



## Reducing Ecological Impacts of Shale Development: RECOMMENDED PRACTICES FOR THE APPALACHIANS

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Using the following references and [additional resources](#), The Nature Conservancy developed a [series of documents](#) that describe the ecological impacts of shale oil and gas development and offer science-based recommended practices to reduce them. References are organized based on the order they appear in each document, not alphabetically.

## LANDSCAPE-SCALE PLANNING

- Johnson, N., T. Gagnon, R. Ralls, E. Zimmerman, B. Eichelberger, C. Tracey, G. Kreitler, S. Orndorff, J. Tomlinson, S. Bearer, and S. Sargent. 2010. Pennsylvania Energy Impacts Assessment Report 1: Marcellus Shale Natural Gas and Wind. *The Nature Conservancy*, Harrisburg, PA.
- Drohan, P. J., M. Brittingham, J. Bishop, and K. Yoder. 2012. Early trends in landcover change and forest fragmentation due to shale-gas development in Pennsylvania: A potential outcome for the northcentral Appalachians. *Environmental Management* **49** (5): 1061–1075.
- Slonecker, E. T., L. E. Milheim, C. M. Roig-Silva, and A. R. Malizia. 2013. *Landscape Consequences of Natural Gas Extraction in Allegheny and Susquehanna Counties, Pennsylvania, 2004–2010*. No. 2013-1025. US Geological Survey.
- Kiviat, E. 2013. Risks to biodiversity from hydraulic fracturing for natural gas in the Marcellus and Utica shales. *Annals of the New York Academy of Sciences* **1286** (1): 1–14.
- With, K. A. 2002. The Landscape Ecology of Invasive Spread. *Conservation Biology* **16** (5): 1192–1203.
- Harper, K. A., S. E. Macdonald, P. J. Burton, C. Jiquan, K. D. Brosowske, S. C. Saunders, E. S. Euskirchen, D. A. R. Roberts, M. S. Jaiteh, and P.-A. Esseen. 2005. Edge Influence on Forest Structure and Composition in Fragmented Landscapes. *Conservation Biology* **19** (3): 768–782.
- Environment Canada. 2004. *How Much Habitat is Enough? Second Edition*. Environment Canada, Toronto, Ontario.
- Braun, T., and S. Hanus. 2005. Forest Fragmentation - Effects of Oil and Gas Activities on Alberta Forests. University of Texas, Fulfillment of requirement for BUEC 663.
- Fahrig, L. 2003. Effects of Habitat Fragmentation on Biodiversity. *Annual Review of Ecology, Evolution, and Systematics* **34**: 487–515.
- Trombulak, S. C., and C. A. Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. *Conservation Biology* **14** (1): 18–30.
- Houlahan, J. E., and C. S. Findlay. 2004. Estimating the “critical” distance at which adjacent land-use degrades wetland water and sediment quality. *Landscape Ecology* **19** (6): 677–690.
- Allan, J. D. 2014. Landscapes and Riverscapes : The Influence of Land Use on Stream Ecosystems. *Annual Review of Ecology, Evolution, and Systematics* **35**: 257–284.

13. Pollock, M. M., T. J. Beechie, M. Liermann, and R. E. Bigley. 2009. Stream temperature relationships to forest harvest in western Washington. *Journal of the American Water Resources Association* **45** (1): 141–156.
14. Price, K., and D. Leigh. 2006. Comparative Water Quality of Lightly- and Moderately-Impacted Streams in the Southern Blue Ridge Mountains, USA. *Environmental Monitoring and Assessment* **120** (1): 269–300.
15. Roth, N. E., J. D. Allan, and D. L. Erickson. 1996. Landscape influences on stream biotic integrity assessed at multiple spatial scales. *Landscape Ecology* **11** (3): 141–156.
16. Ficetola, G. F., E. Padoa-Schioppa, and F. De Bernardi. 2009. Influence of Landscape Elements in Riparian Buffers on the Conservation of Semiaquatic Amphibians. *Conservation Biology* **23** (1): 114–123.
17. Huggett, A. J. 2005. The concept and utility of “ecological thresholds” in biodiversity conservation. *Biological Conservation* **124** (3): 301–310.
18. Askins, R. A., M. J. Philbrick, and D. S. Sugeno. 1987. Relationship between the regional abundance of forest and the composition of forest bird communities. *Biological Conservation* **39** (2): 129–152.
19. Austen, M. J. W., C. M. Francis, D. M. Burke, and M. S. W. Bradstreet. 2001. Landscape Context and Fragmentation Effects on Forest Birds in Southern Ontario. *The Condor* **103** (4): 701–714.
20. Cushman, S. A. 2006. Effects of habitat loss and fragmentation on amphibians: A review and prospectus. *Biological Conservation* **128**: 231–240.
21. Findlay, C. S., and J. Houlahan. 1997. Anthropogenic Correlates of Species Richness in Southeastern Ontario Wetlands. *Conservation Biology* **11**(4):1000–1009.
22. Houlahan and C Scott Findlay, J. E. 2003. The effects of adjacent land use on wetland amphibian species richness and community composition. *Canadian Journal of Fisheries & Aquatic Sciences* **60** (9): 1078–1094.
23. Lehtinen, R., S. Galatowitsch, and J. Tester. 1999. Consequences of habitat loss and fragmentation for wetland amphibian assemblages. *Wetlands* **19** (1): 1–12.
24. McIntyre, N. E. 1995. Effects of forest patch size on avian diversity. *Landscape Ecology* **10** (2): 85–99.
25. Villard, M.-A., M. K. Trzcinski, and G. Merriam. 1999. Fragmentation Effects on Forest Birds: Relative Influence of Woodland Cover and Configuration on Landscape Occupancy. *Conservation Biology* **13** (4): 774–783.
26. Anderson, M. G., and A. Olivero Sheldon. 2011. Conservation Status of Fish, Wildlife, and Natural Habitats in the Northeastern Landscape: Implementation of the Northeast Monitoring Framework. *The Nature Conservancy, Eastern Conservation Science*.
27. Lee, M., L. Fahrig, K. Freemark, and D. J. Currie. 2002. Importance of patch scale vs landscape scale on selected forest birds. *Oikos* **96** (1): 110–118.
28. Blake, J. G., and J. R. Karr. 1984. Species composition of bird communities and the conservation benefit of large versus small forests. *Biological Conservation* **30** (2): 173–187.
29. Knutson, M. G., J. R. Sauer, D. A. Olsen, M. J. Mossman, L. M. Hemesath, and M. J. Lannoo. 1999. Effects of Landscape Composition and Wetland Fragmentation on Frog and Toad Abundance and Species Richness in Iowa and Wisconsin, U.S.A. *Conservation Biology* **13** (6): 1437–1446.
30. Burne, M. R., and C. R. Griffin. 2005. Habitat associations of pool-breeding amphibians in eastern Massachusetts, USA. *Wetlands Ecology and Management* **13** (3): 247–259.
31. Veysey, J., S. Mattfeldt, and K. Babbitt. 2010. Comparative influence of isolation, landscape, and wetland characteristics on egg-mass abundance of two pool-breeding amphibian species. *Landscape Ecology* **26** (5): 661–672.
32. Attum, O., Y. M. Lee, J. H. Roe, and B. A. Kingsbury. 2008. Wetland complexes and upland-wetland linkages: landscape effects on the distribution of rare and common wetland reptiles. *Journal of Zoology* **275** (3): 245–251.
33. Gibbs, J. P. 1998a. Amphibian Movements in Response to Forest Edges, Roads, and Streambeds in Southern New England. *The Journal of Wildlife Management* **62** (2): 584–589.
34. Crawford, J. A., and R. D. Semlitsch. 2007. Estimation of Core Terrestrial Habitat for Stream-Breeding Salamanders and Delineation of Riparian Buffers for Protection of Biodiversity. *Conservation Biology* **21** (1): 152–158.
35. Watson, M. L. 2005. *Habitat Fragmentation and The Effects of Roads on Wildlife and Habitats*. New Mexico Department of Fish and Game: Conservation Service Division.
36. Haskell, D. G. 2000. Effects of Forest Roads on Macroinvertebrate Soil Fauna of the Southern Appalachian Mountains. *Conservation Biology* **14** (1): 57–63.
37. Gehlhausen, S. M., M. W. Schwartz, and C. K. Augspurger. 2000. Vegetation and microclimate edge effects in two mixed-mesophytic forest fragments. *Plant Ecology* **147**: 21–35.

38. Weller, C., J. Thomson, P. Morton, and G. Aplet. 2002. *Fragmenting our lands: The ecological footprint from oil and gas development*. The Wilderness Society.
39. Boulinier, T., J. D. Nichols, J. E. Hines, J. R. Sauer, C. H. Flather, and K. H. Pollock. 2001. Forest Fragmentation and Bird Community Dynamics: Inference at Regional Scales. *Ecology* **82** (4): 1159–1169.
40. Fahrig, L. 2002. Effect of habitat fragmentation on the extinction threshold: A synthesis. *Ecological Applications* **12** (2): 346–353.
41. Bennett, V. J., W. P. Smith, and M. G. Betts. 2011. Toward Understanding the Ecological Impact of Transportation Corridors. General Technical Report PNW-GTR-846. U.S. Forest Service, Portland, OR.
42. Hein, C. D. 2012. Potential impacts of shale gas development on bat populations in the northeastern United States. *Austin, Texas: Bat Conservation International*.
43. Hobson, K. A., and E. Bayne. 2000. Effects of Forest Fragmentation by Agriculture on Avian Communities in the Southern Boreal Mixedwoods of Western Canada. *The Wilson Bulletin* **112** (3): 373–387.
44. Lynch, J. F., and D. F. Whigham. 1984. Effects of forest fragmentation on breeding bird communities in Maryland, USA. *Biological Conservation* **28** (4): 287–324.
45. Stephens, S. E., D. N. Koons, J. J. Rotella, and D. W. Willey. 2004. Effects of habitat fragmentation on avian nesting success: a review of the evidence at multiple spatial scales. *Biological Conservation* **115** (1): 101–110.
46. Blouin-Demers, G., and P. J. Weatherhead. 2001. Habitat Use by Black Rat Snakes (*Elaphe obsoleta obsoleta*) in Fragmented Forests. *Ecology* **82** (10): 2882–2896.
47. Kurki, S., A. Nikula, P. Helle, and H. Linden. 2000. Landscape fragmentation and forest composition effects on grouse breeding success in boreal forests. *Ecology* **81** (7).
48. Robinson, S. K., R. T. Frank III, T. M. Donovan, D. R. Whitehead, and J. Faaborg. 1995. Regional forest fragmentation and the nesting success of migratory birds. *Science* **267** (5206): 1987–1990.
49. Hoover, J. P., M. C. Brittingham, and L. J. Goodrich. 1995. Effects of Forest Patch Size on Nesting Success of Wood Thrushes. *The Auk* **112** (1): 146–155.
50. Rosenberg, K. V., J. D. Lowe, and A. A. Dhondt. 1999. Effects of Forest Fragmentation on Breeding Tanagers: A Continental Perspective. *Conservation Biology* **13** (3): 568–583.
51. Thomas, E. H., M. C. Brittingham, and S. H. Stoleson. 2014. Conventional oil and gas development alters forest songbird communities. *The Journal of Wildlife Management* **78** (2): 293–306.
52. Benitez-Lopez, A., R. Alkemade, and P. A. Verweij. 2010. The impacts of roads and other infrastructure on mammal and bird populations: A meta-analysis. *Biological Conservation* **143**: 1307–1316.
53. Hudy, M., T. M. Thieling, N. Gillespie, and E. P. Smith. 2008. Distribution, status, and land use characteristics of subwatersheds within the native range of brook trout in the Eastern United States. *North American Journal of Fisheries Management* **28** (4): 1069–1085.
54. Seiler, A. 2001. Ecological effects of roads: a review. *Introductory research essay* **9**: 1–40.
55. Nord, A. N., D. A. Mortensen, and E. S. J. Rauschert. 2010. Environmental Factors Influence Early Population Growth of Japanese Stiltgrass. *Invasive Plant Science and Management* **3** (1): 17–25.
56. Rowland, M. M., M. J. Wisdom, B. K. Johnson, and M. A. Penninger. 2005. Effects of roads on elk: Implications for management in forested ecosystems. In M. J. Wisdom, editor. *The Starkey Project: a synthesis of long-term studies of elk and mule deer. Reprinted from the 2004 Transactions of the North American Wildlife and Natural Resources Conference, Alliance Communications Group, Lawrence, Kansas, USA*.
57. Fahrig, L., and T. Rytwinski. 2009. Effects of Roads on Animal Abundance: an Empirical Review and Synthesis. *Ecology and Society* **14** (1).
58. Vistnes, I., and C. Nellemann. 2001. Avoidance of Cabins, Roads, and Power Lines by Reindeer during Calving. *The Journal of Wildlife Management* **65** (4): 915–925.
59. Dyer, S. J., J. P. O'Neill, S. M. Wasel, and S. Boutin. 2001. Avoidance of Industrial Development by Woodland Caribou. *The Journal of Wildlife Management* **65** (3): 531–542.
60. Noss, R. 1995. *The ecological effects of roads*. Unpublished Report. Wildlands CPR, U.S.A.
61. Litvaitis, J. A. 2001. Importance of early successional habitats to mammals in eastern forests. *Wildlife Society Bulletin* **29** (2): 466–473.
62. Marsh, D. M., G. S. Milam, N. R. Gorham, and N. G. Beckman. 2005. Forest roads as partial barriers to terrestrial salamander movement. *Conservation Biology* **19** (6): 2004–2008.
63. Andrews, K. M., J. W. Gibbons, and D. M. Jochimsen. 2008. Ecological Effects of Roads on Amphibians and Reptiles: A Literature Review. *Herpetological Conservation* **3**: 121–143.
64. Gibbs, J. P. 1998b. Distribution of woodland amphibians along a forest fragmentation gradient. *Landscape Ecology* **13** (4): 263–268.

65. Jackson, S. D. 2003. Design and construction of aquatic organism passage at road-stream crossings: Ecological considerations in the design of river and stream crossings. *Pages 20–29 Proceeding of the 2003 International Conference on Ecology and Transportation, North Carolina State University, Raleigh.*
66. US Forest Service Stream Simulation Working Group. 2008. Stream simulation: An ecological approach to providing passage for aquatic organisms at road-stream crossings.
67. Levine, J. 2013. An Economic Analysis of Improved Road-Stream Crossings. The Nature Conservancy, Keene Valley, NY.
68. Mortensen, D. A., E. S. J. Rauschert, A. N. Nord, and B. P. Jones. 2009. Forest Roads Facilitate the Spread of Invasive Species. *Invasive Plant Science and Management* **2** (3): 191–199.
69. With, K. A. 2004. Assessing the Risk of Invasive Spread in Fragmented Landscapes. *Risk Analysis: An International Journal* **24** (4): 803–813.
70. Spellerberg, I. F. 1998. Ecological effects of roads and traffic: A literature review. *Global Ecology and Biogeography Letters* **7** (5): 317–333.
71. Freeman, M. C., C. M. Pringle, and C. R. Jackson. 2007. Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales. *Journal of the American Water Resources Association* **3** (1).
72. Nadeau, T.-L., and M. Rains. 2007. Hydrologic Connectivity Between Headwater Streams and Downstream Waters: How Science Can Inform Policy. *Journal of the American Water Resources Association* **43** (1).
73. Ekness, P., and T. Randhir. 2007. Effects of riparian areas, stream order, and land use disturbance on watershed-scale habitat potential: An ecohydrologic approach to policy. *Journal of the American Water Resources Association* **43** (6): 1468–1482.
74. Jones III, E. B. D., G. S. Helfman, J. O. Harper, and P. V. Bolstad. 1999. Effects of Riparian Forest Removal on Fish Assemblages in Southern Appalachian Streams. *Conservation Biology* **13** (6): 1454–1465.
75. Petranka, J. W., and C. K. Smith. 2005. A functional analysis of streamside habitat use by southern Appalachian salamanders: Implications for riparian forest management. *Forest Ecology and Management* **210**: 443–454.
76. Schueler, T. R., L. Fraley-McNeal, and K. Cappiella. 2009. Is impervious cover still important? Review of recent research. *Journal of Hydrologic Engineering* **14** (4): 309–315.
77. King, R. S., and M. E. Baker. 2010. Considerations for analyzing ecological community thresholds in response to anthropogenic environmental gradients. *Journal of the North American Benthological Society* **29** (3): 998–1008.
78. Wood, P. J., and P. D. Armitage. 1997. Biological effects of fine sediment in the lotic environment. *Environmental Management* **21** (2): 203–217.
79. Eaglin, G. S., and W. A. Hubert. 1993. Management briefs: Effects of logging and roads on substrate and trout in streams of the Medicine Bow National Forest, Wyoming. *North American Journal of Fisheries Management* **13**: 844–846.
80. Sutherland, A. B., J. L. Meyer, and E. P. Gardiner. 2002. Effects of land cover on sediment regime and fish assemblage structure in four southern Appalachian streams. *Freshwater Biology* **47** (9): 1791–1805.
81. Baxter, C. V., C. A. Frissell, and F. R. Hauer. 1999. Geomorphology, logging roads, and the distribution of bull trout spawning in a forested river basin: Implications for a management and conservation. *Transactions of the American Fisheries Society* **128** (5): 854–867.
82. Freyman, M. 2014. Hydraulic Fracturing and Water Stress: Water Demand by the Numbers. Ceres, Boston, MA.
83. Cooley, H., and K. Donnelly. 2012. Hydraulic Fracturing and Water Resources: Separating the Frack from the Fiction. *Pacific Institute, Oakland, CA.*
84. Susquehanna River Basin Commission. 2010. *Managing and Protecting Water Resources in the Susquehanna River Basin.*
85. Mitchell, A. L., M. Small, and E. A. Casman. 2013. Surface Water Withdrawals for Marcellus Shale Gas Development: Performance of Alternative Regulatory Approaches in the Upper Ohio River Basin. *Environmental Science & Technology* **47** (22).
86. Entrekin, S., M. Evans-White, B. Johnson, and E. Hagenbuch. 2011. Rapid expansion of natural gas development poses a threat to surface waters. *Frontiers in Ecology and the Environment* **9** (9): 503–511.
87. Rahm, B. G., and S. J. Riha. 2012. Toward Strategic Management of Shale Gas Development: Regional, Collective Impacts on Water Resources. *Environmental Science and Policy* **17**: 12–23.
88. Smith, D. R., C. D. Snyder, N. P. Hitt, J. A. Young, and S. P. Faulkner. 2012. ENVIRONMENTAL REVIEWS AND CASE STUDIES: Shale Gas Development and Brook Trout: Scaling Best Management Practices to Anticipate Cumulative Effects. *Environmental Practice* **14** (4): 366–381.

89. Weltman-Fahs, M., and J. M. Taylor. 2013. Hydraulic Fracturing and Brook Trout Habitat in the Marcellus Shale Region: Potential Impacts and Research Needs. *Fisheries* **38** (1): 4–15.
90. Vengosh, A., R. B. Jackson, N. Warner, T. H. Darrah, and A. Kondash. 2014. A Critical Review of the Risks to Water Resources from Unconventional Shale Gas Development and Hydraulic Fracturing the United States. *Environmental Science & Technology* **48** (15), 8334–8348.
91. Walters, A., and D. Post. 2008. An experimental disturbance alters fish size structure but not food chain length in streams. *Ecology* **89**: 3261–3267.
92. Dephilip, M., and T. Moberg. 2010. Ecosystem flow recommendations for the Susquehanna River basin. *The Nature Conservancy, Harrisburg, PA.*
93. Dephilip, M., and T. Moberg. 2013a. Ecosystem flow recommendations for the upper Ohio River Basin in western Pennsylvania. *The Nature Conservancy, Harrisburg, PA.*
94. Dephilip, M., and T. Moberg. 2013b. Ecosystem Flow Recommendations for the Delaware River Basin. *The Nature Conservancy, Harrisburg, PA.*
95. Armstrong, D. S., T. A. Richards, and S. B. Levin. 2011. *Factors influencing riverine fish assemblages in Massachusetts*. US Department of the Interior, US Geological Survey.
96. Bowen, Z., K. Bovee, and T. Waddle. 2003. Effects of flow regulation on shallow-water habitat dynamics and floodplain connectivity. *Transactions of the American Fisheries Society* **132**: 809–823.
97. Flinn, M. B., S. R. Adams, M. R. Whiles, and J. E. Garvey. 2008. Biological responses to contrasting hydrology in backwaters of Upper Mississippi River Navigation Pool 25. *Environmental Management* **41** (4): 468–486.
98. Falke, J. A., K. R. Bestgen, and K. D. Fausch. 2010. Streamflow reductions and habitat drying affect growth, survival, and recruitment of brassy minnow across a Great Plains riverscape. *Transactions of the American Fisheries Society* **139**: 1566–1583.
99. Angradi, T., R. Hood, and D. Tarter. 2001. Vertical, longitudinal and temporal variation in the macrobenthos of an Appalachian headwater stream system. *American Midland Naturalist* **146**: 223–242.
100. Brauning, D. W. 1992. *Atlas of breeding birds in Pennsylvania*. Page 483. University of Pittsburgh Press, Pittsburgh, PA.
101. Pennsylvania Natural Heritage Program. 2009. Northern Water Shrew (*Sorex palustris albobarbis*). Species Factsheet.
102. Merritt, J. F. 1987. *Guide to the Mammals of Pennsylvania*. Page 408. University of Pittsburgh Press, Pittsburgh, PA.
103. Zedler, P. 2003. Vernal pools and the concept of “isolated wetlands”. *Wetlands* **23** (3): 597–607.
104. Roe, J. H., and A. Georges. 2007. Heterogeneous wetland complexes, buffer zones, and travel corridors: Landscape management for freshwater reptiles. *Biological Conservation* **135** (1): 67–76.
105. Hoeltje, S., and C. Cole. 2009. Comparison of Function of Created Wetlands of Two Age Classes in Central Pennsylvania. *Environmental Management* **43** (4): 597–608.
106. Franci, K. E., W. M. Ford, and S. B. Castleberry. 2004. *Characterization of High Elevation Central Appalachian Wetlands*. US Forest Service, Northeastern Research Station, Research Paper NE-725.
107. Calhoun, A. J. K., and M. W. Klemens. 2002. Best Development Practices Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States Best Development Practices. *MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.*
108. Naiman, R. J., H. Decamps, and M. Pollock. 1993. The Role of Riparian Corridors in Maintaining Regional Biodiversity. *Ecological Applications* **3** (2): 209–212.
109. Ward, J. V., K. Tockner, and F. Schiener. 1999. Biodiversity of floodplain river ecosystems: Ecotones and connectivity. *Regulated Rivers: Research & Management* **15**: 125–139.
110. Ford, W. M., B. S. Castleberry, T. M. Mengak, L. J. Rodrigue, J. D. Feller, and R. K. Russell. 2006. Persistence of Allegheny Woodrats *Neotoma magister* across the mid-Atlantic Appalachian Highlands landscape, USA. *Ecography* **29**: 745–754.
111. Orndorff, S., and T. Patten. 2008. Management Guidelines for Barrens Communities in Pennsylvania. The Nature Conservancy, Harrisburg, PA.
112. Orndorff, S. 2008. Northeast Pennsylvania Ridgetop Barrens Conservation Plan. A report prepared by The Nature Conservancy submitted to the Pennsylvania Department of Conservation and Natural Resources (BRC-LTP-9-21).
113. Halpern, B. C., and A. T. Spies. 1995. Plant Species Diversity in Natural and Managed Forests of the Pacific Northwest. *Ecological Applications* **5** (4): 913–934.
114. Trombulak, S. C., and F. R. Baldwin, editors. 2010. *Landscape-scale Conservation Planning*. Springer Science & Business Media.

115. Bovee, K. D. 1982. *A guide to stream habitat analysis using the instream flow incremental methodology*. Instream Flow Information Paper #12, FWS/OBS-82/26. USDI Fish and Wildlife Service, Washington, DC. 248 p
116. Poff, N. L., J. D. Allan, M. B. Bain, J. R. Karr, K. L. Prestegaard, B. D. Richter, R. E. Sparks, and J. C. Stromberg. 1997. The Natural Flow Regime. *BioScience* **47** (11): 769–784.
117. Bunn, S., and A. Arthington. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. *Environmental Management* **30**: 492–507.
118. Postel, S., and B. Richter. 2003. *Rivers for life: managing water for people and nature*. Page 253. Island Press, Washington, D.C.
119. Taylor, J., W. Fisher, C. Apse, E. Kendy, D. Klein, and G. Schuler. 2013. Flow recommendations for the tributaries of the Great Lakes in New York and Pennsylvania. Prepared by the New York Cooperative Fish and Wildlife Research Unit at Cornell University for The Nature Conservancy.
120. American Petroleum Institute. 2011. *Practices for Mitigating Surface Impacts Associated with Hydraulic Fracturing*. API Guidance Document HF3, First Edition. Section 12.2. [http://www.api.org/policy-and-issues/policy-items/hf/api\\_hf3\\_practices\\_for\\_mitigating\\_surface](http://www.api.org/policy-and-issues/policy-items/hf/api_hf3_practices_for_mitigating_surface)
121. Drohan, P., and M. Brittingham. 2012. Topographic and Soil Constraints to Shale-Gas Development in the Northcentral Appalachians. *Soil Science Society of America Journal* **76** (5): 1696–1706.

## ECOLOGICAL BUFFERS

- Castelle, A. J., A. W. Johnson, and C. Connelly. 1994. Wetland and Stream Buffer Size Requirements - A Review. *Journal of Environmental Quality* **23**: 878–882.
- Ficetola, G. F., E. Padoa-Schioppa, and F. De Bernardi. 2009. Influence of Landscape Elements in Riparian Buffers on the Conservation of Semiaquatic Amphibians. *Conservation Biology* **23** (1): 114–123.
- Wenger, S. 1999. A review of the scientific literature on riparian buffer width, extent and vegetation. Office of Public Service & Outreach Institute of Ecology, University of Georgia, Athens, GA.
- Hannon, S. J., C. A. Paszkowski, S. Boutin, J. DeGroot, S. E. Macdonald, M. Wheatley, and B. R. Eaton. 2002. Abundance and species composition of amphibians, small mammals, and songbirds in riparian forest buffer strips of varying widths in the boreal mixedwood of Alberta. *Canadian Journal of Forest Research* **32** (10): 1784–1800.
- Lee, P., C. Smyth, and S. Boutin. 2004. Quantitative review of riparian buffer width guidelines from Canada and the United States. *Journal of Environmental Management* **70** (2): 165–180.
- Hawes, E., and M. Smith. 2005. Riparian buffer zones: Functions and recommended widths. *Eightmile River Wild and Scenic Study Committee*.
- Bilecki, L. C. 2003. Bat Hibernacula in the Karst Landscape of Central Manitoba: Protecting Critical Wildlife Habitat while Managing for Resource Development. Diss, University of Manitoba.
- Easterly, T., A. Wood, and T. Litchfield. 1991. *Responses of pronghorn and mule deer to petroleum development on crucial winter range in the Rattlesnake Hills*. Unpublished completion report, Wyoming Game and Fish Department, Cheyenne, Wy.
- Pearson, S. F., and D. A. Manuwal. 2001. Breeding Bird Response to Riparian Buffer Width in Managed Pacific Northwest Douglas-Fir Forests. *Ecological Applications* **11** (3): 840–853.
- Richardson, C. T., and K. M. Clinton. 1997. Recommendations for Protecting Raptors from Human Disturbance: A Review. *Wildlife Society Bulletin* **25** (3): 634–638.
- Semlitsch, R. D., and J. R. Bodie. 2003. Biological Criteria for Buffer Zones around Wetlands and Riparian Habitats for Amphibians and Reptiles. *Conservation Biology* **17** (5): 1219.
- Good Forestry of the Granite State Steering Committee, and K. P. Bennett. 2010. *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. New Hampshire Department of Resources and Economic Development, Division of Forests and Lands; UNH Cooperative Extension. Pages 83–88.

13. Lehigh Valley Planning Commission. 2011. Riparian and Wetland Buffers.
14. Phillips, J. D. 1989. An evaluation of the factors determining the effectiveness of water quality buffer zones. *Journal of Hydrology* **107** (1–4): 133–145.
15. Broadmeadow, S., and T. R. Nisbet. 2004. The effects of riparian forest management on the freshwater environment: a literature review of best management practice. *Hydrology and Earth System Science* **8** (3): 286–305.
16. Vaidya, O., T. Smith, H. Fernand, and N. McInnis Leek. 2008. Forestry Best Management Practices: Evaluation of Alternate Streamside Management Zones on Stream Water Quality in Pockwock Lake and Five Mile Lake Watersheds in Central Nova Scotia, Canada. *Environmental Monitoring and Assessment* **137** (1): 1–14.
17. Smith, M. P., R. Schiff, A. Olivero, and J. MacBroom. 2008. The Active River Area: A conservation framework for protecting rivers and streams. The Nature Conservancy, Boston, MA.
18. Bried, J., and G. Ervin. 2006. Abundance patterns of dragonflies along a wetland buffer. *Wetlands* **26** (3): 878–883.
19. Burke, V. J., and J. W. Gibbons. 1995. Terrestrial Buffer Zones and Wetland Conservation: A Case Study of Freshwater Turtles in a Carolina Bay. *Conservation Biology* **9** (6): 1365–1369.
20. Petranka, J. W., and C. K. Smith. 2005. A functional analysis of streamside habitat use by southern Appalachian salamanders: Implications for riparian forest management. *Forest Ecology and Management* **210**: 443–454.
21. Homan, R. N., B. S. Windmiller, and J. M. Reed. 2004. Critical Thresholds Associated with Habitat Loss for Two Vernal Pool-Breeding Amphibians. *Ecological Applications* **14** (5): 1547–1553.
22. Stranko, S. a., R. H. Hilderbrand, R. P. Morgan, M. W. Staley, A. J. Becker, A. Roseberry-Lincoln, E. S. Perry, and P. T. Jacobson. 2008. Brook Trout Declines with Land Cover and Temperature Changes in Maryland. *North American Journal of Fisheries Management* **28** (4): 1223–1232.
23. Kiviat, E. 2013. Risks to biodiversity from hydraulic fracturing for natural gas in the Marcellus and Utica shales. *Annals of the New York Academy of Sciences* **1286**: 1–14.
24. Northrup, J. M., and G. Wittemyer. 2013. Characterising the impacts of emerging energy development on wildlife, with an eye towards mitigation. *Ecology letters* **16** (1): 112–25.
25. Grubb, T. G., and R. M. King. 1991. Assessing human disturbance of breeding Bald Eagle with classification tree models. *Journal of Wildlife Management* **55** (3): 500–511.
26. Steidl, R. J., and R. G. Anthony. 2000. Experimental effects of human activity on breeding Bald Eagles. *Ecological Applications* **10** (1): 258–268.
27. Mortensen, D. A., E. S. J. Rauschert, A. N. Nord, and B. P. Jones. 2009. Forest Roads Facilitate the Spread of Invasive Species. *Invasive Plant Science and Management* **2** (3): 191–199.
28. With, K. A. 2002. The Landscape Ecology of Invasive Spread. *Conservation Biology* **16** (5): 1192–1203.
29. Hickey, M. B. C., and B. Doran. 2004. A Review of the Efficiency of Buffer Strips for the Maintenance and Enhancement of Riparian Ecosystems. *Water Quality Resources Journal of Canada* **39** (3): 311–317.
30. Conner, R. N., J. G. Dickson, J. H. Williamson, and B. Ortego. 2004. Width of Forest Streamside Zones and Breeding Bird Abundance in Eastern Texas. *Southeastern Naturalist* **3** (4): 669–682.
31. Lambert, J. D., and S. J. Hannon. 2000. Short-Term Effects of Timber Harvest on Abundance, Territory Characteristics, and Pairing Success of Ovenbirds in Riparian Buffer Strips. *The Auk* **117** (3): 687–698.
32. Haegen, W. M. Vander, and R. M. Degraaf. 1996. Predation on Artificial Nests in Forested Riparian Buffer Strips. *The Journal of Wildlife Management* **60** (3): 542–550.
33. Peterman, W. E., and R. D. Semlitsch. 2009. Efficacy of riparian buffers in mitigating local population declines and the effects of even-aged timber harvest on larval salamanders. *Forest Ecology and Management* **257** (1): 8–14.
34. Joyal, L. A., M. McCollough, and M. L. Hunter Jr. 2001. Landscape ecology approaches to wetland species conservation: A case study of two turtle species in southern Maine. *Conservation Biology* **15** (6): 1755–1762.
35. Attum, O., Y. M. Lee, J. H. Roe, and B. A. Kingsbury. 2008. Wetland complexes and upland-wetland linkages: landscape effects on the distribution of rare and common wetland reptiles. *Journal of Zoology* **275** (3): 245–251.
36. Lehtinen, R., S. Galatowitsch, and J. Tester. 1999. Consequences of habitat loss and fragmentation for wetland amphibian assemblages. *Wetlands* **19** (1): 1–12.
37. Burne, M. R., and C. R. Griffin. 2005. Habitat associations of pool-breeding amphibians in eastern Massachusetts, USA. *Wetlands Ecology and Management* **13** (3): 247–259.

38. Houlahan, J. E., and C. S. Findlay. 2004. Estimating the “critical” distance at which adjacent land-use degrades wetland water and sediment quality. *Landscape Ecology* **19** (6): 677–690.
39. Keller, G. S., and R. H. Yahner. 2007. Seasonal Forest-Patch Use by Birds in Fragmented Landscapes of South-Central Pennsylvania. *The Wilson Journal of Ornithology* **119** (3): 410–418.
40. Pollock, M. M., T. J. Beechie, M. Liermann, and R. E. Bigley. 2009. Stream temperature relationships to forest harvest in western Washington. *Journal of the American Water Resources Association* **45** (1): 141–156.
41. Huday, M., T. M. Thieling, N. Gillespie, and E. P. Smith. 2008. Distribution, status, and land use characteristics of subwatersheds within the native range of brook trout in the Eastern United States. *North American Journal of Fisheries Management* **28** (4): 1069–1085.
42. Keitzer, S. C. 2007. *Habitat Preferences of the eastern hellbender in West Virginia*.
43. Anderson, P. G. 1996. Sediment generation from forestry operations and associated effects on aquatic ecosystems. *Proceedings of the Forest-Fish Conference: Land Management Practices Affecting Aquatic Ecosystems, Calgary, Alberta*.
44. Luce, C. H., and T. A. Black. 2001. Spatial and Temporal Patterns in Erosion from Forest Roads. *Water Science and Application* **2**: 165–178.
45. Kreutzweiser, D. P., S. S. Capell, and K. P. Good. 2005. Macroinvertebrate Community Responses to Selection Logging in Riparian and Upland Areas of Headwater Catchments in a Northern Hardwood Forest. *Journal of the North American Benthological Society* **24** (1): 208–222.
46. Vaughn, C. C., S. J. Nichols, and D. E. Spooner. 2008. Community and foodweb ecology of freshwater mussels. *Journal of the North American Benthological Society* **27** (2): 409–423.
47. Ekness, P., and T. Randhir. 2007. Effects of riparian areas, stream order, and land use disturbance on watershed-scale habitat potential: An ecohydrologic approach to policy. *Journal of the American Water Resources Association* **43** (6): 1468–1482.
48. Naiman, R. J., H. Decamps, and M. Pollock. 1993. The Role of Riparian Corridors in Maintaining Regional Biodiversity. *Ecological Applications* **3** (2): 209–212.
49. Arthur, M. A., G. B. Coltharp, and D. L. Brown. 1998. Effects of best management practices on forest streamwater quality in eastern Kentucky. *Journal of the American Water Resources Association* **34** (3): 481–495.
50. Roe, J. H., and A. Georges. 2007. Heterogeneous wetland complexes, buffer zones, and travel corridors: Landscape management for freshwater reptiles. *Biological Conservation* **135** (1): 67–76.
51. Hoeltje, S., and C. Cole. 2009. Comparison of Function of Created Wetlands of Two Age Classes in Central Pennsylvania. *Environmental Management* **43** (4): 597–608.
52. Findlay, C. S., and J. Houlahan. 1997. Anthropogenic Correlates of Species Richness in Southeastern Ontario Wetlands. *Conservation Biology* **11** (4): 1000–1009.
53. Calhoun, A. J. K., and M. W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. *MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York*.
54. Freeman, M. C., C. M. Pringle, and C. R. Jackson. 2007. Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales. *Journal of the American Water Resources Association* **3** (1).
55. Nadeau, T.-L., and M. Rains. 2007. Hydrologic Connectivity Between Headwater Streams and Downstream Waters: How Science Can Inform Policy. *Journal of the American Water Resources Association* **43** (1).
56. Kaplan, L. A., T. L. Bott, J. K. Jackson, J. D. Newbold, and B. W. Sweeney. 2008. Protecting headwaters: The scientific basis for safeguarding stream and river ecosystems. *Avondale: Stroud Water Research Centre*.
57. Veysey, J., S. Mattfeldt, and K. Babbitt. 2010. Comparative influence of isolation, landscape, and wetland characteristics on egg-mass abundance of two pool-breeding amphibian species. *Landscape Ecology* **26** (5): 661–672.
58. Paton, P. W. C. 2005. A review of vertebrate community composition in seasonal forest pools of the northeastern United States. *Wetlands Ecology and Management* **13** (3): 235–246.
59. Zedler, P. H. 2003. Vernal pools and the concept of “isolated wetlands”. *Wetlands* **23** (3): 597–607.
60. Jones III, E. B. D., G. S. Helfman, J. O. Harper, and P. V Bolstad. 1999. Effects of Riparian Forest Removal on Fish Assemblages in Southern Appalachian Streams. *Conservation Biology* **13** (6): 1454–1465.
61. Studinski, J. M., K. J. Hartman, J. M. Niles, and P. Keyser. 2012. The effects of riparian forest disturbance on stream temperature, sedimentation, and morphology. *Hydrobiologia* **686** (1): 107–117.

62. Vermont Agency of Natural Resources. 2005. *Riparian Buffers and Corridors: Technical Papers*. Vermont Agency of Natural Resources, Waterbury, VT.
63. Swank, W. T., J. M. Vose, and K. J. Elliott. 2001. Long-term hydrologic and water quality responses following commercial clearcutting of mixed hardwoods on a southern Appalachian catchment. *Forest Ecology and Management* **143**: 163–178.
64. Sweeney, B. W., T. L. Bott, J. K. Jackson, L. A. Kaplan, J. D. Newbold, L. J. Standley, W. C. Hession, and R. J. Horwitz. 2004. Riparian deforestation, stream narrowing, and loss of stream ecosystem services. *Proceedings of the National Academy of Sciences of the United States of America*. Pages 14132–14137.
65. Henley, W. F., M. A. Patterson, R. J. Neves, and A. D. Lemly. 2010. Effects of Sedimentation and Turbidity on Lotic Food Webs: A Concise Review for Natural Resource Managers. *Reviews in Fisheries Science* **8** (2).
66. Mayer, P. M., S. K. Reynolds, M. D. McCutchen, and T. J. Canfield. 2007. Meta-analysis of Nitrogen Removal in Riparian Buffers. *Journal of Environmental Quality* **36**: 1172–1180.
67. Chesapeake Bay Program STAC Responsive Workshop. 2008. Quantifying the Role of Wetlands in Achieving Nutrient and Sediment Reductions in Chesapeake Bay.
68. Sweeney, B. W., and J. D. Newbold. 2014. Streamside forest buffer width needed to protect stream water quality, habitat, and organisms: A literature review. *Journal of the American Water Resources Association* **50** (3).
69. Bodie, J. R. 2001. Stream and riparian management for freshwater turtles. *Journal of Environmental Management* **62** (4): 443–455.
70. Hodges Jr., M. F., and D. G. Krementz. 1996. Neotropical Migratory Breeding Bird Communities in Riparian Forests of Different Widths along the Altamaha River, Georgia. *The Wilson Bulletin*: 496–506.
71. Hassinger, J. D., C. M. Butchkoski, and D. R. Diefenbach. 2008. Managing Surface Rock Communities for *Neotoma magister*. Pages 133–152 In J. D. Peles and J. Wright, editors. *The Allegheny Woodrat: Ecology, Conservation, and Management of a Declining Species*. Springer, New York, NY.
72. Hart, J. 2005. A Short Conservation Plan for Hartman Cave, Monroe County. *The Nature Conservancy, Middletown, PA*.
73. Clawson, R. L. 2000. Implementation of a recovery plan for the endangered Indiana bat. *Proceedings of Bat Conservation and Mining: A Technical Interactive Forum*. K. C. Vories and D. Throgmorton, editors.
74. Semlitsch, R. D. 1998. Biological Delineation of Terrestrial Buffer Zones for Pond-Breeding Salamanders. *Conservation Biology* **12** (5): 1113–1119.
75. Crawford, J. A., and R. D. Semlitsch. 2007. Estimation of Core Terrestrial Habitat for Stream-Breeding Salamanders and Delineation of Riparian Buffers for Protection of Biodiversity. *Conservation Biology* **21** (1): 152–158.
76. Hagan, J., and A. Whitman. 2000. Rate of Stream Water Warming in Buffered-Clearcut and Intact-Forest Streams in Western Maine. *Conference Proceedings of Forestry and the Riparian Zone*. Cooperative Forestry Research Unit, University of Maine and Manomet Center for Conservation Sciences, Orono, ME.
77. Alexander, G. R., J. L. Fenske, and D. W. Smith. 1995. *A Fisheries Management Guide to Stream Protection and Restoration*. Michigan Department of Natural Resources, Fisheries Division.
78. Jones, K. L., G. C. Poole, J. L. Meyer, W. Bumback, and E. A. Kramer. 2006. Quantifying Expected Ecological Response to Natural Resource Legislation: a Case Study of Riparian Buffers, Aquatic Habitat, and Trout Populations. *Ecology and Society* **11** (2): 15.
79. Rowe, D. K., J. Smith, J. Quinn, and I. Boothroyd. 2002. Effects of logging with and without riparian strips on fish species abundance, mean size, and the structure of native fish assemblages in Coromandel, New Zealand, streams. *New Zealand Journal of Marine and Freshwater Research* **36** (1): 67–79.
80. Grown, I. O., D. A. Pollard, and P. C. Gehrke. 1998. Changes in river fish assemblages associated with vegetated and degraded banks, upstream of and within nutrient-enriched zones. *Fisheries Management and Ecology* **5** (1): 55–69.
81. Kiffney, P. M., J. S. Richardson, and J. P. Bull. 2003. Responses of periphyton and insects to experimental manipulation of riparian buffer width along forest streams. *Journal of Applied Ecology* **40** (6): 1060–1076.
82. Davies, P. E., and M. Nelson. 1994. Relationships between riparian buffer widths and the effects of logging on stream habitat, invertebrate community composition and fish abundance. *Australian Journal of Marine and Freshwater Research* **45** (7): 1289–1305.
83. Castelle, A. J., and A. W. Johnson. 2000. *Riparian Vegetation Effectiveness*. No. 799. National Council for Air and Stream Improvement, Incorporated.

## ROAD DEVELOPMENT

1. Bloser, S. M., and B. E. Scheetz. 2012. Sediment Production from Unpaved Oil Well Access Roads in the Allegheny National Forest.
2. Daniels, B., D. McAvoy, M. Kuhns, and R. Groppe. 2004. Managing Forests for Water Quality: Forest Roads. *Extension Utah State University*.
3. Gucinski, H., M. H. Brookes, M. J. Furniss, and R. R. Ziemer. 2001. Forest Roads: a synthesis of scientific information. General Technical Report PNW-GTR-509. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR.
4. Andrews, K. M., J. W. Gibbons, and D. M. Jochimsen. 2008. Ecological Effects of Roads on Amphibians and Reptiles: A Literature Review. *Herpetological Conservation* **3**: 121–143.
5. Watson, M. L. 2005. *Habitat Fragmentation and the Effects of Roads on Wildlife and Habitats*. New Mexico Department of Fish and Game: Conservation Service Division.
6. Seiler, A. 2001. Ecological effects of roads: a review. *Introductory research essay* **9**: 1–40.
7. Bennett, V. J., W. P. Smith, and M. G. Betts. 2011. *Toward Understanding the Ecological Impact of Transportation Corridors*. General Technical Report PNW-GTR-846. U.S. Forest Service, Portland, OR.
8. Frair, J. L., E. H. Merrill, H. L. Beyer, and J. M. Morales. 2008. Thresholds in landscape connectivity and mortality risks in response to growing road networks. *Journal of Applied Ecology* **45** (5): 1504–1513.
9. Sawyer and F. Lindzey, H. 2004. Assessing impacts of oil and gas development on mule deer. In *Transactions from the 69th North American Wildlife and Natural Resources Conference*.
10. Drohan, P. J., M. Brittingham, J. Bishop, and K. Yoder. 2012. Early trends in landcover change and forest fragmentation due to shale-gas development in Pennsylvania: A potential outcome for the northcentral Appalachians. *Environmental Management* **49** (5): 1061–1075.
11. Clinton, B. D., and J. M. Vose. 2003. Differences in Surface Water Quality Draining Four Road Surface Types in the Southern Appalachians. *Southern Journal of Applied Forestry* **27** (2): 100–106.
12. Sheridan, G. J., and P. J. Noske. 2007. A quantitative study of sediment delivery and stream pollution from different forest road types. *Hydrological Processes* **21** (3): 387–398.
13. Cushman, S. A. 2006. Effects of habitat loss and fragmentation on amphibians: A review and prospectus. *Biological Conservation* **128**: 231–240.
14. Findlay, C. S., and J. Houlahan. 1997. Anthropogenic Correlates of Species Richness in Southeastern Ontario Wetlands. *Conservation Biology* **11** (4): 1000–1009.
15. Houlahan, J. E., and C. S. Findlay. 2003. The effects of adjacent land use on wetland amphibian species richness and community composition. *Canadian Journal of Fisheries & Aquatic Sciences* **60** (9): 1078–1094.
16. Switalski, A. 2006. How many is too many: A review of road density thresholds for wildlife. *The Road-RIPorter* **2** (4): 6–8.
17. Baxter, C. V., C. A. Frissell, and F. R. Hauer. 1999. Geomorphology, logging roads, and the distribution of bull trout spawning in a forested river basin: Implications for a management and conservation. *Transactions of the American Fisheries Society* **128** (5): 854–867.
18. Eaglin, G. S., and W. A. Hubert. 1993. Management briefs: Effects of logging and roads on substrate and trout in streams of the Medicine Bow National Forest, Wyoming. *North American Journal of Fisheries Management* **13**: 844–846.
19. Huday, M., T. M. Thieling, N. Gillespie, and E. P. Smith. 2008. Distribution, status, and land use characteristics of subwatersheds within the native range of brook trout in the Eastern United States. *North American Journal of Fisheries Management* **28** (4): 1069–1085.
20. Hedrick, L., S. Welsh, J. Anderson, L.-S. Lin, Y. Chen, and X. Wei. 2010. Response of benthic macroinvertebrate communities to highway construction in an Appalachian watershed. *Hydrobiologia* **641** (1): 115–131.
21. Arthur, M. A., G. B. Coltharp, and D. L. Brown. 1998. Effects of best management practices on forest streamwater quality in eastern Kentucky. *Journal of the American Water Resources Association* **34** (3): 481–495.
22. Marsh, D. M. 2007. Edge effects of gated and ungated roads on terrestrial salamanders. *Journal of Wildlife Management* **71** (2): 389–394.
23. Sealy, J. B. 2002. Ecology and behavior of the timber rattlesnake (*Crotalus horridus*) in the Upper Piedmont of North Carolina: Identified threats and conservation recommendations. *Biology of the Vipers*: 561–578.

24. Beebee, T. J. C. 2013. Effects of road mortality and mitigation measures on amphibian populations. *Conservation biology* **27** (4): 657–68.
25. Rowland, M. M., M. J. Wisdom, B. K. Johnson, and M. A. Penninger. 2005. Effects of roads on elk: Implications for management in forested ecosystems. In M. J. Wisdom, editor. *The Starkey Project: a synthesis of long-term studies of elk and mule deer. Reprinted from the 2004 Transactions of the North American Wildlife and Natural Resources Conference, Alliance Communications Group, Lawrence, Kansas, USA.*
26. Calhoun, A. J. K., and M. W. Klemens. 2002. Best Development Practices Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States Best Development Practices. *MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.*
27. Roe, J. H., and A. Georges. 2007. Heterogeneous wetland complexes, buffer zones, and travel corridors: Landscape management for freshwater reptiles. *Biological Conservation* **135** (1): 67–76.
28. Shine, R., M. Lemaster, M. Wall, T. Langkilde, and R. Mason. 2004. Why did the snake cross the road? Effects of roads on movement and location of mates by garter snakes (*Thamnophis sirtalis parietalis*). *Ecology and Society* **9** (1).
29. Litvaitis, J. A. 2001. Importance of early successional habitats to mammals in eastern forests. *Wildlife Society Bulletin* **29** (2): 466–473.
30. Noss, R. 1995. The ecological effects of roads. Unpublished Report. Wildlands CPR, U.S.A.
31. Spellerberg, I. F. 1998. Ecological effects of roads and traffic: A literature review. *Global Ecology and Biogeography Letters* **7** (5): 317–333.
32. Benitez-Lopez, A., R. Alkemade, and P. A. Verweij. 2010. The impacts of roads and other infrastructure on mammal and bird populations: A meta-analysis. *Biological Conservation* **143**: 1307–1316.
33. Sawyer, H., R. M. Nielson, F. Lindzey, and L. L. McDonald. 2006. Winter habitat selection of mule deer before and during development of a natural gas field. *Journal of Wildlife Management* **70** (2): 396–403.
34. Sawyer, H., M. J. Kauffman, and R. M. Nielson. 2009. Influence of Well Pad Activity on Winter Habitat Selection Patterns of Mule Deer. *Journal of Wildlife Management* **73** (7): 1052–1061.
35. Mladenoff, D. J., T. A. Sickley, R. G. Haight, and A. P. Wydeven. 1995. A Regional Landscape Analysis and Prediction of Favorable Gray Wolf Habitat in the Northern Great Lakes Region. *Conservation Biology* **9** (2): 279–294.
36. Thurber, J. M., R. O. Peterson, T. D. Drummer, and S. A. Thomasma. 1994. Gray wolf response to refuge boundaries and roads in Alaska. *Wildlife Society Bulletin* **22**: 61–68.
37. Mech, L. D., S. H. Fritts, G. L. Radde, and W. J. Paul. 1988. Wolf distribution and road density in Minnesota. *Wildlife Society Bulletin* **16** (1): 85–87.
38. Reynolds-Hogland, M. J., and M. S. Mitchell. 2007. Effects of roads on habitat quality for bears in the Southern Appalachians: A long-term study. *Journal of Mammalogy* **88** (4): 1050–1061.
39. Forman, R. T. T., B. Reineking, and A. M. Hersperger. 2002. Road traffic and nearby grassland bird patterns in a suburbanizing landscape. *Environmental Management* **29** (6): 782–800.
40. Adams, M. B., P. J. Edwards, W. M. Ford, J. B. Johnson, T. M. Schuler, M. T. Gundy, and F. Wood. 2011a. *Effects of Development of a Natural Gas Well and Associated Pipeline on the Natural and Scientific Resources of the Fernow Experimental Forest*. U.S. Forest Service, Newtown Square, PA.
41. Studinski, J. M., K. J. Hartman, J. M. Niles, and P. Keyser. 2012. The effects of riparian forest disturbance on stream temperature, sedimentation, and morphology. *Hydrobiologia* **686** (1): 107–117.
42. Houlahan, J. E., and C. S. Findlay. 2004. Estimating the “critical” distance at which adjacent land-use degrades wetland water and sediment quality. *Landscape Ecology* **19** (6): 677–690.
43. Adams, M. B., W. M. Ford, T. M. Schuler, and M. T. Gundy. 2011b. Effects of natural gas development on forest ecosystems. Pages 219–226 *Proceedings of the 17th Central Hardwood Forest Conference*.
44. Silverman, B., D. J. Horn, F. F. Purrington, and K. J. K. Gandhi. 2008. Oil pipeline corridor through an intact forest alters ground beetle (Coleoptera : Carabidae) assemblages in southeastern Ohio. *Environmental Entomology* **37** (3): 725–733.
45. Thomas, E. H., M. C. Brittingham, and S. H. Stoleson. 2014. Conventional oil and gas development alters forest songbird communities. *The Journal of Wildlife Management* **78** (2): 293–306.
46. Menzel, M. A., W. M. Ford, J. Laerm, and D. Krishon. 1999. Forest to wildlife opening: habitat gradient analysis among small mammals in the southern Appalachians. *Forest Ecology and Management* **114** (2-3): 227–232.

47. Gibbs, J. P., and E. J. Stanton. 2001. Habitat Fragmentation and Arthropod Community Change: Carrion Beetles, Phoretic Mites, and Flies. *Ecological Applications* **11** (1): 79–85.
48. Hargis, C. D., J. A. Bissonette, and D. L. Turner. 1999. The Influence of Forest Fragmentation and Landscape Pattern on American Martens. *Journal of Applied Ecology* **36** (1): 157–172.
49. Boulinier, T., J. D. Nichols, J. E. Hines, J. R. Sauer, C. H. Flather, and K. H. Pollock. 2001. Forest Fragmentation and Bird Community Dynamics: Inference at Regional Scales. *Ecology* **82** (4): 1159–1169.
50. Fahrig, L. 2002. Effect of habitat fragmentation on the extinction threshold: A synthesis. *Ecological Applications* **12** (2): 346–353.
51. Hobson, K. A., and E. Bayne. 2000. Effects of Forest Fragmentation by Agriculture on Avian Communities in the Southern Boreal Mixedwoods of Western Canada. *The Wilson Bulletin* **112** (3): 373–387.
52. Lynch, J. F., and D. F. Whigham. 1984. Effects of forest fragmentation on breeding bird communities in Maryland, USA. *Biological Conservation* **28** (4): 287–324.
53. Stephens, S. E., D. N. Koons, J. J. Rotella, and D. W. Willey. 2004. Effects of habitat fragmentation on avian nesting success: a review of the evidence at multiple spatial scales. *Biological Conservation* **115** (1): 101–110.
54. Blouin-Demers, G., and P. J. Weatherhead. 2001. Habitat Use by Black Rat Snakes (*Elaphe obsoleta obsoleta*) in Fragmented Forests. *Ecology* **82** (10): 2882–2896.
55. Kurki, S., A. Nikula, P. Helle, and H. Linden. 2000. Landscape fragmentation and forest composition effects on grouse breeding success in boreal forests. *Ecology* **81** (7).
56. Robinson, S. K., R. T. Frank III, T. M. Donovan, D. R. Whitehead, and J. Faaborg. 1995. Regional forest fragmentation and the nesting success of migratory birds. *Science* **267** (5206): 1987–1990.
57. Rosenberg, K. V., J. D. Lowe, and A. A. Dhondt. 1999. Effects of Forest Fragmentation on Breeding Tanagers: A Continental Perspective. *Conservation Biology* **13** (3): 568–583.
58. Porneluzi, P., and J. Faaborg. 1999. Season-long fecundity, survival, and viability of Ovenbirds in fragmented and unfragmented landscapes. *Conservation Biology* **13** (1151–1161).
59. Villard, M.-A., M. K. Trzcinski, and G. Merriam. 1999. Fragmentation Effects on Forest Birds: Relative Influence of Woodland Cover and Configuration on Landscape Occupancy. *Conservation Biology* **13** (4): 774–783.
60. Evans, D. R., and J. E. Gates. 1997. Cowbird selection of breeding areas: The role of habitat and bird species abundance. *The Wilson Bulletin* **109** (3): 470–480.
61. Watkins, R. Z., J. Chen, J. Pickens, and K. Brosowske. 2003. Effects of Forest Roads on Understory Plants in a Managed Hardwood Landscape. *Conservation Biology* **17** (2): 411–419.
62. Moseley, K. R., W. M. Ford, and J. W. Edwards. 2009. Local and landscape scale factors influencing edge effects on woodland salamanders. *Environmental Monitoring and Assessment* **151** (1–4): 425–435.
63. Matlack, G. R. 1993. Microenvironment variation within and among forest edge sites in the eastern United States. *Biological Conservation* **66** (3): 185–194.
64. Haskell, D. G. 2000. Effects of Forest Roads on Macroinvertebrate Soil Fauna of the Southern Appalachian Mountains. *Conservation Biology* **14** (1): 57–63.
65. Kiviat, E. 2013. Risks to biodiversity from hydraulic fracturing for natural gas in the Marcellus and Utica shales. *Annals of the New York Academy of Sciences* **1286**: 1–14.
66. Harper, K. A., S. E. Macdonald, P. J. Burton, C. Jiquan, K. D. Brosowske, S. C. Saunders, E. S. Euskirchen, D. A. R. Roberts, M. S. Jaiteh, and P.-A. Esseen. 2005. Edge Influence on Forest Structure and Composition in Fragmented Landscapes. *Conservation Biology* **19** (3): 768–782.
67. Gehlhausen, S. M., M. W. Schwartz, and C. K. Augspurger. 2000. Vegetation and microclimate edge effects in two mixed-mesophytic forest fragments. *Plant Ecology* **147**: 21–35.
68. Petranka, J. W., M. E. Eldridge, and K. E. Haley. 1993. Effects of Timber Harvesting on Southern Appalachian Salamanders. *Conservation Biology* **7** (2): 363–370.
69. Brody, A. J., and M. R. Pelton. 1989. Effects of Roads on Black Bear Movements in Western North Carolina. *Wildlife Society Bulletin* **17** (1): 5–10.
70. Marsh, D. M., G. S. Milam, N. R. Gorham, and N. G. Beckman. 2005. Forest roads as partial barriers to terrestrial salamander movement. *Conservation Biology* **19** (6): 2004–2008.
71. Gibbs, J. P. 1998. Amphibian Movements in Response to Forest Edges, Roads, and Streambeds in Southern New England. *The Journal of Wildlife Management* **62** (2): 584–589.
72. Lehtinen, R., S. Galatowitsch, and J. Tester. 1999. Consequences of habitat loss and fragmentation for wetland amphibian assemblages. *Wetlands* **19** (1): 1–12.

73. Mortensen, D. A., E. S. J. Rauschert, A. N. Nord, and B. P. Jones. 2009. Forest Roads Facilitate the Spread of Invasive Species. *Invasive Plant Science and Management* **2** (3): 191–199.
74. With, K. A. 2004. Assessing the Risk of Invasive Spread in Fragmented Landscapes. *Risk Analysis* **24** (4): 803–815.
75. With, K. A. 2002. The Landscape Ecology of Invasive Spread. *Conservation Biology* **16** (5): 1192–1203.
76. Nord, A. N., D. A. Mortensen, and E. S. J. Rauschert. 2010. Environmental Factors Influence Early Population Growth of Japanese Stiltgrass. *Invasive Plant Science and Management* **3** (1): 17–25.
77. Brown, W. E. 2009. *Impacts of Dirt and Gravel Road Dust On Roadside Organic Forest Soils and Roadside Vegetation*. Diss, The Pennsylvania State University.
78. Jackson, S. D. 2003. Design and construction of aquatic organism passage at road-stream crossings: Ecological considerations in the design of river and stream crossings. *Pages 20–29 Proceeding of the 2003 International Conference on Ecology and Transportation, North Carolina State University, Raleigh*.
79. US Forest Service Stream Simulation Working Group. 2008. Stream simulation: An ecological approach to providing passage for aquatic organisms at road-stream crossings.
80. Roth, N. E., J. D. Allan, and D. L. Erickson. 1996. Landscape influences on stream biotic integrity assessed at multiple spatial scales. *Landscape Ecology* **11** (3): 141–156.
81. Sutherland, A. B., J. L. Meyer, and E. P. Gardiner. 2002. Effects of land cover on sediment regime and fish assemblage structure in four southern Appalachian streams. *Freshwater Biology* **47** (9): 1791–1805.
82. Luce, C. H., and T. A. Black. 2001. Spatial and Temporal Patterns in Erosion from Forest Roads. *Water Science and Application* **2**:165–178.
83. Forsyth, A. R., K. A. Bubb, and M. E. Cox. 2006. Runoff, sediment loss and water quality from forest roads in a southeast Queensland coastal plain Pinus plantation. *Forest Ecology and Management* **221** (1): 194–206.
84. Wood, P. J., and P. D. Armitage. 1997. Biological effects of fine sediment in the lotic environment. *Environmental Management* **21** (2): 203–217.
85. Henley, W. F., M. A. Patterson, R. J. Neves, and A. D. Lemly. 2010. Effects of Sedimentation and Turbidity on Lotic Food Webs: A Concise Review for Natural Resource Managers. *Reviews in Fisheries Science* **8** (2).
86. Wenger, S. 1999. A review of the scientific literature on riparian buffer width, extent and vegetation. Office of Public Service & Outreach Institute of Ecology, University of Georgia, Athens, GA.
87. Braun, T., and S. Hanus. 2005. Forest Fragmentation - Effects of Oil and Gas Activities on Alberta Forests. *University of Texas, Fulfillment of requirement for BUEC 663*.
88. Brittingham, M., P. Drohan, and J. Bishop. 2012. Initial landscape changes associated with Marcellus shale development - Implications for forests and wildlife. *Page 2 Proceedings of the 18th Central Hardwoods Forest Conference*.
89. James, A. R. C., and A. K. Stuart-Smith. 2000. Distribution of Caribou and Wolves in Relation to Linear Corridors. *The Journal of Wildlife Management* **64** (1): 154–159.
90. King, D. I., and R. M. DeGraaf. 2002. The Effect of Forest Roads on the Reproductive Success of Forest-Dwelling Passerine Birds. *Forest Science* **48** (2): 391–396.
91. Good Forestry of the Granite State Steering Committee, and K. P. Bennett. 2010. *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. New Hampshire Department of Resources and Economic Development, Division of Forests and Lands; UNH Cooperative Extension. Pages 83–88.
92. Drohan, P., and M. Brittingham. 2012. Topographic and Soil Constraints to Shale-Gas Development in the Northcentral Appalachians. *Soil Science Society of America Journal* **76** (5): 1969–170.
93. Lyon, L. J. 1979. Habitat effectiveness for elk as influenced by roads and cover. *Journal of Forestry* **77** (10): 658–660.
94. Marsh, D. M., and N. G. Beckman. 2004. Effects of forest roads on the abundance and activity of terrestrial salamanders. *Ecological Applications* **14** (6): 1882–1891.
95. Grace III, J. M., B. Rummer, B. J. Stokes, and W. J. 1998. Evaluation of erosion control techniques on forest roads. *Transactions of the ASAE* **41** (2): 383–392.
96. American Petroleum Institute. 2011. *Practices for Mitigating Surface Impacts Associated with Hydraulic Fracturing*. API Guidance Document HF3, First Edition. Section 16. [http://www.api.org/policy-and-issues/policy-items/hf/api\\_hf3\\_practices\\_for\\_mitigating\\_surface](http://www.api.org/policy-and-issues/policy-items/hf/api_hf3_practices_for_mitigating_surface)
97. Ettinger, W. S. 1987. Impacts of a chemical dust suppressant/soil stabilizer on the physical and biological characteristics of a stream. *Soil and Water Conservation Society* **42** (2): 111–114.
98. Cole, E. K., M. D. Pope, and R. G. Anthony. 1992. Effects of road management on movement and survival of Roosevelt Elk. *Journal of Wildlife Management* **61** (4): 1115–1126.

## STREAM CROSSINGS

1. Jackson, S. D. 2003. Design and construction of aquatic organism passage at road-stream crossings: Ecological considerations in the design of river and stream crossings. *Pages 20–29 Proceeding of the 2003 International Conference on Ecology and Transportation, North Carolina State University, Raleigh.*
2. Lévesque, L., and M. Dubé. 2007. Review of the effects of in-stream pipeline crossing construction on aquatic ecosystems and examination of Canadian methodologies for impact assessment. *Environmental Monitoring and Assessment* **132** (1): 395–409.
3. Anderson, P. G., C. G. J. Fraikin, and T. J. Chandler. 1997. *Impacts and recovery in a coldwater stream following a natural gas pipeline crossing installation.*
4. Vermont Fish and Wildlife Department. *Vermont Stream Crossing Handbook.* Waterbury, VT.
5. Jackson, S. D., A. Bowden, B. Lambert, and A. Singler. 2011. Massachusetts River and Stream Crossing Standards. River and Stream Continuity Partnership.
6. Reid, S. M., S. Stoklosar, S. Metikosh, and J. Evans. 2002. Effectiveness of Isolated Pipeline Crossing Techniques to Mitigate Sediment Impacts on Brook Trout Streams. *Water Quality Resources Journal of Canada* **37** (2): 473–488.
7. Reid, S. M., G. Isaac, S. Metikosh, and J. Evans. 2003. Physiological Response of Rainbow Trout to Sediment Released during Open-Cut Pipeline Water Crossing Construction. *Water Quality Resources Journal of Canada* **38** (3): 473–481.
8. Canadian Association of Petroleum Producers, and Canadian Energy Pipeline Association and Canadian Gas Association. 2005. *Pipeline Associated Watercourse Crossings.* Prepared by TERA Environmental Consultants and Salmo Consulting Inc., Calgary, AB.
9. Castro, J. M., A. Macdonald, E. Lynch, and C. R. Thorne. 2014. Risk-based approach to designing and reviewing pipeline stream crossings to minimize impacts to aquatic habitats and species. *River Research and Applications*.
10. US Forest Service Stream Simulation Working Group. 2008. Stream simulation: An ecological approach to providing passage for aquatic organisms at road-stream crossings.
11. Levine, J. 2013. An Economic Analysis of Improved Road-Stream Crossings. *Keene Valley, The Nature Conservancy.*
12. Lachance, S., M. Dube, R. Dostie, and P. Berube. 2008. Temporal and Spatial Quantification of Fine-Sediment Accumulation Downstream of Culverts in Brook Trout Habitat. *Transactions of the American Fisheries Society* **137** (6): 1826–1838.
13. Meyer, J. L., D. L. Strayer, J. B. Wallace, S. L. Eggert, G. S. Helfman, and N. E. Leonard. 2007. The Contribution of Headwater Streams to Biodiversity in River Networks. *Journal of the American Water Resources Association* **43** (1): 86–103.
14. Freeman, M. C., C. M. Pringle, and C. R. Jackson. 2007. Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales. *Journal of the American Water Resources Association* **3** (1).
15. Nadeau, T.-L., and M. Rains. 2007. Hydrologic Connectivity Between Headwater Streams and Downstream Waters: How Science Can Inform Policy. *Journal of the American Water Resources Association* **43** (1).
16. Ekness, P., and T. Randhir. 2007. Effects of riparian areas, stream order, and land use disturbance on watershed-scale habitat potential: An ecohydrologic approach to policy. *Journal of the American Water Resources Association* **43** (6): 1468–1482.
17. Reid, S. M., and P. G. Anderson. 1999. Effects of sediment released during Open-cut pipeline water crossings. *Canadian Water Resources Journal* **24** (3): 235–251.
18. Alexander, G. R., and E. A. Hansen. 1986. Sand bed load in a brook trout *Salvelinus fontinalis* stream. *North American Journal of Fisheries Management* **6** (1): 9–23.
19. Barton, B. A. 1977. Short-term effects of highway construction on limnology of a small stream in southern Ontario. *Freshwater Biology* **7** (2): 99–108.
20. Henley, W. F., M. A. Patterson, R. J. Neves, and A. D. Lemly. 2010. Effects of Sedimentation and Turbidity on Lotic Food Webs: A Concise Review for Natural Resource Managers. *Reviews in Fisheries Science* **8** (2).
21. Levy, D. A. 2009. *Pipelines and Salmon in Northern British Columbia: Potential Impacts.* The Pembina Institute.
22. The Nature Conservancy, Adirondack Chapter. Where the River Meets the Road: Investing in Improved Stream Crossings Benefit Communities and Natural Systems.

23. Alexander, G. R., J. L. Fenske, and D. W. Smith. 1995. *A Fisheries Management Guide to Stream Protection and Restoration*. Michigan Department of Natural Resources, Fisheries Division.
24. Kemp, P., D. Sear, A. Collins, P. Naden, and I. Jones. 2011. The impacts of fine sediment on riverine fish. *Hydrological Processes* **25** (11): 1800–1821.
25. Sutherland, A. B., J. L. Meyer, and E. P. Gardiner. 2002. Effects of land cover on sediment regime and fish assemblage structure in four southern Appalachian streams. *Freshwater Biology* **47** (9): 1791–1805.
26. Price, K., and D. Leigh. 2006. Comparative Water Quality of Lightly- and Moderately-Impacted Streams in the Southern Blue Ridge Mountains, USA. *Environmental Monitoring and Assessment* **120** (1): 269–300.
27. Petranka, J. W., and C. K. Smith. 2005. A functional analysis of streamside habitat use by southern Appalachian salamanders: Implications for riparian forest management. *Forest Ecology and Management* **210**: 443–454.
28. Perkins, D. W., and M. L. Hunter Jr. 2006. Use of amphibians to define riparian zones of headwater streams. *Canadian Journal of Forest Research* **36** (9): 2124–2130.
29. Crawford, J. A., and R. D. Semlitsch. 2007. Estimation of Core Terrestrial Habitat for Stream-Breeding Salamanders and Delineation of Riparian Buffers for Protection of Biodiversity. *Conservation Biology* **21** (1): 152–158.
30. Bodie, J. R. 2001. Stream and riparian management for freshwater turtles. *Journal of Environmental Management* **62** (4): 443–455.
31. Lee, P., C. Smyth, and S. Boutin. 2004. Quantitative review of riparian buffer width guidelines from Canada and the United States. *Journal of Environmental Management* **70** (2): 165–180.
32. Foster, H. R., and T. A. Keller. 2011. Flow in culverts as a potential mechanism of stream fragmentation for native and nonindigenous crayfish species. *Journal of the North American Benthological Society* **30** (4): 1129–1137.
33. Warren Jr, M. L., and M. G. Pardew. 1998. Road Crossings as Barriers to Small-Stream Fish Movement. *Transactions of the American Fisheries Society* **127**: 637–644.
34. Poplar-Jeffers, I. O., J. T. Petty, J. T. Anderson, S. J. Kite, M. P. Strager, and R. H. Fortney. 2009. Culvert Replacement and Stream Habitat Restoration: Implications from Brook Trout Management in an Appalachian Watershed, USA. *Restoration Ecology* **17** (3): 404–413.
35. Benton, P. D., W. E. Ensign, and B. J. Freeman. 2008. The effect of road crossings on fish movements in small Etowah basin streams. *Southeastern Naturalist* **7** (2): 301–310.
36. Foltz, R. B., K. A. Yanosek, and T. M. Brown. 2008. Sediment concentration and turbidity changes during culvert removals. *Journal of Environmental Management* **87** (3): 329–340.
37. Department of Conservation Maine Forest Service. 2009. Maine Forestry Best Management Practices Use and Effectiveness.
38. Eaglin, G. and W. Hubert. 1993. Management briefs: Effects of logging and roads on substrate and trout in streams of the Medicine Bow National Forest, Wyoming. *North American Journal of Fisheries Management* **13**: 844–846.
39. Baxter, C. V., C. A. Frissell, and F. R. Hauer. 1999. Geomorphology, logging roads, and the distribution of bull trout spawning in a forested river basin: Implications for a management and conservation. *Transactions of the American Fisheries Society* **128** (5): 854–867.
40. Gillespie, N., A. Unthank, L. Campbell, P. Anderson, R. Gubernick, M. Weinhold, D. Cenderelli, B. Austin, D. McKinley, S. Wells, J. Rowan, C. Orvis, M. Hudy, A. Bowden, A. Singler, E. Fretz, J. Levine, and R. Kirn. 2014. Flood Effects on Road-Stream Crossing Infrastructure: Economic and Ecological Benefits of Stream Simulation Designs. *Fisheries* **39** (2): 62–76.
41. Keller, G., and J. Sherar. 2003. *Low-Volume Roads Engineering: Best Management Practices Field Guide*. USDA Forest Service, Washington, DC.

## WATER WITHDRAWALS

1. Tennant, D. L. 1976. Instream flow regimens for fish, wildlife, recreation and related environmental resources. *Fisheries* **1** (4): 6–10.
2. Bovee, K. D. 1982. *A guide to stream habitat analysis using the instream flow incremental methodology*. Instream Flow Information Paper #12, FWS/OBS-82/26. USDI Fish and Wildlife Service, Washington, DC. 248 p.
3. Poff, N. L., J. D. Allan, M. B. Bain, J. R. Karr, K. L. Prestegaard, B. D. Richter, R. E. Sparks, and J. C. Stromberg. 1997. *The Natural Flow Regime*. *BioScience* **47** (11): 769–784.
4. Bunn, S., and A. Arthington. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. *Environmental Management* **30**: 492–507.
5. Postel, S., and B. Richter. 2003. *Rivers for life: managing water for people and nature*. Island Press, Washington, D.C. Page 253.
6. Armstrong, D. S., T. A. Richards, and G. W. Parker. 2001. *Assessment of habitat, fish communities and streamflow requirements for habitat protection, Ipswich River, Massachusetts, 1998–99*. U.S. Geological Survey Water-Resources Investigations Report 01-4161.
7. Freeman, M. C., and P. A. Marcinek. 2006. Fish assemblage responses to water withdrawals and water supply reservoirs in piedmont streams. *Environmental Management* **38** (3): 435–450.
8. Kanno, Y., and J. C. Vokoun. 2010. Evaluating effects of water withdrawals and impoundments on fish assemblages in southern New England streams, USA. *Fisheries Management and Ecology* **17** (3): 272–283.
9. Wills, T. C., E. A. Baker, A. J. Nuhfer, and T. G. Zorn. 2006. Response of the benthic macroinvertebrate community in a northern Michigan stream to reduced summer streamflows. *River Research and Applications* **22**: 819–836.
10. Dewson, Z., A. James, and R. Death. 2007. Invertebrate community responses to experimentally reduced discharge in small streams of different water quality. *Journal of the North American Bentholological Society* **26**: 754–766.
11. Walters, A., and D. Post. 2008. An experimental disturbance alters fish size structure but not food chain length in streams. *Ecology* **89**: 3261–3267.
12. Johnson, P., A. Liner, S. Golladay, and W. Michener. 2001. Effects of drought on freshwater mussels and instream habitat in Coastal Plain tributaries of the Flint River, southwest Georgia (July–October, 2000). *Nature Conservancy Apalachicola River and Bay Project*. Nature Conservancy, Apalachicola, FL.
13. Haag, W., and M. Warren. 2008. Effects of severe drought on freshwater mussel assemblages. *Transactions of the American Fisheries Society* **137**: 1165–1178.
14. Boulton, A. J. 2003. Parallels and contrasts in the effects of drought on stream macroinvertebrate assemblages. *Freshwater Biology* **48** (7): 1173–1185.
15. Hakala, J. P., and K. J. Hartman. 2004. Drought effect on stream morphology and brook trout (*Salvelinus fontinalis*) populations in forested headwater streams. *Hydrobiologia* **515** (1–3): 203–213.
16. McCargo, J. W., and J. T. Peterson. 2010. An evaluation of the influence of seasonal base flow and geomorphic stream characteristics on Coastal Plain stream fish assemblages. *Transactions of the American Fisheries Society* **139**: 29–48.
17. Gibson, J. W., J. L. Greene, and J. D. Congdon. 1983. Drought-related responses of aquatic turtle populations. *Journal of Herpetology* **17** (3): 242–246.
18. Carlisle, D., D. Wolock, and M. Meador. 2010. Alteration of streamflow magnitudes and potential ecological consequences: a multiregional assessment. *Frontiers in Ecology and the Environment* **9**: 264–270.
19. Poff, N., and J. Zimmerman. 2010. Ecological responses to altered flow regimes: a literature review to inform environmental flows science and management. *Freshwater Biology* **55** (1): 194–205.
20. Poff, N. L., B. Richter, A. H. Arthington, S. E. Bunn, R. J. Naiman, E. Kendy, M. Acreman, C. Apse, B. P. Bledsoe, M. Freeman, J. Henriksen, R. B. Jacobson, J. Kennen, D. M. Merritt, J. O'Keeffe, J. D. Olden, K. Rogers, R. E. Tharme, and A. Warner. 2010. The ecological limits of hydrologic alteration (ELOHA): a new framework for developing regional environmental flow standards. *Freshwater Biology* **55**: 147–170.
21. Depphilip, M., and T. Moberg. 2010. Ecosystem flow recommendations for the Susquehanna River basin. *The Nature Conservancy, Harrisburg, PA*.
22. Depphilip, M., and T. Moberg. 2013a. Ecosystem flow recommendations for the upper Ohio River Basin in western Pennsylvania. *The Nature Conservancy, Harrisburg, PA*.

23. Dephilip, M., and T. Moberg. 2013b. Ecosystem Flow Recommendations for the Delaware River Basin. *The Nature Conservancy*, Harrisburg, PA.
24. Taylor, J., W. Fisher, C. Apse, E. Kendy, D. Klein, and G. Schuler. 2013. Flow recommendations for the tributaries of the Great Lakes in New York and Pennsylvania. Prepared by the New York Cooperative Fish and Wildlife Research Unit at Cornell University for The Nature Conservancy
25. Susquehanna River Basin Commission. 2010. Managing and Protecting Water Resources in the Susquehanna River Basin.
26. Mitchell, A. L., M. Small, and E. A. Casman. 2013. Surface Water Withdrawals for Marcellus Shale Gas Development: Performance of Alternative Regulatory Approaches in the Upper Ohio River Basin. *Environmental Science & Technology* **47** (22).
27. Rahm, B. G., and S. J. Riha. 2012. Toward Strategic Management of Shale Gas Development: Regional, Collective Impacts on Water Resources. *Environmental Science and Policy* **17**: 12–23.
28. Armstrong, D. S., T. A. Richards, and S. B. Levin. 2011. *Factors influencing riverine fish assemblages in Massachusetts*. US Department of the Interior, US Geological Survey.
29. Bowen, Z., K. Bovee, and T. Waddle. 2003. Effects of flow regulation on shallow-water habitat dynamics and floodplain connectivity. *Transactions of the American Fisheries Society* **132**: 809–823.
30. Freeman, M. C., C. M. Pringle, and C. R. Jackson. 2007. Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales. *Journal of the American Water Resources Association* **3** (1).
31. Flinn, M. B., S. R. Adams, M. R. Whiles, and J. E. Garvey. 2008. Biological responses to contrasting hydrology in backwaters of Upper Mississippi River Navigation Pool 25. *Environmental Management* **41** (4): 468–486.
32. Falke, J. A., K. R. Bestgen, and K. D. Fausch. 2010. Streamflow reductions and habitat drying affect growth, survival, and recruitment of brassy minnow across a Great Plains riverscape. *Transactions of the American Fisheries Society* **139**: 1566–1583.
33. Angradi, T., R. Hood, and D. Tarter. 2001. Vertical, longitudinal and temporal variation in the macrobenthos of an Appalachian headwater stream system. *American Midland Naturalist* **146**: 223–242.
34. Brauning, D. W. 1992. *Atlas of breeding birds in Pennsylvania*. University of Pittsburgh Press. Page 483.
35. Pennsylvania Natural Heritage Program. 2009. Northern Water Shrew (*Sorex palustris albifrons*). Species Factsheet.
36. Merritt, J. F. 1987. *Guide to the Mammals of Pennsylvania*. University of Pittsburgh Press. Page 408.
37. DiStefano, R., D. Magoulick, E. Imhoff, and E. Larson. 2009. Imperiled crayfishes use hyporheic zone during seasonal drying of an intermittent stream. *Journal of North American Benthological Society* **28**: 142–152.
38. Hartman, K., and M. Logan. 2010. Movement and habitat use by transplanted adult brook trout in an Appalachian headwater stream. *Northeastern Naturalist* **17**: 357–372.
39. Petty, J. T., J. L. Hansbarger, B. M. Huntsman, and P. M. Mazik. 2012. Brook trout movement in response to temperature, flow, and thermal refugia within a complex Appalachian riverscape. *Transactions of the American Fisheries Society* **141** (4): 1060–1073.
40. Baird, O., and C. Krueger. 2003. Behavioral thermoregulation of brook and rainbow trout: Comparison of summer habitat use in an Adirondack River, New York. *Transactions of the American Fisheries Society* **132**: 1194–1206.
41. Strayer, D. L., and H. M. Malcom. 2012. Causes of recruitment failure in freshwater mussel populations in southeastern New York. *Ecological Applications* **22** (6): 1780–1790.
42. Peterson, J., J. Wisniewski, C. Shea, and C. Jackson. 2011. Estimation of mussel population response to hydrologic alteration in a southern U.S. stream. *Environmental Management* **48**: 109–122.
43. Galbraith, H. S., C. J. Blakeslee, and W. A. Lellis. 2012. Recent thermal history influences thermal tolerance in freshwater mussel species (Bivalvia:Unionoida). *Freshwater Science* **31** (1): 83–92.
44. Smith, D. R., C. D. Snyder, N. P. Hitt, J. A. Young, and S. P. Faulkner. 2012. ENVIRONMENTAL REVIEWS AND CASE STUDIES: Shale Gas Development and Brook Trout: Scaling Best Management Practices to Anticipate Cumulative Effects. *Environmental Practice* **14** (4): 366–381.
45. Alonso-Gonzalez, C., J. Gortazar, D. B. Sanz, and D. G. de Jalon. 2008. Dam function rules based on brown trout flow requirements: design of environmental flow regimes in regulated streams. *Hydrobiologia* **609**: 253–262.
46. Merritt, D., M. Scott, N. LeRoy, N. L. Poff, G. Auble, and D. Lytle. 2010. Theory, methods and tools for determining environmental flows for riparian vegetation: riparian vegetation-flow response guilds. *Freshwater Biology* **55**: 206–225.

47. Eyler, S., S. Welsh, D. Smith, and M. Mandt. 2010. Environmental variables and seasonality associated with silver eel out-migration on the Shendandoah River. *Presentation at the 2010 Association of Mid-Atlantic Aquatic Biologists, March 31-April 1, 2010. Berkeley Springs, WV.*
48. Freeman, M., Z. Bowen, K. Bovee, and E. Irwin. 2001. Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes. *Ecological Society of America* **11**: 179–190.
49. Chaplin, J., K. White, and L. Olson. 2009. *Water quality monitoring in response to young-of-the-year smallmouth bass (*Micropterus dolomieu*) mortality in the Susquehanna River and major tributaries, Pennsylvania-2008.* U.S. Geological Survey Open-File Report 2009-1216.
50. Townsend, P. 2001. Relationships between vegetation patterns and hydroperiod on the Roanoke River floodplain, North Carolina. *Plant Ecology* **156**: 43–58.
51. Cowell, M., and J. Dyer. 2002. Vegetation development in a modified riparian environment: human imprints on an Alleghany River wilderness. *Annals of Association of American Geographers* **92**: 189–202.
52. Elderd, B. 2003. The impact of changing flow regimes on riparian vegetation and the riparian species *Mimulus guttatus*. *Ecological Applications* **13**: 1610–1625.
53. Auble, G., J. Friedman, and M. Scott. 1994. Relating riparian vegetation to present and future streamflows. *Ecological Applications* **4**: 544–554.
54. Ahn, C., D. White, and R. Sparks. 2004. Moist-soil plants as ecohydrologic indicators for recovering the flood pulse in the Illinois River. *Restoration Ecology* **12**: 207–213.
55. Scheidegger, K. J., and M. B. Bain. 1995. Larval Fish Distribution and Microhabitat Use in Free-Flowing and Regulated Rivers. *Copeia*, 125–135.
56. Layzer, J., and L. Madison. 1995. Microhabitat use by freshwater mussels and recommendations for determining their instream flow needs. *Regulated Rivers: Research & Management* **10**: 329–345.
57. Halleraker, J. H., S. J. Saltveit, A. Harby, J. V Arnekleiv, H. P. Fjeldstad, and B. Kohler. 2003. Factors influencing stranding of wild juvenile brown trout (*Salmo trutta*) during rapid and frequent flow decrease in an artificial stream. *River Research and Applications* **19**: 589–603.
58. Grabowski, T., and J. Isley. 2007. Effects of flow fluctuations on the spawning habitat of a riverine fish. *Southern Naturalist* **6**: 471–478.
59. Freyman, M. 2014. *Hydraulic Fracturing and Water Stress: Water Demand by the Numbers*. Ceres, Boston, MA.
60. Cooley, H., and K. Donnelly. 2012. *Hydraulic Fracturing and Water Resources: Separating the Frack from the Fiction*. Pacific Institute.
61. Entrekin, S., M. Evans-White, B. Johnson, and E. Hagenbuch. 2011. Rapid expansion of natural gas development poses a threat to surface waters. *Frontiers in Ecology and the Environment* **9** (9): 503–511.
62. Weltman-Fahs, M., and J. M. Taylor. 2013. Hydraulic Fracturing and Brook Trout Habitat in the Marcellus Shale Region: Potential Impacts and Research Needs. *Fisheries* **38** (1): 4–15.
63. Vengosh, A., R. B. Jackson, N. Warner, T. H. Darrah, and A. Kondash. 2014. A Critical Review of the Risks to Water Resources from Unconventional Shale Gas Development and Hydraulic Fracturing in the United States. *Environmental Science & Technology* **48** (15): 8334–8348.
64. Veil, J. A. 2010. *Water Management Technologies Used by Marcellus Shale Gas Producers*. Report prepared by Argonne National Laboratory, Environmental Science division, for the US Department of Energy, Office of Fossil Energy, National Energy Technology Laboratory.
65. Pickett, A. 2009. New solutions emerging to treat recycled water used in hydraulic fracs. *American Oil & Gas Reporter*.
66. U.S. Environmental Protection Agency. 2011. *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*. EPA/600/R-11/122. Environmental Protection Agency, Washington, D.C.
67. New York State Department of Environmental Conservation. 2011. *Revised Draft: Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*.
68. Nadeau, T.-L., and M. Rains. 2007. Hydrologic Connectivity Between Headwater Streams and Downstream Waters: How Science Can Inform Policy. *Journal of the American Water Resources Association* **43** (1).
69. Ligon, F. K., W. E. Dietrich, and W. J. Trush. 1995. Downstream ecological effects of dams. *BioScience* **45**: 183–192.
70. Cumming, G. S. 2004. The Impact of Low-Head Dams on Fish Species Richness in Wisconsin, USA. *Ecological Applications* **14**: 1495–1506.
71. Tiemann, J. S., D. P. Gillette, M. L. Wildhaber, and D. R. Edds. 2004. Effects of lowhead dams on riffle-dwelling fishes and macroinvertebrates in a midwestern river. *Transactions of the American Fisheries Society* **133**: 705–717.

72. Katano, O., T. Nakamura, S. Abe, S. Yamamoto, and Y. Baba. 2006. Comparison of fish communities between above and below dam sections of small streams; barrier effect to diadromous fishes. *Journal of Fish Biology* **68**: 767–782.
73. Poff, N. L., J. D. Olden, D. M. Merritt, and D. M. Pepin. 2007. Homogenization of regional river dynamics by dams and global biodiversity implications. *Proceedings of the National Academy of Sciences of the United States of America* **104** (14): 5732–5737.
74. Susquehanna River Basin Commission. 2012. Low flow protection related to withdrawal approvals.
75. He, C., T. Zhang, and R. D. Vidic. 2013. Use of Abandoned Mine Drainage for the Development of Unconventional Gas Resources. *Disruptive Science and Technology* **1** (4): 169–176.
76. Mauter, M. S., P. J. J. Alvares, A. Burton, D. C. Cafaro, W. Chen, K. B. Gregory, G. Jiang, Q. Li, J. Pittock, D. Reible, and J. L. Schnoor. 2014. Regional Variation in Water-related Impacts of Shale Gas Development and Implications for Emerging International Plays. *Environmental Science & Technology* **48** (15): 8298–8306.
77. American Petroleum Institute. 2010. *Water Management Associated with Hydraulic Fracturing*. API Guidance Document HF2, First Edition. [http://www.api.org/policy-and-issues/policy-items/hf/api\\_hf2\\_water\\_management.aspx](http://www.api.org/policy-and-issues/policy-items/hf/api_hf2_water_management.aspx)
78. Pennsylvania Department of Environmental Protection. 2013. *Utilization of Mine Influenced Water for Natural Gas Extraction Activities*.
79. Mathews, R. M., and B. Richter. 2007. Application of the indicators of hydrologic alteration software in environmental flow setting. *Journal of the American Water Resources Association* **43**: 1400–1413.
80. Kendy, E., C. Apse, and K. Blann. 2012. A Practical Guide to Environmental Flows for Policy and Planning. The Nature Conservancy.
81. Richter, B. D., M. M. Davis, C. Apse, and C. Konrad. 2011. A presumptive standard for environmental flow protection. *River Research and Applications* **28**: 1312–1321.
82. Gomi, T., R. C. Sidle, and J. S. Richardson. 2002. Understanding Processes and Downstream Linkages of Headwater Systems. *BioScience* **52** (10): 905–916.
83. Paybins, K. 2003. *Flow Origin, Drainage Area, and Hydrologic Characteristics for Headwater Streams in the Mountaintop Coal-Mining Region of Southern West Virginia, 2000–01*. U.S. Geological Survey, Water Resources Investigations Report 02-4300.
84. Fritz, K. M., B. R. Johnson, and D. M. Walters. 2006. *Field Operations Manual for Assessing the Hydrologic Permanence and Ecological Condition of Headwater Streams*. EPA/600/R-06/126. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.
85. Alexander, R. B., E. W. Boyer, R. A. Smith, and G. E. Schwartz. 2007. The Role of Headwater Streams in Downstream Water Quality. *Journal of the American Water Resources Association* **43** (1): 41–59.
86. Meyer, J. L., D. L. Strayer, J. B. Wallace, S. L. Eggert, G. S. Helfman, and N. E. Leonard. 2007. The Contribution of Headwater Streams to Biodiversity in River Networks. *Journal of the American Water Resources Association* **43** (1): 86–103.
87. Kaplan, L. A., T. L. Bott, J. K. Jackson, J. D. Newbold, and B. W. Sweeney. 2008. Protecting headwaters: The scientific basis for safeguarding stream and river ecosystems. *Avondale: Stroud Water Research Centre*.
88. Susquehanna River Basin Commission. 2007. Susquehanna River Basin Commission Information Sheet: Pennsylvania Agricultural Consumptive Water Use.
89. Susquehanna River Basin Commission. 2011. What's New: 13 Water Withdrawals Remain on Hold to Protect Streams in the Susquehanna Basin.
90. Curtright, A. E., and K. Giglio. 2012. Coal Mine Drainage for Marcellus Shale Natural Gas Extraction. RAND Corporation, Santa Monica, CA.
91. Jiang, M., C. T. Hendrickson, and J. M. VanBriesen. 2014. Life Cycle Water Consumption and Wastewater Generation Impacts of a Marcellus Shale Gas Well. *Environmental Science & Technology* **48**: 1911–1920.
92. Souchon, Y., C. Sabaton, R. Deibel, D. Reiser, J. Kershner, M. Gard, C. Katopodis, P. Leonard, N. L. Poff, W. J. Miller, and B. L. Lamb. 2008. Detecting biological responses to flow management: missed opportunities; future directions. *River Research and Applications* **24** (5): 506–518.
93. Ehlke, M. H., and L. A. Reed. 1999. *Comparison of Methods for Computing Streamflow Statistics for Pennsylvania Streams*. U.S. Geological Survey, Lemoyne, PA.
94. Stuckey, M. E., Koerkle, and J. Ulrich. 2012. *Estimation of baseline daily mean streamflows for ungaged location on Pennsylvania streams, water years 1960–2008*. U.S. Geological Survey Scientific Investigations Report 2012-5142.

## NOISE

1. Francis, C. D., and J. R. Barber. 2013. A framework for understanding noise impacts on wildlife: an urgent conservation priority. *Frontiers in Ecology and the Environment* **11** (6): 305–313.
2. Barber, J. R., K. R. Crooks, and K. M. Fristrup. 2009. The costs of chronic noise exposure for terrestrial organisms. *Trends in Ecology & Evolution* **25** (3): 180–189.
3. Radle, A. L. 2007. The Effect of Noise on Wildlife: A Literature Review. *World Forum for Acoustic Ecology Online Reader*.
4. Brown, L. 2001. Overview of research on the effects of noise on wildlife. *Pages 14–18 Proceedings of the Effects of Noise on Wildlife Conference. Happy Valley-Goose Bay, Labrador*.
5. Larkin, R. P., L.L. Pater, and D.J. Tazik. 1996. Effects of military noise on wildlife: a literature review. U.S. Army Construction Engineering Research Laboratory Technical Report 96/21, Champaign, IL.
6. Barber, J. R., C. L. Burdett, S. E. Reed, K. A. Warner, C. Formichella, K. R. Crooks, D. M. Theobald, and K. M. Fristrup. 2011. Anthropogenic noise exposure in protected natural areas: estimating the scale of ecological consequences. *Landscape Ecology* **26**: 1281–1295.
7. Luther, D., and K. Gentry. 2013. Sources of background noise and their influence on vertebrate acoustic communication. *Behaviour* **150**: 1045–1068.
8. Lampe, U., T. Schmoll, A. Franzke, and K. Reinhold. 2012. Staying tuned: grasshoppers from noisy roadside habitats produce courtship signals with elevated frequency components. *Functional Ecology* **26**: 1348–1354.
9. Bunkley, J. P., C. J. W. McClure, N. J. Kleist, C. D. Francis, and J. R. Barber. 2015. Anthropogenic noise alters bat activity levels and echolocation calls. *Global Ecology and Conservation* **3**: 62–71.
10. Habib, L., E. M. Bayne, and S. Boutin. 2007. Chronic industrial noise affects pairing success and age structure of ovenbirds *Seiurus aurocapilla*. *Journal of Applied Ecology* **44**: 176–184.
11. Francis, C. D., C. P. Ortega, and A. Cruz. 2009. Noise Pollution Changes Avian Communities and Species Interactions. *Current Biology* **19** (16): 1415–1419.
12. Bradshaw, C. J. A., S. Boutin, and D. M. Hebert. 1997. Effects of Petroleum Exploration on Woodland Caribou in Northeastern Alberta. *The Journal of Wildlife Management* **61** (4): 1127–1133.
13. Francis, C. D., J. Paritsis, C. P. Ortega, and A. Cruz. 2010. Landscape patterns of avian habitat use and nest success are affected by chronic gas well compressor noise. *Landscape Ecology* **26** (9): 1269–1280.
14. Fuller, R. A., P. H. Warren, and K. J. Gaston. 2007. Daytime noise predicts nocturnal singing in urban robins. *Biology Letters* **3** (4): 368–370.
15. Gross, K., G. Pasinelli, and H. P. Kunc. 2010. Behavioral Plasticity Allows Short-Term Adjustment to a Novel Environment. *The American Naturalist* **176** (4): 456–464.
16. Slabbekoorn, H., and E. A. P. Ripmeester. 2007. Birdsong and anthropogenic noise: implications and applications for conservation. *Molecular Ecology* **17** (1): 72–83.
17. Langemann, U., B. Gauger, and G. M. Klump. 1998. Auditory sensitivity in the great tit: perception of signals in the presence and absence of noise. *Animal Behaviour* **56**: 763–769.
18. LaGory, K. E., Y.-S. Chang, K. C. Chun, T. Reeves, R. Liebich, and K. Smith. 2001. *A Study of the Effects of Gas Well Compressor Noise on Breeding Bird Populations of the Rattlesnake Canyon Habitat Management Area, San Juan County, New Mexico*. No. DOE/BC/W-31-109-ENG-38-10. National Petroleum Technology Office, Tulsa, OK.
19. Halfwerk, W., L. J. M. Holleman, C. M. Lessells, and H. Slabbekoorn. 2010. Negative impact of traffic noise on avian reproductive success. *Journal of Applied Ecology* **48** (1): 210–219.
20. Leonard, M. L., and A. G. Horn. 2008. Does ambient noise affect growth and begging call structure in nestling birds? *Behavioral Ecology* **19** (3): 502–507.
21. Lackey, M. A., M. L. Morrison, Z. G. Loman, N. Fisher, S. L. Farrell, B. A. Collier, and R. N. Wilkins. 2011. Effects of road construction noise on the endangered golden-cheeked warbler. *Wildlife Society Bulletin* **35** (1): 15–19.
22. Bayne, E. M., L. Habib, and S. Boutin. 2008. Impacts of Chronic Anthropogenic Noise from Energy-Sector Activity on Abundance of Songbirds in the Boreal Forest. *Conservation Biology* **22** (5): 1186–1193.
23. Forman, R. T. T., B. Reineking, and A. M. Hersperger. 2002. Road traffic and nearby grassland bird patterns in a suburbanizing landscape. *Environmental Management* **29** (6): 782–800.

24. Holloran, M. J. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. Diss, University of Wyoming, Laramie, WY.
25. Swaddle, J. P., and L. C. Page. 2007. High levels of environmental noise erode pair preferences in zebra finches: implications for noise pollution. *Animal Behaviour* **74**: 363–368.
26. Ward, A. L. 1984. The Response of Elk to Seismograph Activity in the Little Snake River Known Recoverable Coal Resource Area of Southcentral Wyoming.
27. Sawyer, H., R. M. Nielson, F. Lindzey, and L. L. McDonald. 2006. Winter habitat selection of mule deer before and during development of a natural gas field. *Journal of Wildlife Management* **70** (2): 396–403.
28. Schaub, A., J. Ostwald, and B. M. Siemers. 2008. Foraging bats avoid noise. *Journal of Experimental Biology* **211** (19): 3174–3180.
29. Occupational Safety & Health Administration. Safety and Health Topics: Occupational Noise Exposure. <https://www.osha.gov/SLTC/noisehearingconservation/>.
30. Northrup, J. M., and G. Wittemyer. 2013. Characterising the impacts of emerging energy development on wildlife, with an eye towards mitigation. *Ecology letters* **16** (1): 112–25.
31. American Petroleum Institute. 2011. *Practices for Mitigating Surface Impacts Associated with Hydraulic Fracturing*. API Guidance Document HF3, First Edition. Section 15. [http://www.api.org/policy-and-issues/policy-items/hf/api\\_hf3\\_practices\\_for\\_mitigating\\_surface](http://www.api.org/policy-and-issues/policy-items/hf/api_hf3_practices_for_mitigating_surface)
32. Parris, K. M., M. Velik-Lord, and J. M. A. North. 2009. Frogs Call at a Higher Pitch in Traffic Noise. *Ecology and Society* **14** (1): 24.
33. Kaiser, K., D. G. Scofield, M. Alloush, R. M. Jones, S. Marczak, K. Martineau, M. A. Oliva, and P. M. Narins. 2010. When sounds collide: the effect of anthropogenic noise on a breeding assemblage of frogs in Belize, Central America. *Behaviour* **148** (2): 215–232.
34. Lyon, A. G., and S. H. Anderson. 2003. Potential gas development impacts on sage grouse nest initiation and movement. *Wildlife Society Bulletin* **31** (2): 486–491.
35. Pater, L. L., T. G. Grubb, and D. K. Delaney. 2009. Recommendations for Improved Assessment of Noise Impacts on Wildlife. *The Journal of Wildlife Management* **73** (5): 788–795.

## ARTIFICIAL LIGHTING

- Rich, C., and T. Longcore. 2005. *Ecological Consequences of Artificial Night Lighting*. Island Press, Washington, DC.
- Stone, E. L., G. Jones, and S. Harris. 2009. Street Lighting Disturbs Commuting Bats. *Current Biology* **19** (13).
- Kempenaers, B., P. Borgstroem, P. Loes, E. Schlicht, and M. Valcu. 2010. Artificial Night Lighting Affects Dawn Song, Extra-Pair Singing Success, and Lay Date in Songbirds. *Current Biology* **20** (19): 1735–1739.
- Baker, B. J., and J. M. L. Richardson. 2006. The effect of artificial light on male breeding-season behaviour in green frogs, *Rana clamitans melanota*. *Canadian Journal of Zoology* **84** (10): 1528–1532.
- Gal, G., E. R. Loew, L. G. Rudstam, and A. M. Mohammadian. 1999. Light and diel vertical migration: spectral sensitivity and light avoidance by *Mysis relicta*. *Canadian Journal of Fisheries and Aquatic Sciences* **56** (2): 311–322.
- Longcore, T., and C. Rich. 2004. Ecological light pollution. *Frontiers in Ecology and the Environment* **2** (4): 191–198.
- Corre, M., A. Ollivier, S. Ribes, and P. Jouventin. 2002. Light-induced mortality of petrels: a 4-year study from Réunion Island (Indian Ocean). *Biological Conservation* **105**: 93–102.
- Telfer, T. C., J. L. Sincock, G. V. Byrd, and J. R. Reed. 1987. Attraction of Hawaiian Seabirds to Lights: Conservation Efforts and Effects of Moon Phase. *Wildlife Society Bulletin* **15** (3): 406–413.
- Miller, M. W. 2006. Apparent effects of light pollution on singing behavior of American robins. *Condor* **108** (1): 130–139.
- Beier, P. 2005. Effects of Artificial Night Lighting on Terrestrial Mammals. Pages 19–42 in *Ecological Consequences of Artificial Night Lighting* (eds. C. Rich and T. Longcore). Island Press, Washington, DC.
- Perry, G., and R. N. Fisher. 2005. Night Lights and Reptiles: Observed and Potential Effects. Pages 169–191 in *Ecological Consequences of Artificial Night Lighting* (eds. C. Rich and T. Longcore). Island Press, Washington, DC.

12. Buchanan, B. W. 2005. Observed and Potential Effects of Artificial Night Lighting on Anuran Amphibians. Pages 192–220 in *Ecological Consequences of Artificial Night Lighting* (eds. C. Rich and T. Longcore). Island Press, Washington, DC.
13. Eisenbeis, G. 2005. Artificial Night Lighting and Insects. Pages 281–304 in *Ecological Consequences of Artificial Night Lighting* (eds. C. Rich and T. Longcore). Island Press, Washington, DC.
14. Frank, K. D. 2005. Effects of Artificial Night Lighting on Moths. Pages 305–344 in *Ecological Consequences of Artificial Night Lighting* (eds. C. Rich and T. Longcore). Island Press, Washington, DC.
15. Murphy, S., D. Hill, and F. Greenaway. 2009. *Pilot study of a technique for investigating the effects of artificial light and noise on bat activity*. Report for People's Trust for Endangered Species. Report for People's Trust for Endangered Species, School of Life Sciences, University of Sussex, Falmer, Brighton.
16. Patriarca, E., and P. Debernardi. 2010. Bats and light pollution. EUROBATS. Centro Regionale Chiroterri, Turin.
17. Kuijper, D., J. Schut, D. Van Dullemen, H. Toorman, N. Goossens, J. Ouwehand, and H. J. G. A. Limpens. 2008. Experimental evidence of light disturbance along the commuting routes of pond bats (*Myotis dasycneme*). *Lutra* **51** (1): 37–49.
18. Rydell, J. 2005. Bats and Their Insect Prey at Streetlights. Pages 43–60 in *Ecological Consequences of Artificial Night Lighting* (eds. C. Rich and T. Longcore). Island Press, Washington, DC.
19. Poot, H., B. J. Ens, H. D. Vries, M. A. H. Donners, M. R. Wernand, and J. M. Marquenie. 2008. Green Light for Nocturnally Migrating Birds. *Ecology and Society* **13** (2): 14.
20. Reed, J. R., J. L. Sincock, and J. P. Hailman. 1985. Light Attraction in Endangered Procellariiform Birds: Reduction by Shielding Upward Radiation. *The Auk* **102** (2): 377–383.
21. Calhoun, A. J. K., and M. W. Klemens. 2002. Best Development Practices Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States Best Development Practices. *MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York*.
22. Gehring, J., P. Kerlinger, and A. M. Manville. 2009. Communication towers, lights, and birds: successful methods of reducing the frequency of avian collisions. *Ecological Applications* **19** (2): 505–514.
23. Canadian Wildlife Service and Environment Canada. 2009. *Petroleum Industry Activity Guidelines for Wildlife Species at Risk in the Prairie and Northern Region*. Prairie and Northern Region, Edmonton, Alberta.
24. Lloyd, J. E. 2005. Stray Light, Fireflies, and Fireflyers. Pages 345–364 in *Ecological Consequences of Artificial Night Lighting* (eds. C. Rich and T. Longcore). Island Press, Washington, DC.
25. Beier, P. 1995. Dispersal of juvenile cougars in fragmented habitat. *Journal of Wildlife Management* **59**: 228–237.
26. Grigione, M. M., and R. Myrakalo. 2004. Effects of artificial night lighting on endangered ocelots (*Leopardus pardalis*) and nocturnal prey along the United States-Mexico border: A literature review and hypotheses of potential impacts. *Urban Ecosystems* **7** (1): 65–77.
27. Drewitt, A. L., and R. H. W. Langston. 2008. Collision Effects of Wind-power Generators and Other Obstacles on Birds. *Annals of the New York Academy of Sciences* **1134**: 233–266.
28. Fure, A. 2006. Bats and lighting. *The London Naturalist* **85**.

## SEASONAL TIMING OF ACTIVITIES

1. Doherty, K. E., D. E. Naugle, B. L. Walker, and J. M. Graham. 2008. Greater sage-grouse winter habitat selection and energy development. *Journal of Wildlife Management* **72** (1): 187–195.
2. Holloran, M. J. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. Diss, University of Wyoming, Laramie, WY.
3. Andrews, K. M., J. W. Gibbons, and D. M. Jochimsen. 2008. Ecological Effects of Roads on Amphibians and Reptiles: A Literature Review. *Herpetological Conservation* **3**: 121–143.

4. Dyer, S. J., J. P. O'Neill, S. M. Wasel, and S. Boutin. 2001. Avoidance of Industrial Development by Woodland Caribou. *The Journal of Wildlife Management* **65** (3): 531–542.
5. Easterly, T., A. Wood, and T. Litchfield. 1991. *Responses of pronghorn and mule deer to petroleum development on crucial winter range in the Rattlesnake Hills*. Unpublished completion report, Wyoming Game and Fish Department, Cheyenne, WY.
6. Lyon, A. G., and S. H. Anderson. 2003. Potential gas development impacts on sage grouse nest initiation and movement. *Wildlife Society Bulletin* **31** (2): 486–491.
7. Webb, S. L., M. R. Dzialak, S. M. Harju, L. D. Hayden-Wing, and J. B. Winstead. 2011. Effects of human activity on space use and movement patterns of female Elk. *Wildlife Society Bulletin* **35** (3): 261–269.
8. Kemp, P., D. Sear, A. Collins, P. Naden, and I. Jones. 2011. The impacts of fine sediment on riverine fish. *Hydrological Processes* **25** (11): 1800–1821.
9. Halfwerk, W., L. J. M. Holleman, C. M. Lessells, and H. Slabbeekoor. 2010. Negative impact of traffic noise on avian reproductive success. *Journal of Applied Ecology* **48** (1): 210–219.
10. Knight, R. L., and D. N. Cole. 1995. Factors That Influence Wildlife Responses to Recreationists. Pages 71–80 in *Wildlife and recreationists: coexistence through management and research* (eds. R. L. Knight and K. J. Gutzwiller). Island Press, Washington, DC.
11. Gilbert, M. M., and A. D. Chalfoun. 2011. Energy Development Affects Populations of Sagebrush Songbirds in Wyoming. *Journal of Wildlife Management* **75** (4): 816–824.
12. Thomas, E. H., M. C. Brittingham, and S. H. Stoleson. 2014. Conventional oil and gas development alters forest songbird communities. *The Journal of Wildlife Management* **78** (2): 293–306.
13. Lackey, M. A., M. L. Morrison, Z. G. Loman, N. Fisher, S. L. Farrell, B. A. Collier, and R. N. Wilkins. 2011. Effects of road construction noise on the endangered golden-cheeked warbler. *Wildlife Society Bulletin* **35** (1): 15–19.
14. Bee, M. A., and E. M. Swanson. 2007. Auditory masking of anuran advertisement calls by road traffic noise. *Animal Behaviour* **74**: 1765–1776.
15. Barber, J. R., K. R. Crooks, and K. M. Fristrup. 2009. The costs of chronic noise exposure for terrestrial organisms. *Trends in Ecology & Evolution* **25** (3): 180–189.
16. Canadian Wildlife Service and Environmental Canada. 2009. *Petroleum Industry Activity Guidelines for Wildlife Species at Risk in the Prairie and Northern Region*. Prairie and Northern Region, Edmonton, Alberta.
17. Richardson, C. T., and K. M. Clinton. 1997. Recommendations for Protecting Raptors from Human Disturbance: A Review. *Wildlife Society Bulletin* **25** (3): 634–638.
18. Hein, C. D. 2012. Potential impacts of shale gas development on bat populations in the northeastern United States. *Bat Conservation International*, Austin, TX.
19. Grubb, T. G., and W. W. Bowerman. 1997. Variations in breeding bald eagle responses to jets, light planes and helicopters. *Journal of Raptor Research* **31** (3): 213–222.
20. Dephilip, M., and T. Moberg. 2010. Ecosystem flow recommendations for the Susquehanna River basin. *The Nature Conservancy*, Harrisburg, PA.
21. Rahm, B. G., and S. J. Riha. 2012. Toward Strategic Management of Shale Gas Development: Regional, Collective Impacts on Water Resources. *Environmental Science and Policy* **17**: 12–23.
22. Poff, N. L., J. D. Allan, M. B. Bain, J. R. Karr, K. L. Prestegaard, B. D. Richter, R. E. Sparks, and J. C. Stromberg. 1997. The Natural Flow Regime. *BioScience* **47** (11): 769–784.
23. Freyman, M. 2014. Hydraulic Fracturing and Water Stress: Water Demand by the Numbers. Ceres, Boston, MA.
24. Vengosh, A., R. B. Jackson, N. Warner, T. H. Darrah, and A. Kondash. 2014. A Critical Review of the Risks to Water Resources from Unconventional Shale Gas Development and Hydraulic Fracturing the United States. *Environmental Science & Technology* **48** (15): 8334–8348.
25. Weltman-Fahs, M., and J. M. Taylor. 2013. Hydraulic Fracturing and Brook Trout Habitat in the Marcellus Shale Region: Potential Impacts and Research Needs. *Fisheries* **38** (1): 4–15.
26. Entrekin, S., M. Evans-White, B. Johnson, and E. Hagenbuch. 2011. Rapid expansion of natural gas development poses a threat to surface waters. *Frontiers in Ecology and the Environment* **9** (9): 503–511.
27. Smith, D. R., C. D. Snyder, N. P. Hitt, J. A. Young, and S. P. Faulkner. 2012. ENVIRONMENTAL REVIEWS AND CASE STUDIES: Shale Gas Development and Brook Trout: Scaling Best Management Practices to Anticipate Cumulative Effects. *Environmental Practice* **14** (4): 366–381.
28. Longcore, T., and C. Rich. 2004. Ecological light pollution. *Frontiers in Ecology and the Environment* **2** (4): 191–198.

29. Agosta, S. J., D. Morton, B. D. Marsh, and K. M. Kuhn. 2005. Nightly, Seasonal, and Yearly Patterns of Bat Activity at Night Roosts in the Central Appalachians. *Journal of Mammalogy* **86** (6): 1210–1219.
30. Menzel, M. A., S. F. Owen, W. M. Ford, J. W. Edwards, P. B. Wood, B. R. Chapman, and K. V Miller. 2002. Roost tree selection by northern long-eared bat (*Myotis septentrionalis*) maternity colonies in an industrial forest of the Appalachian mountains. *Forest Ecology and Management* **155** (1-3): 107–114.
31. Sawyer, H., R. M. Nielson, F. Lindzey, and L. L. McDonald. 2006. Winter habitat selection of mule deer before and during development of a natural gas field. *Journal of Wildlife Management* **70** (2): 396–403.
32. Sawyer, H., M. J. Kauffman, and R. M. Nielson. 2009. Influence of Well Pad Activity on Winter Habitat Selection Patterns of Mule Deer. *Journal of Wildlife Management* **73** (7): 1052–1061.
33. Adams, M. B., P. J. Edwards, W. M. Ford, J. B. Johnson, T. M. Schuler, M. T. Gundy, and F. Wood. 2011. *Effects of Development of a Natural Gas Well and Associated Pipeline on the Natural and Scientific Resources of the Fernow Experimental Forest*. U.S. Forest Service, Newtown Square, PA.
34. Van Dyke, F., and W. C. Klein. 1996. Response of Elk to Installation of Oil Wells. *Journal of Mammalogy* **77** (4): 1028–1041.
35. Bennett, V. J., W. P. Smith, and M. G. Betts. 2011. Toward Understanding the Ecological Impact of Transportation Corridors. General Technical Report PNW-GTR-846. U.S. Forest Service, Portland, OR.
36. Seiler, A. 2001. Ecological effects of roads: a review. *Introductory research essay* **9**: 1–40.
37. Frair, J. L., E. H. Merrill, H. L. Beyer, and J. M. Morales. 2008. Thresholds in landscape connectivity and mortality risks in response to growing road networks. *Journal of Applied Ecology* **45** (5): 1504–1513.
38. Marsh, D. M. 2007. Edge effects of gated and ungated roads on terrestrial salamanders. *Journal of Wildlife Management* **71** (2): 389–394.
39. Sealy, J. B. 2002. Ecology and behavior of the timber rattlesnake (*Crotalus horridus*) in the Upper Piedmont of North Carolina: Identified threats and conservation recommendations. *Biology of the Vipers*: 561–578.
40. Beebee, T. J. C. 2013. Effects of road mortality and mitigation measures on amphibian populations. *Conservation Biology* **27** (4): 657–68.
41. Roe, J. H., and A. Georges. 2007. Heterogeneous wetland complexes, buffer zones, and travel corridors: Landscape management for freshwater reptiles. *Biological Conservation* **135** (1): 67–76.
42. Steen, D. A., M. J. Aresco, S. G. Beilke, B. W. Compton, E. P. Condon, J. Dodd, C. K. H. Forrester, J. W. Gibbons, J. L. Greene, G. Johnson, T. A. Langen, M. J. Oldham, D. N. Oxier, R. A. Saumure, F. W. Schueler, J. M. Sleeman, L. L. Smith, J. K. Tucker, and J. P. Gibbs. 2006. Relative vulnerability of female turtles to road mortality. *Animal Conservation* **9**: 269–273.
43. Habib, L., E. M. Bayne, and S. Boutin. 2007. Chronic industrial noise affects pairing success and age structure of ovenbirds *Seiurus aurocapilla*. *Journal of Applied Ecology* **44**: 176–184.
44. Forman, R. T. T., B. Reineking, and A. M. Hersperger. 2002. Road traffic and nearby grassland bird patterns in a suburbanizing landscape. *Environmental Management* **29** (6): 782–800.
45. Alexander, G. R., and E. A. Hansen. 1986. Sand bed load in a brook trout *Salvelinus fontinalis* stream. *North American Journal of Fisheries Management* **6** (1): 9–23.
46. Alexander, G. R., J. L. Fenske, and D. W. Smith. 1995. *A Fisheries Management Guide to Stream Protection and Restoration*. Michigan Department of Natural Resources, Fisheries Division.
47. Barton, B. A. 1977. Short-term effects of highway construction on limnology of a small stream in southern Ontario. *Freshwater Biology* **7** (2): 99–108.
48. Levy, D. A. 2009. *Pipelines and Salmon in Northern British Columbia: Potential Impacts*. The Pembina Institute.
49. Lachance, S., M. Dube, R. Dostie, and P. Berube. 2008. Temporal and Spatial Quantification of Fine-Sediment Accumulation Downstream of Culverts in Brook Trout Habitat. *Transactions of the American Fisheries Society* **137** (6): 1826–1838.
50. Brauning, D. W. 1992. *Atlas of breeding birds in Pennsylvania*. Page 483. University of Pittsburgh Press, Pittsburgh, PA.
51. Pennsylvania Natural Heritage Program. 2009. Northern Water Shrew (*Sorex palustris albobarbis*). Species Factsheet.
52. Merritt, J. F. 1987. *Guide to the Mammals of Pennsylvania*. Page 408. University of Pittsburgh Press, Pittsburgh, PA.
53. Fitch, H. S., G. R. Pisani, H. W. Greene, A. F. Echelle, and M. Zerwekh. 2004. A field study of the timber rattlesnake in Leavenworth County, Kansas. *Journal of Kansas Herpetology* **11**: 18–24.
54. Goodrich, J. M., and J. Berger. 1994. Winter recreation and hibernating black bears. *Biological Conservation* **67**: 105–110.

55. US Fish and Wildlife Service. 2014. Northern Long-eared Bat Interim Conference and Planning Guidance.
56. Linnell, J. D. C., J. E. Swenson, R. Andersen, and B. Barnes. 2000. How vulnerable are denning bears to disturbance? *Wildlife Society Bulletin* **28** (2): 400–413.
57. Mehlman, D. W., S. E. Mabey, D. N. Ewert, C. Duncan, B. Abel, D. Cimprich, R. D. Sutter, and M. Woodrey. 2005. Conserving Stopover Sites for Forest-Dwelling Migratory Landbirds. *The Auk* **122** (4): 1281.
58. Robinson, S. K., and D. S. Wilcove. 2010. Forest fragmentation in the temperate zone and its effects on migratory songbirds. *Bird Conservation International* **4** (2-3): 233–249.
59. Corre, M., A. Ollivier, S. Ribes, and P. Jouventin. 2002. Light-induced mortality of petrels: a 4-year study from Réunion Island (Indian Ocean). *Biological Conservation* **105**: 93–102.
60. Poot, H., B. J. Ens, H. D. Vries, M. A. H. Donners, M. R. Wernand, and J. M. Marquenie. 2008. Green Light for Nocturnally Migrating Birds. *Ecology and Society* **13** (2): 14.
61. Jones, J., and C. M. Francis. 2003. The Effects of Light Characteristics on Avian Mortality at Lighthouses. *Journal of Avian Biology* **34** (4): 328–333.
62. Jackson, S. D. 2003. Design and construction of aquatic organism passage at road-stream crossings: Ecological considerations in the design of river and stream crossings. *Pages 20–29 Proceeding of the 2003 International Conference on Ecology and Transportation.*
63. Foster, H. R., and T. A. Keller. 2011. Flow in culverts as a potential mechanism of stream fragmentation for native and nonindigenous crayfish species. *Journal of the North American Benthological Society* **30** (4): 1129–1137.
64. US Forest Service Stream Simulation Working Group. 2008. *Stream simulation: An ecological approach to providing passage for aquatic organisms at road-stream crossings.*
65. Benton, P. D., W. E. Ensign, and B. J. Freeman. 2008. The effect of road crossings on fish movements in small Etowah basin streams. *Southeastern Naturalist* **7** (2): 301–310.
66. Foltz, R. B., K. A. Yanosek, and T. M. Brown. 2008. Sediment concentration and turbidity changes during culvert removals. *Journal of Environmental Management* **87** (3): 329–340.
67. Department of Conservation Maine Forest Service. 2009. *Maine Forestry Best Management Practices Use and Effectiveness.*
68. Day, K. M., and T. Tomasi. 2014. Winter energetics of Female Indiana Bats Myotis sodalis. *Physiology and Biochemical Zoology* **87** (1): 56–64.
69. Freeman, M. C., C. M. Pringle, and C. R. Jackson. 2007. Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales. *Journal of the American Water Resources Association* **3** (1).
70. Hakala, J. P., and K. J. Hartman. 2004. Drought effect on stream morphology and brook trout (*Salvelinus fontinalis*) populations in forested headwater streams. *Hydrobiologia* **515** (1-3): 203–213.
71. Meyer, J. L., D. L. Strayer, J. B. Wallace, S. L. Eggert, G. S. Helfman, and N. E. Leonard. 2007. The Contribution of Headwater Streams to Biodiversity in River Networks. *Journal of the American Water Resources Association* **43** (1): 86–103.
72. Slabbekoorn, H., and E. A. P. Ripmeester. 2007. Birdsong and anthropogenic noise: implications and applications for conservation. *Molecular Ecology* **17** (1): 72–83.
73. Lyon, L. J. 1979. Habitat effectiveness for elk as influenced by roads and cover. *Journal of Forestry* **77** (10): 658–660.
74. Switalski, A. 2006. How many is too many: A review of road density thresholds for wildlife. *The Road-RIPorter* **2** (4): 6–8.
75. Watson, M. L. 2005. *Habitat Fragmentation and the Effects of Roads on Wildlife and Habitats.* New Mexico Department of Fish and Game: Conservation Service Division.
76. Cole, E. K., M. D. Pope, and R. G. Anthony. 1992. Effects of road management on movement and survival of Roosevelt Elk. *Journal of Wildlife Management* **61** (4): 1115–1126.
77. Eaglin, G. S., and W. A. Hubert. 1993. Management briefs: Effects of logging and roads on substrate and trout in streams of the Medicine Bow National Forest, Wyoming. *North American Journal of Fisheries Management* **13**: 844–846.
78. Henley, W. F., M. A. Patterson, R. J. Neves, and A. D. Lemly. 2010. Effects of Sedimentation and Turbidity on Lotic Food Webs: A Concise Review for Natural Resource Managers. *Reviews in Fisheries Science* **8** (2).
79. Anderson, P. G., C. G. J. Fraikin, and T. J. Chandler. 1997. Impacts and recovery in a coldwater stream following a natural gas pipeline crossing installation.
80. Daniels, B., D. McAvoy, M. Kuhns, and R. Gropp. 2004. *Managing Forest for Water Quality: Forest Roads.* Extension Utah State University.
81. Bloser, S. M., and B. E. Scheetz. 2012. Sediment Production from Unpaved Oil Well Access Roads in the Allegheny National Forest.

82. Adams, M. B., W. M. Ford, T. M. Schuler, and M. T. Gundy. Effects of natural gas development on forest ecosystems. Pages 219–226 *Proceeding of the 17th Central Hardwood Forest Conference*.
83. Ettinger, W. S. 1987. Impacts of a chemical dust suppressant/soil stabilizer on the physical and biological characteristics of a stream. *Soil and Water Conservation Society* **42**: 111–114.
84. Fure, A. 2006. Bats and lighting. *The London Naturalist* **85**.
85. Murphy, S., D. Hill, and F. Greenaway. 2009. Pilot study of a technique for investigating the effects of artificial light and noise on bat activity. Report for People's Trust for Endangered Species. Report for People's Trust for Endangered Species, School of Life Sciences, University of Sussex, Falmer, Brighton.
86. Rich, C., and T. Longcore. 2005. *Ecological Consequences of Artificial Night Lighting*. Island Press, Washington, DC.
87. Gehring, J., P. Kerlinger, and A. M. Manville. 2009. Communication towers, lights, and birds: successful methods of reducing the frequency of avian collisions. *Ecological Applications* **19** (2): 505–514.
88. Hannon, S. J., C. A. Paszkowski, S. Boutin, J. DeGroot, S. E. Macdonald, M. Wheatley, and B. R. Eaton. 2002. Abundance and species composition of amphibians, small mammals, and songbirds in riparian forest buffer strips of varying widths in the boreal mixedwood of Alberta. *Canadian Journal of Forest Research* **32** (10): 1784–1800.
89. Lee, P., C. Smyth, and S. Boutin. 2004. Quantitative review of riparian buffer width guidelines from Canada and the United States. *Journal of Environmental Management* **70** (2): 165–180.
90. Hawes, E., and M. Smith. 2005. Riparian buffer zones: Functions and recommended widths. *Eightmile River Wild and Scenic Study Committee*.
91. Ficetola, G. F., E. Padoa-Schioppa, and F. De Bernardi. 2009. Influence of Landscape Elements in Riparian Buffers on the Conservation of Semiaquatic Amphibians. *Conservation Biology* **23** (1): 114–123.
92. Bilecki, L. C. 2003. *Bat Hibernacula in the Karst Landscape of Central Manitoba: Protecting Critical Wildlife Habitat while Managing for Resource Development*. University of Manitoba.
93. Pearson, S. F., and D. A. Manuwal. 2001. Breeding Bird Response to Riparian Buffer Width in Managed Pacific Northwest Douglas-Fir Forests. *Ecological Applications* **11** (3): 840–853.
94. Semlitsch, R. D., and J. R. Bodie. 2003. Biological Criteria for Buffer Zones around Wetlands and Riparian Habitats for Amphibians and Reptiles. *Conservation Biology* **17** (5): 1219.
95. Grubb, T. G., and R. M. King. 1991. Assessing human disturbance of breeding Bald Eagle with classification tree models. *Journal of Wildlife Management* **55** (3): 500–511.
96. Steidl, R. J., and R. G. Anthony. 2000. Experimental effects of human activity on breeding Bald Eagles. *Ecological Applications* **10** (1): 258–268.