaluation of timber harvest and BMPs.

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1571. Warmwater stream bank protection and fish habitat: A comparative study.

Shields, F. D.; Knight, S. S.; and Cooper, C. M.
Environmental Management 26(3): 317-328. (2000)

NAL Call #: HC79.E5E5 ; ISSN: 0364152X.

Notes: doi: 10.1007/s002670010089.

Descriptors: fish/ habitat/ stream bank protection/ stream restoration/ streambank erosion/ bank protection/ biomass/ cost benefit analysis/ ocean habitats/ stream bank protection/ environmental protection/ conservation planning/ fish/ habitat restoration/ river management/ cost/ environmental management/ environmental protection/ fish/ marine environment/ nonhuman/ United States/

Abstract: Fishes and their habitats were sampled in Harland Creek, Mississippi, for 3 years to compare the relative value of three types of bank treatment in an incised, warm-water stream. Semiannual samples were collected from 10 reaches: 3 reaches protected by each of the three types of protection (longitudinal stone toe, stone spurs, and dormant willow posts) and an unprotected, slowly eroding bend. Protection of concave banks of bends had no measurable effect on the habitat quality of downstream riffles. Although bends and adjacent downstream riffles were faunistically similar at the species level, catostomids and centrarchids were more dominant in pools and smaller cyprinids more dominant in riffles. Reaches with willow posts were slightly deeper than the others, most likely because of geomorphic factors rather than bank treatment. Mean water surface widths in reaches stabilized with stone spurs were 40% to 90% greater than for other treatments, and current velocities were greatest in reaches with stone toe. Patterns of fish abundance and species diversity did

not differ significantly among treatments. However, principal components analysis indicated that the fish species distribution associated with the untreated reference site was distinct. Reaches stabilized with stone spurs supported significantly higher densities of large fish and higher levels of fish biomass per unit channel length than reaches with other bank treatments, generally confirming previous research in the region. Initial costs for spurs were comparable to those for stone toe and about three times greater than for willow posts.

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1572. Water quality in relation to watershed management in the lower San Gabriel River, southern California.

Haj Manouchehri, Daneh

Fullerton, CA: California State University, Fullerton, 2004.

Notes: Degree: MS; Advisor: Laton, William Richard

Descriptors: watershed management/ water quality/ San Gabriel River/ California

Abstract: Currently water quality is one of the most critical concerns throughout the world. the lower reaches of the San Gabriel River Watershed, located in Los Angeles and Orange Counties lie in a semi-arid climate with a dense population. the purpose of this research was to identify the impaired reaches of the river with the type and level of impairment below the Whittier Narrows Dam. the levels of impairment were compared with federal, state and local surface water quality standards. the survey results indicated that the lower reaches of San Gabriel River were significantly impaired by metals (4 mg/l of arsenic), total coliform (240000/100ml) and nutrients (5 mg/l of nitrite). the major sources of the impairments are local industrial land use, intensive residential areas and agricultural runoff, respectively. the level of impairment at several stations reached readings too high to support the existing and intermittent designated beneficial uses of the river. Most of the dams and canalization of the basin were in response to the catastrophic floods of 1938. However, since it has been urbanized, people are demanding that the river be a resource for recreation and wildlife not only a gutter for urban runoff and flood flows. the study concludes that attaining the river water quality standards for beneficial uses will significantly enhance the value of the watershed.

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1573. Water quality in Wyoming: The Sage Creek Project.

Shirley, M. D.

Rangelands 25(3): 32-35. (2003)

NAL Call #: SF85.A1R32; ISSN: 0190-0528

Descriptors: benthos/ development projects/ erosion/ geological sedimentation/ geology/ grazing systems/ monitoring/ plant communities/ riparian vegetation/ streams/ vegetation/ water quality/ watersheds

Abstract: The geology and soils, erosion and sedimentation, and vegetation of the Sage Creek Basin in Wyoming, USA, were examined to assess the water quality of the stream. Sage Creek has been one of Wyoming's impaired stream, thus a Sage Creek Project was developed. The important aspects of the project were the implementation of a planned grazing system in the majority of the watershed and modifications to road crossings. A monitoring system has been established to collect additional baseline data and track the effectiveness of the

best management practice implementation. The monitoring programme includes: chemical water quality and benthic macroinvertebrate sampling, channel cross-sections, riparian photo-points, green-line transects, and upland biological transects.

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1574. Watershed improvement using prescribed burns as a way to restore aquatic habitat for native fish.

Gori, David and Backer, Dana

In: Connecting mountain islands and desert seas: biodiversity and management of the Madrean Archipelago II., Proceedings RMRS 36/ Gottfried, Gerald J.; Gebow, Brooke S.; Eskew, Lane G.; and Edminster, Carleton B.; Ogden, UT: Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 403-406. http://www.fs.fed.us/rm/pubs/rmrs_p036/rmrs_p036_403_406.pdf

Descriptors: conservation measures/ land zones/ North America/ Pisces: habitat management/ aquatic habitat restoration/ native species/ fire management/ grassland watersheds/ freshwater habitat/ United States, southwestern region/ Pisces/ chordates/ fish/ vertebrates

Abstract: The Nature Conservancy and Bureau of Land Management are testing a model that prescribed burns can be used to increase perennial grass cover, reduce shrubs in desert grassland, and improve watershed condition and aquatic habitat. Results of a prescribed burn in the Hot Springs Creek watershed on Muleshoe Ranch CMA demonstrated the predicted vegetation changes and watershed improvement. Since 1991, instream cover, aquatic habitat depth, and native fish density have increased in Hot Springs Creek. Our results suggest that prescribed fire is an important tool for managing grassland watersheds and restoring aquatic habitat.

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1575. Winter habitat of selected stream fishes and potential impacts from land-use activity.

Cunjak, R. A.

In: Workshop on the science and management for habitat conservation and restoration strategies (HabCARES) in the Great Lakes. Kempenfelt, Ontario, Canada.

Kelso, J. R. (eds.)

Ottawa, Ontario, Canada: National Research Council of Canada; pp. 267-282; 1996.

Notes: Also published as: Canadian journal of fisheries and aquatic sciences/ Journal canadien des sciences halieutiques et aquatiques [Can. J. Fish. Aquat. Sci./J. Can. Sci. Halieut. Aquat.] 53 (supplement 1); ISSN: 0706-652X .

Descriptors: habitat/ habitat selection/ winter/ environmental impact/ land use/ metabolism/ habitat improvement/ rivers/ Salmonidae/ Canada/ conservation, wildlife management and recreation

Abstract: This paper reviews the habitat characteristics and the behaviour of selected stream fishes during winter in temperate-boreal ecosystems. Emphasis is placed on the salmonid fishes upon which most winter research has been directed. As space is the primary factor regulating stream fish populations in winter, aspects of winter habitat are considered at various spatial scales from microhabitat to stream reach to river basin. Choice of winter habitat is governed by the need to minimize energy expenditure, with the main criterion being protection from adverse physicochemical conditions. The distance moved to