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## CHAPTER 5 – REFERENCES

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### 5.1 References Cited

- Advisory Council on Historic Preservation, Colorado State Historic Preservation Officer, and USDA Forest Service. 2010. *Programmatic Agreement Among the Advisory Council on Historic Preservation, the Colorado State Historic Preservation Officer, and the USDA Forest Service Rocky Mountain Region, Arapaho and Roosevelt National Forests, Cimarron-Comanche National Grasslands, Grand Mesa, Uncompahgre and Gunnison National Forests, Medicine Bow-Routt National Forests, Pawnee National Grassland, Pike and San Isabel National Forests, Rio Grande National Forest, and San Juan National Forest Regarding the Reporting of Negative Results Cultural Resource Inventories*. Denver, Colorado. On file at San Juan Public Lands Center, Durango, Colorado.
- Agee, J.K. 1998. Landscape Fire Regimes and their Implications for Wildlife. In: *Fire and Wildlife in the Pacific Northwest: Research, Policy, and Management*. Symposium of the Northwest Section of The Wildlife Society, April 6-8, 1998. Spokane, Washington.
- Air Resource Specialists, 2009. *Air Quality Analysis Technical Support Document for San Juan Public Lands Center Land Management Plan and Environmental Impact Statement*. Available at: [http://ocs.fortlewis.edu/forestplan/supplement/SJPLC-TSD\\_Report\\_051111.pdf](http://ocs.fortlewis.edu/forestplan/supplement/SJPLC-TSD_Report_051111.pdf). Accessed August 6, 2013.
- America's Byways Resource Center. 2004. America's Scenic Byway—The Colorado Report. Available at: <http://www.santafetrails scenicandhistoricbyway.org/corcontents.html>. Accessed August 6, 2013.
- Anderegg, W.R., J.A. Berry, D.D. Smith, J.S. Sperry, L.D.L. Anderegg, C.B. Field. 2012. The roles of hydraulic and carbon stress in a widespread climate-induced forest die-off. *Proceedings of the National Academy of Sciences* 109(1):233–237.
- Anderson, D.G. 2004. *Population Status Survey of Schmoll's Milkvetch (Astragalus schmolliae C.L. Porter) – Final Report*. Prepared for National Park Service, Mesa Verde National Park. Fort Collins, Colorado: Colorado Natural Heritage Program.
- Anderson, R.M., and G. Stewart. 2007. *Impacts of Stream Flow Alterations on the Native Fish Assemblage and their Habitat Availability as Determined by 2D Modeling and the Use of Fish Population Data to Support Instream Flow Recommendations for the Sections of the Yampa, Colorado, Gunnison, and Dolores Rivers in Colorado*. Special Report 80. Fort Collins, Colorado: Colorado Division of Wildlife.
- Applied Hydrology Associates, Inc. 2000. 3M Project, San Juan Basin, Colorado and New Mexico, hydrologic modeling report. Prepared for the Southern Ute Indian Tribe, Colorado Oil and Gas Conservation Commission, and the U.S. Bureau of Land Management.
- Arrington, K. 2006. Personal communication. Archaeologist, San Juan Public Lands Center, Durango, Colorado.
- Aubry, K.B., K.S. McKelvey, and J.P. Copeland. 2007. Distribution and broadscale habitat relations of the wolverine in the contiguous United States. *Journal of Wildlife Management* 71:2147–2158.

- Balch, D.F., and J.C. Malecheck. 1985. Cattle trampling of crested wheatgrass under short-duration grazing. *Journal of Range Management* 38:226–227.
- Beidleman, C.A. (facilitator). 2000. *Colorado Partners in Flight Land Bird Conservation Plan*. Colorado Partners-In-Flight. Estes Park, Colorado.
- Bezzlerides, N., and K. Bestgen. 2002. *Status Review of Roundtail Chub Gila robusta, Flannelmouth Sucker Catostomus latipinnis, and Bluehead Sucker Castostomus discobolus in the Colorado River Basin*. Fort Collins, Colorado: Colorado State University Larval Fish Laboratory.
- Bird, D., D. Varland, and J. Negro. 1996. *Raptors in Human Landscapes, Adaptations to Built and Cultivated Environments*. New York: Academic Press.
- Blair, R., T.A. Casey, W.H. Romme, and R.N. Ellis. 1996. *The Western San Juan Mountains, Their Geology, Ecology, and Human History*. University Press of Colorado. Fort Lewis College Foundation.
- Blickley J L., D. Blackwood, and G. Patricelli. 2012. Experimental evidence for the effects of chronic anthropogenic noise on abundance of greater sage-grouse at leks. *Conservation Biology* 26(3):471–471.
- Bock, C.E., and W.M. Block. 2005. Fire and birds in the southwestern United States. In *Fire and Avian Ecology in North America*, edited by V.A. Saab and H.D.W. Powell, pp. 14–32. *Studies in Avian Biology* No. 30.
- Bockheim, J.G., S.W. Lee, and J.E. Leide. 1983. Distribution and cycling of elements in a *Pinus resinosa* plantation ecosystem in Wisconsin. *Canadian Journal of Forest Research* 13:609–619.
- Booz Allen Hamilton. 2007. *Oil and Gas Economic Impact Analysis*. Prepared for the Colorado Energy Research Institute.
- Boreal Toad Recovery Team and Technical Advisory Group. 2001. Conservation Plan and Agreement for the Management and Recovery of the Southern Rocky Mountain Population of the Boreal Toad (*Bufo boreas boreas*). Unpublished, 97 pages.
- Bowker, J.M., C.M. Starbuck, D.B.K. English, J.C. Bergstrom, R.S. Rosenberger, and D.W. McCollum. 2009. *Estimating the Net Economic Value of National Forest Recreation: An Application of the National Visitor Use Monitoring Database*. Faculty Series Working Paper, FS 09-02. Athens, Georgia: University of Georgia.
- Braun, C.E., R.W. Hoffman, and G.E. Rogers. 1976. Wintering areas and winter ecology of white-tailed ptarmigan in Colorado. Special Report Number 38. Denver: Colorado Division of Wildlife.
- Braun, C.E., and G.E. Rogers. 1971. *The White-Tailed Ptarmigan in Colorado*. Technical Publication Number 27, GFP-R-T-27. Denver: Colorado Division of Game, Fish and Parks.
- Braun, C.E., D.R. Stevens, K.M. Giesen, and C.P. Melcher. 1991. Elk, white-tailed ptarmigan and willow relationships: a management dilemma in Rocky Mountain National Park. *Transactions of the North American Wildlife and Natural Resources Conference* 56:74–85.

- Brown, P.M., and R. Wu. 2005. Climate and disturbance forcing of episodic tree recruitment in a southwestern ponderosa pine landscape. *Ecology* 86:3030–3038.
- Buechling, A., and W.L. Baker. 2004. A fire history from tree rings in a high elevation forest of Rocky Mountain National Park. *Canadian Journal of Forest Research* 34:1259–1273.
- Buenger, B.A. 2003. *The Impact of Wildland and Prescribed Fire on Archaeological Resources*. Department of Anthropology, University of Kansas. On file, San Juan Public Lands Center, Durango, Colorado.
- Bull, E.L., C.G. Parks, and T.R. Torgersen. 1997. Trees and Logs Important to Wildlife in the Interior Columbia River Basin. USDA Forest Service General Technical Report, PNW-GTR-391. Portland, Oregon.
- Bureau of Land Management (BLM). 1985. *San Juan/San Miguel Resource Management Plan*. U.S. Department of the Interior, Bureau of Land Management. San Juan Field Office, Durango, Colorado.
- . 1986. BLM. Wild Horse Herd Management Area Plan (HMAP). Rev. 1994. Durango, Colorado: San Juan Public Lands Center.
- . 1990a. BLM Colorado Instruction Memorandum CO-90-072, Colorado Burial Discovery Procedures.
- . 1990b. San Juan/San Miguel Wilderness Final EIS. Montrose District. Available at BLM Southwest District Office, Montrose, Colorado.
- . 1991a. Colorado Wilderness Study Report. U.S. Department of the Interior, Bureau of Land Management, Volume 3 Montrose District Study Areas, pp. 169–352.
- . 1991b. *Colorado Oil and Gas Leasing and Development Final Environmental Impact Statement and Amendment to the San Juan/San Miguel Resource Management Plan*. U.S. Department of the Interior, Bureau of Land Management. Montrose District. Durango, Colorado.
- . 1992. *The Alpine Loop Cultural Resource Management Plan*. On file, Bureau of Land Management Tres Rios Field Office, Dolores, Colorado.
- . 1994. *Spring Creek Basin Wild Horse Herd Management Area Plan*. San Juan Resource Area. Durango, Colorado: U.S. Department of the Interior, Bureau of Land Management, Montrose District.
- . 1997. Colorado Public Land Health Standards and Guidelines. Colorado State Office USDI Bureau of Land Management. BLM Instruction Memorandums and Bulletins related to the agency livestock grazing management program.
- . 1998. BLM IM No. CO-98-052: *Clarification of Cultural Resource Clearance Responsibilities and Maintenance on On-Going Projects*.
- . 1999. *Environmental Assessment of #CO-036-99-014 Tomichi Allotment Management Plan and Grazing Permit Reissuance for Tomichi Allotment #06319*. On file, San Juan Public Lands Center, Durango, Colorado.

- 
- . 2000. BLM IM No. CO-2000-016. *Disposition Policy on Native American Graves Protection and Repatriation Act (NAGPRA) Repatriated Museum Collections*.
- . 2002a. *Final Environmental Impact Statement for Oil and Gas Development on the Southern Ute Indian Reservation*. Available at San Juan Public Lands Center, Durango, Colorado.
- . 2002b. BLM IM IB No. WO-2002-002: New Heritage Education Plan.
- . 2002c. BLM IM No. CO-2002-029, *Interim Historic Preservation Guidelines and Procedures for Evaluating the Effect of Rangeland Management Activities on Historic Properties*. Available at:  
[http://www.blm.gov/style/medialib/blm/co/information/efoia/2002/2002\\_im.Par.58943.File.dat/COIM2002-029.pdf](http://www.blm.gov/style/medialib/blm/co/information/efoia/2002/2002_im.Par.58943.File.dat/COIM2002-029.pdf). Accessed July 26, 2013.
- . 2002d. BLM IB No. WO-2002-101: *Cultural Resource Considerations in Resource Management Plans*.
- . 2003a. BLM Technical Reference 1737-16. *Riparian Area Management – A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lentic Areas*. Denver: U.S. Department of the Interior, Bureau of Land Management, National Applied Resource Sciences Center.
- . 2003b. *Farmington Resource Management Plan with Record of Decision*. Farmington, New Mexico. Farmington, New Mexico: U.S. Department of the Interior, Bureau of Land Management, Farmington Field Office.
- . 2003c. BLM IB No. WO-2003-093: *Implementation of Executive Order (EO) 13287 and Preserve America Initiative*.
- . 2003d. BLM IM No. WO-2003-147: *Application for Permit to Drill (APD) – Process Improvement #3 – Cultural Resources*.
- . 2004a. BLM IM No. WO-2004-020: *Guidance for Recording Cultural and Paleontological Resource Locations for the Bureau of Land Management using Global Positioning System Technology*.
- . 2004b. BLM IM No. WO-2004-052: *Assessing Tribal and Cultural Considerations as Required in IM-2003-233, Integration of the Energy Policy and Conservation Act (EPCA) Inventory Results into the Land Use Planning Process*.
- . 2004c. BLM IB No. WO-2004-154: Amendments to 36 CFR Part 800, Protection of Historic Properties.
- . 2005a. Wild Horse Appropriate Management Level in the Spring Creek Basin HMA (EA #CO-800-2005-027). Durango, Colorado: San Juan Public Lands Center.
- . 2005b. BLM IM No. WO-2005-027: National Historic Preservation Act (NHPA) Section 106 and Oil and Gas Permitting.
- . 2005c. BLM IM No. WO-2005-003: Cultural Resources and Tribal Consultation and Fluid Minerals Leasing.
-

- . 2005d. Wind Energy ROD - Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments, December 2005.
- . 2006a. Surface Operating Standards and Guidelines for Oil and Gas Development. The Gold Book. Fourth Edition—2006.
- . 2006b. BLM Washington Office IM 2006-060: This provides direction for incorporating benefits-based management in the recreation program.
- . 2006c. BLM IM No. CO-2006-026: Cultural Resource Standards and Guidelines for Renewal of Right-of-Way grants and Temporary Use Permits under Section 106 of the National Historic Preservation Act.
- . 2007a. Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Environmental Impact Statement (PEIS).
- . 2007b. Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report (PER).
- . 2007c. BLM Washington Office IM 2007-043. “Unified Strategy” describing how best to implement the BLM Priorities for Recreation and Visitor Services Workplan (Purple Book), as outlined in IM No. 2006-060.
- . 2007d. BLM IM No. WO-2007-002: Disposition Policy on Native American Graves Protection and Repatriation Act Repatriated Museum Collections.
- . 2007e. Addendum 1 to the BLM Colorado Protocol: Section 106 Requirements for Comprehensive Travel and Transportation Management Planning. Available at: [http://www.blm.gov/pgdata/etc/medialib/blm/co/information/efoia/2007/2007\\_im.Par.53849.File.dat/COIM2007-023ATT1.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/co/information/efoia/2007/2007_im.Par.53849.File.dat/COIM2007-023ATT1.pdf). Accessed August 2, 2013.
- . 2007f. BLM IM 2007-097, Solar Energy Development Policy.
- . 2008. BLM IM 2008-009. Probable Fossil Yield Classification.
- . 2009a. Addendum to the Oil and Gas Potential and Reasonable Foreseeable Development (RFD) Scenarios in the San Juan National Forest and BLM Public Lands, Colorado. U.S. Department of the Interior. Bureau of Land Management. Durango, Colorado.
- . 2009b. BLM IM 2009-011. Assessment and Mitigation of Potential Impacts to Paleontological Resources.
- . 2009c. Wind ROD BMPs: BLM Wind Energy Program Policies and Best Management Practices. Available at: [http://www.blm.gov/style/medialib/blm/wo/Information\\_Resources\\_Management/policy/im\\_attachments/2009.Par.34083.File.dat/IM2009-043\\_att1.pdf](http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/im_attachments/2009.Par.34083.File.dat/IM2009-043_att1.pdf). Accessed August 6, 2013.
- . 2009d. BLM IM 2009-043, Wind Energy Development Policy.
- . 2010a. *Canyon of the Ancients National Monument Record of Decision and Resource Management Plan*. Washington, D.C.: U.S. Department of the Interior, Bureau of Land Management. Available at: [http://www.blm.gov/style/medialib/blm/co/programs/land\\_use\\_planning/rmp/canm/documents/](http://www.blm.gov/style/medialib/blm/co/programs/land_use_planning/rmp/canm/documents/)

- [final\\_rmp\\_and\\_rod.Par.99533.File.dat/CANM ROD PLAN with signature pages scanned.pdf](#). Accessed August 6, 2013.
- . 2010b. Memorandum of understanding between the U.S. Department of the Interior Bureau of Land Management and the U.S. Fish and Wildlife Service to promote the conservation of migratory birds. Signed April 12, 2010. Unpublished document. 13 pages.
- . 2010c. BLM Instruction Memorandum CO-2010-028. Lakewood, Colorado: U.S. Department of the Interior, Bureau of Land Management, Colorado State Office. Available at: <http://www.blm.gov/pgdata/etc/medialib/blm/co/information/efoia/2010.Par.16266.File.dat/COIM2010-028.pdf>. Accessed June 12, 2013.
- . 2011a. Integrated Weed Management Plan, BLM, San Juan Public Lands Center (CO-800-2008-075 EA).
- . 2011b. BLM Washington Office IM 2011-154 which directed field units to review and update their inventory of lands for their wilderness characteristics and established a uniform protocol for doing so
- . 2012a. *Record of Decision for Surface Management of Gas Leasing and Development, Carson National Forest, Jicarilla Ranger District*. NEPA # DOI-BLM-NM-F010-2013-0417-EIS. Available at: [http://www.blm.gov/pgdata/etc/medialib/blm/nm/field\\_offices/farmington/farmington\\_planning/ffo\\_eis.Par.12897.File.dat/Jicarilla%20EIS%20-%20BLM%20Adoption%20ROD%2012%206%2012.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/nm/field_offices/farmington/farmington_planning/ffo_eis.Par.12897.File.dat/Jicarilla%20EIS%20-%20BLM%20Adoption%20ROD%2012%206%2012.pdf). Accessed July 30, 2013.
- . 2012b. BLM Road Maintenance Schedule, unpublished listing of maintained Tres Rios Field Office roads, updated April 2012, available at the Tres Rios Field Office, Dolores, Colorado.
- . 2012c. BLM IM CO-2012-002: Processing Livestock Grazing Permit Applications. On file, San Juan Public Lands Center, Durango, Colorado.
- . 2012d. BLM IM 2012-140: Collecting Paleontological Resources Under the Paleontological Resources Preservation Act of 2009
- . 2012c. BLM IM 2012-141: Confidentiality of Paleontological Locality Information Under the Omnibus Public Lands Act of 2009, Title VI, Subtitle D on Paleontological Resources Preservation
- . 2013. State and Transition Model (STM). Available at: <http://www.blm.gov/wo/st/en/prog/more/soil2/soil2/model.html> .
- Bureau of Land Management (BLM) and Advisory Council on Historic Preservation. 1997. Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers regarding the manner in which BLM will meet its responsibilities under the National Historic Preservation Act.
- Bureau of Land Management (BLM) and Bureau of Indian Affairs. 2009. Programmatic EA for 80 Acre Infill Oil and Gas Development on the Southern Ute Indian Reservation. Ignacio, Colorado. Available at: [http://suitdoe.com/Documents/SUIT\\_PEA\\_08.5.09.pdf](http://suitdoe.com/Documents/SUIT_PEA_08.5.09.pdf). Accessed July 30, 2013.

- Bureau of Land Management and U.S. Department of Energy (BLM and DOE). 2003. *Assessing the Potential for Renewable Energy on Public Lands*. DOE/GO-102003-1704. Available at: <http://www.nrel.gov/docs/fy03osti/33530.pdf> . Accessed August 7, 2013.
- Bureau of Land Management and U.S. Forest Service (BLM and USFS). 2006a. *Northern San Juan Basin Coal Bed Methane Project Draft Environmental Impact Statement*. Volume 1, Groundwater Section, pp. 3-58–3-78. Durango, Colorado: San Juan Public Lands Center.
- . 2006b. Memorandum of Understanding Between USFS and BLM Concerning Oil and Gas Leasing and Operations. Available at: [http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS\\_\\_REALTY\\_\\_AND\\_RESOURCE\\_PROTECTION\\_/energy/epca\\_chart.Par.42324.File.dat/BLM\\_MOU\\_WO\\_300-2006-07.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/epca_chart.Par.42324.File.dat/BLM_MOU_WO_300-2006-07.pdf). Access August 6, 2013
- . 2007. *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development – The Gold Book*. 4th ed. BLM/WO/ST-06/021+3071. Denver: Bureau of Land Management. Available at: [http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS\\_REALTY\\_AND\\_RESOURCE\\_PROTECTION\\_/energy/oil\\_and\\_gas.Par.18714.File.dat/OILgas.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS_REALTY_AND_RESOURCE_PROTECTION_/energy/oil_and_gas.Par.18714.File.dat/OILgas.pdf). Accessed August 7, 2013.
- . 2010. *Oil and Gas Potential and Reasonable Foreseeable Development Scenarios in the San Juan National Forest and BLM Public Lands, Colorado*. Cortez, Colorado: Bureau of Land Management and U.S. Department of Agriculture, Forest Service.
- Bureau of Land Management (BLM), State of Colorado, U.S. Forest Service (USFS), Colorado State Historic Preservation Office (SHPO), and Advisory Council on Historic Preservation. 1998. Programmatic Agreement among BLM, the State of Colorado, the USFS, National Forests in the State of Colorado, USFS, the State Historic Preservation Office of Colorado, and the Advisory Council on Historic Preservation regarding the Management of Wildland Fire for Resource Benefits (Agreement No. 1102-002-98-038).
- Bureau of Reclamation. 2009. McPhee Dam. Available at: [http://www.usbr.gov/projects/Facility.jsp?fac\\_Name=McPhee+Dam](http://www.usbr.gov/projects/Facility.jsp?fac_Name=McPhee+Dam). Accessed August 7, 2013.
- Buskirk, S.W., and L.F. Ruggiero. 1994. American marten. In *The Scientific Basis for Conserving Forest Carnivores, American Marten, Fisher, Lynx, and Wolverine, in the Western United States*, edited by L.F. Ruggier, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, pp. 7–37. USDA Forest Service General Technical Report RM-254. Fort Collins, Colorado.
- Byrne, G., and J. Copeland. 1997. An Aerial Survey for Wolverine (*Gulo gulo*) in Colorado. Unpublished report, Colorado Division of Wildlife.
- Cade, T.J., M. Martell, P. Redig, G. Septon, and H. Tordoff. 1996. Peregrine falcons in urban North America. In *Raptors in Human Landscapes, Adaptations to Built and Cultivated Environments*, edited by D. Bird, D. Varland, and J. Negro, pp. 3–13. New York: Academic Press.
- Center for Biological Diversity. 2010. Petition to list the white-tailed ptarmigan, (*Lagopus leucura*) as a threatened species under the Endangered Species Act, August 24, 2010. Unpublished

- document, Center for Biological Diversity, Portland, OR. 52 pages. Available at:  
[http://www.biologicaldiversity.org/species/birds/white-tailed\\_ptarmigan/pdfs/WTP\\_Petition.pdf](http://www.biologicaldiversity.org/species/birds/white-tailed_ptarmigan/pdfs/WTP_Petition.pdf)
- Chamberlin, T. W., R. D. Harr, and F. H. Everest. 1991. Timber harvest, silviculture, and watershed processes. *American Fisheries Society Special Publication* 19:181-205.
- Clow, D.W. 2007. Changes in the Timing of Snowmelt and Streamflow in Colorado: A Response to Recent Warming. *Journal of Climate*, V.23, pp. 2293-2306.
- Colborn TC, Kwiatkowski C, Shultz K, and Backstrom M. 2011. Natural gas operations from a public health perspective. *Int J Hum Ecol Risk Assess*. In press.
- Cole, E. K., M. D. Pope, and R. G. Anthony. 1997. Effects of road management on movement and survival of Roosevelt elk. *Journal of Wildlife Management* 61:1115-1126.
- Coleman, J. 2000. *Environmental Assessment #CO-036-99-01 Tomichi Allotment Management Plan & Grazing Permit Reissuance for Tomichi Allotment #06319*. On file, Bureau of Land Management, Gunnison Field Office, Gunnison, Colorado.
- Collins, S.K., W.J. Grimm, and A. Wise. 2006. Class I Cultural Resources Overview of Bureau of Land Management Lands in the San Juan Field Office, Southwestern Colorado. Prepared by Sandstone Archaeology, LLC. Mancos, Colorado.
- Colorado Department of Local Affairs. 2012. 2011 Biennial Report, Direct Distribution. Available at:  
[http://www.colorado.gov/cs/Satellite?c=Document\\_C&childpagename=DOLA-Main%2FDocument\\_C%2FCBONDefault&cid=1251594705227&pagename=CBONWrapper](http://www.colorado.gov/cs/Satellite?c=Document_C&childpagename=DOLA-Main%2FDocument_C%2FCBONDefault&cid=1251594705227&pagename=CBONWrapper). Accessed August 6, 2013.
- Colorado Department of Natural Resources. 2004. *10-Year Strategic Plan on the Comprehensive Removal of Tamarisk*. Tamarisk Coalition. Grand Junction, Colorado.
- . 2005. *Report on the Health of Colorado's Forests 2004 – Special Issue: Ponderosa Pine Forests*. Denver: Colorado Department of Natural Resources, Division of Forestry. Colorado Department of Natural Resources et al. 1976. Dolores River
- Colorado Department of Natural Resources, Colorado Water Conservation Board, and Bureau of Land Management (BLM). 2011. Memorandum of Understanding between the Colorado Department of Natural Resources, the Colorado Water Conservation Board, and the BLM regarding the management of water and water uses on BLM lands in Colorado. Available at:  
<http://cwcb.state.co.us/legal/Pages/GovernmentalAgreements.aspx> Accessed July 29, 2013.
- Colorado Department of Natural Resources and U.S. Forest Service (USFS). 2009. MOU between the Colorado Department of Natural Resources and the U.S. Department of Agriculture, Forest Service. Available at:  
<http://cwcb.state.co.us/legal/Pages/GovernmentalAgreements.aspx> Accessed July 29, 2013.
- Colorado Department of Public Health and Environment, Colorado Air Quality Control Commission. 2011. Regulation Number 9, Open Burning, Prescribed Burning, and Permitting. 5 CCR 1001-11. Available at:  
<http://www.colorado.gov/cs/Satellite?c=Page&childpagename=CDPHE-Main%2FCBONLayout&cid=1251601911433&pagename=CBONWrapper>. Accessed July 30, 2013.

- . 2006. Colorado's Section 303(D) List of Impaired Waters and Monitoring and Evaluation List. 5 CRR 1002-93 Regulation #93, Adopted March 14, 2006.
- . 2012. Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List.
- Colorado Department of Revenue. 2010. State of Colorado Department of Revenue, Sales Tax Statistical Summary, January to December 2010, In Thousands of Dollars. Available at: <http://www.colorado.gov/cs/Satellite/Revenue-Main/XRM/1213954128545>. Accessed August 7, 2013.
- Colorado Division of Water Resources. 2012. GIS data of water rights in Colorado Water Division 7. Available at: <http://water.state.co.us/DataMaps/GISandMaps/Pages/GISDownloads.aspx>. Accessed August 7, 2013.
- Colorado Division of Wildlife. 2002. Threatened and Endangered Species. Denver: Colorado Division of Wildlife. Available at: <http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/ThreatenedEndangeredList/ListOfThreatenedAndEndangeredSpecies.htm>. Accessed January 2002.
- . 2006. *Colorado's Comprehensive Wildlife Conservation Strategy and Wildlife Action Plans*. Denver: Colorado Division of Wildlife.
- Colorado Forest Restoration Institute. 2010. *Mixed-Conifer Forests in Southwest Colorado – A Summary of Existing Knowledge and Considerations for Restoration and Management*. Fort Collins, Colorado: Colorado Forest Restoration Institute, Colorado State University.
- Colorado Natural Heritage Program. 2002. Status and Ranking. Fort Collins, Colorado: Colorado Natural Heritage Program, Colorado State University. Available at: <http://www.cnhp.colostate.edu/list.html>. Accessed January 2002.
- Colorado Parks and Wildlife (CPW). 2004. Fungus contamination prevention guidelines. In Procedures for Monitoring and Surveying Boreal Toad Populations, slide show by L.J. Livo. Available at: <http://wildlife.state.co.us/Research/Aquatic/BorealToad/Pages/BorealSurveying.aspx>. Accessed July 20, 2013.
- . 2008. Recommended buffer zones and seasonal restrictions for Colorado raptors. Unpublished report by Colorado Division of Wildlife. Available at: <http://wildlife.state.co.us/SiteCollectionDocuments/DOW/WildlifeSpecies/LivingWithWildlife/RaptorBufferGuidelines2008.pdf>. Accessed August 7, 2013.
- . 2012a. Colorado bighorn sheep management plan, data analysis unit RBS-20, Weminuche herd. Unpublished report, Colorado Parks and Wildlife, Denver. Available at: <http://wildlife.state.co.us/SiteCollectionDocuments/DOW/Hunting/BigGame/DAU/BighornSheep/RBS20DAUPlan.pdf>. Accessed August 7, 2013.
- . 2012b. Colorado bighorn sheep management plan, data analysis unit RBS-21, San Juans West. Unpublished report, Colorado Parks and Wildlife, Denver. Available at: [http://wildlife.state.co.us/SiteCollectionDocuments/DOW/Hunting/BigGame/DAU/BighornSheep/RBS21DAUPlan\\_SanJuansWest.pdf](http://wildlife.state.co.us/SiteCollectionDocuments/DOW/Hunting/BigGame/DAU/BighornSheep/RBS21DAUPlan_SanJuansWest.pdf). Accessed August 7, 2013.

- Colorado River Cutthroat Trout Task Force. 2001. *Conservation Agreement and Strategy for Colorado River Cutthroat Trout (Oncorhynchus clarki pleuriticus) in the States of Colorado, Utah, and Wyoming*. Fort Collins, Colorado: Colorado Division of Wildlife.
- Colorado State Demography Office. 2011. Population Totals for Colorado Counties. Available at: <http://www.colorado.gov/cs/Satellite?c=Page&childpagename=DOLA-Main%2FCBONLayout&cid=1251593346867&pagename=CBONWrapper>. Accessed August 6, 2013.
- . 2012a. Historical census population. Available at: [https://dola.colorado.gov/demog\\_webapps/hcp\\_parameters.jsf](https://dola.colorado.gov/demog_webapps/hcp_parameters.jsf). Accessed July 13, 2012.
- . 2012b. Population forecasts—years 2000 to 2040. Most recent forecasts produced in September, 2011. Available at: [http://www.colorado.gov/cs/Satellite?c=Document\\_C&childpagename=DOLA-Main%2FDocument\\_C%2FCBONAddLinkView&cid=1251593369324&pagename=CBONWrapper](http://www.colorado.gov/cs/Satellite?c=Document_C&childpagename=DOLA-Main%2FDocument_C%2FCBONAddLinkView&cid=1251593369324&pagename=CBONWrapper). Accessed July 13, 2012.
- . 2012c. Components of population change. Available at: [https://dola.colorado.gov/demog\\_webapps/cpc\\_parameters.jsf](https://dola.colorado.gov/demog_webapps/cpc_parameters.jsf). Accessed July 13, 2012.
- Colorado State University. 2013. Cheatgrass and wildfire. Available at: <http://www.ext.colostate.edu/pubs/natres/06310.html>. Accessed August 6, 2013.
- . 2010. *Colorado's Water Supply Future: State of Colorado 2050 Municipal & Industrial Water Use Projections*. Denver: Colorado Water Conservation Board.
- Cordell, H.K., C. Betz, J.M. Bowker, D.B.K. English, S.H. Mou, J.C. Bergstrom, R.J. Teasley, M.A. Tarrant, and J. Loomis. 1999. *Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends*. Champaign, Illinois: Sagamore Publishing.
- Cothran, E.G.. 2010. *Genetic Analysis of the Spring Creek Basin HMA, CO*. Department of Veterinary Integrative Bioscience, Texas A&M University, June 21, 2010.
- Covington, W.W., and M.M. Moore. 1994. Southwestern ponderosa pine forest structure: changes since Euro-American settlement. *Journal of Forestry* 92:39–47.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. U.S. Fish and Wildlife Service. Washington, D.C.
- Cox, D., P. Onsager, J. Thomson, R. Reinke, G. Gianinny, C. Vliss, J. Hughes, and M. Janowiak. 2001. *San Juan Basin Ground Water Modeling Study: Ground Water–Surface Water Interactions between Fruitland Coalbed Methane Development and Rivers*. Sponsored by the Ground Water Protection Research Foundation.
- Crawford, D. 2008. *San Juan Public Lands Fuels Project Contract History*. On file at the San Juan Public Lands Center, Durango, Colorado.
- Dadkhah, M., and G.F. Gifford. 1981. Influence of vegetation, rock cover and trampling on infiltration rates and sediment production. *Water Resources Bulletin* 16:979–986.

- Dahms, W.C., and B.W. Geils. 1997. *An Assessment of Forest Ecosystem Health in the Southwest. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station and Southwestern Region*. General Technical Report RM-GTR-295.
- Debyle, N.V. 1995. Wildlife. In *Aspen: Ecology and Management in the Western United States*, edited by N.V. DeByle and R.P. Winokur, pp. 29–33. General Technical Report RM-119. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.
- DeVelice, R.L., J.A. Ludwig, W.H. Moir, and F. Ronco, Jr. 1986. *A Classification of Forest Habitat Types of New Mexico and Southern Colorado*. General Technical Report RM-131. Washington, D.C.: U.S. Department of Agriculture, Forest Service.
- Duke, P. 1998. *Management Summary of an Overview of the Archaeological Resources in the San Juan-Rio Grande National Forest: Mancos-Dolores, Columbine and Pagosa Districts*. Durango, Colorado: Center for Southwest Studies, Fort Lewis College.
- Duke, P., D. Cave, and R. Kimmick. 2003. *The Effects of Fire on Cultural Resources*. Durango, Colorado: Department of Anthropology, Fort Lewis College. On file, San Juan Public Lands Center, Durango, Colorado.
- Duvall, R. 2012. SJNF and TRFO operations, unpublished data. San Juan Public Lands Center, Durango, Colorado.
- Eager, T. 2010. Personal communication. Gunnison Service Center, Region 2 Forest Health Management.
- Ehle, D.S., and W.L. Baker. 2003. Disturbance and stand dynamics in ponderosa pine forests in Rocky Mountain National Park, USA. *Ecological Monographs* 73:543–566.
- Ellingson, A.R. 2003. Uncompahgre fritillary butterfly monitoring and inventory: 2002 field report and recommendations. Unpublished report. Prepared for the U.S. Fish and Wildlife Service, the U.S. Forest Service, and the U.S. Bureau of Land Management. Fort Collins, Colorado.
- Engler, T.W., B.S. Brister, H. Chen, and L.W. Teufel. 2001. *Oil and Gas Resource Development for San Juan Basin, New Mexico: A 20-year, Reasonable Foreseeable Development (RFD) Scenario Supporting the Resource Management Plan for the Farmington Field Office, Bureau of Land Management*. Farmington, New Mexico: U.S. Department of the Interior, Bureau of Land Management, Farmington Field Office.
- Environmental Protection Agency (EPA). 2005. Mercury, Cleaner Power Plants, Safer Environment. Available at: <http://www.epa.gov/airquality/powerplanttoxics/#>. Accessed August 6, 2013.
- . 2009. Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2007. Available at: <http://epa.gov/climatechange/emissions/usinventoryreport.html> . Accessed August 6, 2013.
- . 2011. *Passive Sampling of Ambient Reactive Gaseous Mercury In the Four Corners Area, Eastern Oklahoma, and Central/East Texas: Important Method Evaluation and Baseline Work*. Available at: <http://www.epa.gov/ttnamti1/files/ambient/airtox/2011workshop/day4MarkSatherPassiveMercury.pdf>. Accessed August 6, 2013.

- Environmental Protection Agency. 1995. AP 42, Compilation of Air Pollutant Emission Factors. Available at: <http://www.epa.gov/ttnchie1/ap42/>. Access July 30, 2013.
- Ferland, C. 2005. Northern goshawk (*Accipiter gentillis atricapillus*) breeding status in the San Juan and Rio Grande National Forests, Southwestern Colorado. Unpublished report. Prepared for the San Juan and Rio Grande National Forests. Washington, D.C.: U.S. Department of Agriculture, U.S. Forest Service.
- Finch, D.M. (ed.) 2012. *Climate Change in Grasslands, Shrublands, and Deserts of the Interior American West: A Review and Needs Assessment*. General Technical Report RMRS-GTR-285. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Finch, D.M., and L.F. Ruggiero. 1993. Wildlife habitats and biological diversity in the Rocky Mountains and Northern Great Plains. *Natural Areas Journal* 12:191–203.
- Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. *Mammals of Colorado*. Niwot, Colorado: Denver Museum of Natural History and University of Colorado Press.
- Fleischner, T.L. 1994. Ecological costs of livestock grazing in western North America. *Conservation Biology* 8(3):629–644.
- Floyd, L.M., W.H. Romme, and D.D. Hanna. 2000. Fire history and vegetation pattern in Mesa Verde National Park, Colorado, USA. *Ecological Applications* 10(6):1666–1680.
- . 2004. Historical and recent fire regimes in pinon-juniper woodlands on Mesa Verde Colorado, USA. *Forest Ecology and Management* 198:269–289.
- Friedlander, J. D. 1980. The Status of Rare and Endangered Plant Species in Mesa Verde National Park, Colorado. M.S. Thesis, Colorado State University, Fort Collins, CO.
- Fuller, M.R. 2010. *Raptor Nesting Near Oil and Gas Development: An Overview of Key Findings and Implications for Management Based on Four Reports by Hawk Watch International*. BLM Technical Note 432. Prepared for U.S. Department of the Interior, Bureau of Land Management Utah State Office, Colorado State Office, and Wyoming State Office. Boise, Idaho: Forest and Rangeland Ecosystem Science Center, U.S. Geological Survey.
- Geist, V. 1971. *Mountain Sheep: A Study in Behavior and Evolution*. Chicago: University of Chicago Press.
- Gellhorn, J. 2007. *White-tailed Ptarmigan, Ghosts of the Alpine Tundra*. Boulder, Colorado: Johnson Books.
- George, J.L., R. Kahn, M.W. Miller, and B. Watkins. 2009. *Colorado Bighorn Sheep Management Plan, 2009–2019*. Special Report No. 81. Denver: Colorado Division of Wildlife.
- Giesen, K.M., and C.E. Braun. 1992. Winter home range and habitat characteristics of white-tailed ptarmigan in Colorado. *Wilson Bulletin* 104:263–272.
- Glenn, G. 2013. U.S. Fish and Wildlife Service Grand Junction Ecological Services Field Office. Personal communication regarding Knowlton's cactus.

- Graeter, G.J., K. Buhlmann, I. Wilkinson, and J. Gibbons. 2013. *Inventory and Monitoring: Recommended Techniques for Reptiles and Amphibians*. Partners in Amphibian and Reptile Conservation Technical Publication IM-1, Birmingham, Alabama.
- Grissino-Mayer, H.D., W.H. Romme, M.L. Floyd, and D.D. Hanna. 2004. Climatic and human influences on fire regimes of the southern San Juan Mountains, Colorado, USA. *Ecology* 85:1708–1724.
- Gunnison Sage-Grouse Rangewide Steering Committee. 2005. *Gunnison Sage-Grouse Rangewide Conservation Plan*. Denver: Colorado Division of Wildlife.
- Hammerson, G.A. 1999. *Amphibians and Reptiles in Colorado*. 2nd ed. Denver: Colorado Division of Wildlife; Niwot, Colorado: University Press of Colorado.
- Hann, W., D. Havlina, A. Shlisky. 2003. Fire Regime Condition Class (FRCC) website. Available at: <http://www.frames.gov/partner-sites/frcc/frcc-home>. U.S. Department of Agriculture, U.S. Forest Service; U.S. Department of the Interior; The Nature Conservancy; and Systems for Environmental Management.
- Harness, R.E. 2007. Mitigation. In *Raptor Research and Management Techniques*, edited by D.M. Bird and K.L. Bildstein, pp. 365–382. Blaine, Washington: Hancock House Publishers.
- Hayward, G.D. 1994. Review of technical knowledge: Boreal owls. *Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment*, edited by G.D. Hayward and J. Verner, pp. 92–127. General Technical Report RM-253. Fort Collins, Colorado: U.S. Forest Service.
- Hayward, G.D., P.H. Hayward, and E.O. Garton. 1993. Ecology of boreal owls in the Northern Rocky Mountains, USA. *Wildlife Monographs* 124:1–59.
- Hebblewhite, M. 2008. A literature review of the effects of energy development on ungulates: Implications for central and eastern Montana. Unpublished report. Miles City, Montana: Montana Fish, Wildlife and Parks.
- Heffelfinger, J. 2006. *Deer of the Southwest, A Complete Guide to the Natural History, Biology, and Management of Southwestern Mule Deer and White-Tailed Deer*. College Station, Texas: Texas A & M University Press.
- Heinselman, M.L., 1981. Fire and succession in the conifer forests of North America. In *Forest Succession: Concepts and Applications*, edited by D.C. West, H.H. Shugart, and D.B. Botkin, pp. 374–406. New York: Springer-Verlag.
- Hill, R., and C.M. Pickering. 2009. Differences in the resistance of three subtropical vegetation types to experimental trampling. *Journal of Environmental Management* 90:1305–1312.
- Hoffman, R.W. 2006. *White-tailed Ptarmigan (Lagopus leucura): A Technical Conservation Assessment*. Available at: <http://www.fs.fed.us/r2/projects/scp/assessments/whitetailedptarmigan.pdf>. Accessed August 6, 2013.

- Holloran, M.J. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. Ph.D. dissertation, University of Wyoming.
- Hoover, R.L., and D. Wills. 1984. *Managing Forested Lands for Wildlife*. Denver: Colorado Division of Wildlife.
- Husband, M.B. 1984. Colorado Plateau Country Historic Context. Office of Archaeology and Historic Preservation, Denver.
- Inman, R.M., M.L. Pakila, K.H. Inman, B. Aber, R. Spence, and D. McCauley. 2009. *Greater Yellowstone Wolverine Program, Progress Report—December 2009*. Bozeman, Montana: Wildlife Conservation Society, North American Program.
- Intergovernmental Panel on Climate Change. 2007. Summary for Policy Makers. In *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom, and New York: Cambridge University Press. Available at: [http://www.ipcc.ch/publications\\_and\\_data/ar4/wg1/en/contents.html](http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html). Accessed August 6, 2013.
- International Union for Conservation of Nature. 1994. Guidelines for Protected Area Management Categories. Gland and Cambridge: International Union for Conservation of Nature.
- Johnson, A. 2008. HD Mountains mule deer monitoring project annual report, 2007-2008 data. Unpublished report. Ignacio, Colorado: Southern Ute Indian Tribe.
- Johnson Matthey. 2009. Gas Engine Emissions Control. Available at: <http://www.jmcatalysts.com/>. Accessed August 19, 2013.
- Kaufmann, M.R., C.M. Regan, and P.M. Brown. 2000. Heterogeneity in ponderosa pine/Douglas-fir forests: Age and size structure in unlogged and logged landscapes of central Colorado. *Canadian Journal of Forest Research* 30.
- Keith, J.O. 1965. The Abert squirrel and its dependence on ponderosa pine. *Ecology* 46:150–163.
- Keith, J.O. 2003. *Abert's Squirrel (Sciurus aberti): A Technical Conservation Assessment*. USDA Forest Service, Rocky Mountain Region. Available at: <http://www.fs.fed.us/r2/projects/scp/assessments/abertsquirrel.pdf>. Accessed August 6, 2013.
- Kinder Morgan. 2005. Personal communication between Robert Garrigues, BLM Geologist and Bob Clayton, Kinder Morgan Company, 2005.
- Kingery, H.E. (ed.). 1998. *Colorado Breeding Bird Atlas*. Denver: Colorado Bird Atlas Partnership and Colorado Division of Wildlife.
- Kirschbaum, M.A., and L.R.H. Biewick, 2009, "A Summary of the Coal Deposits in the Colorado Plateau: Arizona, Colorado, New Mexico, and Utah," Chapter B in *Geological Assessment of Coal in the Colorado Plateau: Arizona, Colorado, New Mexico, and Utah*, Kirschbaum et al. (editors), Professional Paper 1625-B, U.S. Geological Survey.
- Knight, D.H. 1994. Dynamics of subalpine forests. In *Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment*, edited by G.D. Hayward and J.

- Verner, pp. 128–138. General Technical Report RM-253. Fort Collins, Colorado: U.S. Forest Service.
- Kulakowski, D., T.T. Veblen, and S. Drinkwater. 2004. The persistence of quaking aspen (*Populus tremuloides*) in the Grand Mesa area, Colorado. *Ecological Applications* 14(5):1603–1614.
- La Plata County. 2008. *Baseline Greenhouse Gas Emission Profile and Forecast*. Available at: <http://www.co.laplata.co.us/sites/default/files/documents/457/baselinegreenhousegasemissionprofileandforecast.pdf>. Accessed August 6, 2013.
- LANDFIRE 2810640. LANDFIRE Biophysical Setting Model 2810640.
- LANDFIRE 2811250. LANDFIRE Biophysical Setting Model 2811250.
- LANDFIRE 2811350. LANDFIRE Biophysical Setting Model 2811350. Inter-Mountain Basins Semi-Desert Grassland.
- LANDFIRE 2811460. LANDFIRE Biophysical Setting Model 2811460. Southern Rocky Mountain Montane-Subalpine Grassland.
- LANDFIRE 2811530. LANDFIRE Biophysical Setting Model 2811530. Inter-Mountain Basins Greasewood Flat.
- Landres, P.B., P. Morgan, and F.J. Swanson. 1999. Overview of the natural variability concepts in managing ecological systems. *Ecological Applications* 9:1179–1188.
- Larison, J.R., G.E. Likens, J.W. Fitzpatrick, and J.G. Crock. 2000. Cadmium toxicity among wildlife in the Colorado Rocky Mountains. *Nature* 406:181–183.
- Leschak, P., September 10, 2010. Personal communication, BLM, Tres Rios Field Office, Durango, Colorado.
- Lipe, W.D., M.D. Varien, and R.H. Wilshusen. 1999. *Colorado Prehistory: A Context for the Southern Colorado River Basin*. Prehistory of Colorado: A Publication Series. Denver: Colorado Council of Professional Archaeologists.
- Lloyd Levy Consulting. 2008. Economic Driver Study for Archuleta, Dolores, La Plata and Montezuma Counties, Colorado. On file with Lloyd Level Consulting, LLC.
- . 2010. Economic Driver Study for Archuleta, Dolores, La Plata and Montezuma Counties, Colorado. On file with Lloyd Level Consulting, LLC.
- Lyon, L.J. 1983. Road density models describing habitat effectiveness for elk. *Journal of Forestry* 81.9:592–613.
- Lyon, L.J., J.K. Brown, M.H. Huff, and J.K. Smith. 2000. In Chapter 1, Introduction. *Wildland Fire in Ecosystems: Effects of Fire on Fauna*, edited by J.K. Smith. Pages 1-8. USFS General Technical Report RMRS-GTR-42. Volume 1. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Lyon, L.J., and A.G. Christensen. 2002. Elk and land management. In *North American Elk: Ecology and Management*, edited by D.E. Towell and J.W. Thomas, pp. 557–582. Washington, D.C.: Smithsonian Institution Press.

- MacDonald, L.H., and J.D. Stednick. 2003. *Forests and Water: A State-of-the-art Review for Colorado*. Fort Collins, Colorado: Colorado Water Resources Research Institute, Colorado State University.
- McGarigal, K., and W. Romme. 2005. *Historic Range of Variability in Landscape Structure and Wildlife Habitat*. Durango, Colorado: U.S. Department of Agriculture, Forest Service, San Juan National Forest.
- McGarigal, K., W.H. Romme, M. Crist, and E. Roworth. 2001. Cumulative effects of roads and logging on landscape structure in the San Juan Mountains, Colorado, USA. *Landscape Ecology* 16:321–349.
- McKelvey, K.S., J. Claar, G.W. McDaniel, and G. Hanvey. 1999. National lynx detection protocol. Missoula, Montana: U.S. Forest Service, Rocky Mountain Research Station.
- MacMillan, V., J. Samulski, K. Simon, S. Keene, and K. Smyth. 2007. *Mud Springs Travel Management Cultural Resources Inventory Project, Montezuma County, Colorado (SJ07038)*. On file, San Juan Public Lands Center, Durango, Colorado.
- Marcus, M.D., M.K. Young, L.E. Noel, and B.A. Mullan. 1990. *Salmonid Habitat Relationships in the Western United States: A Review and Indexed Bibliography*. USFS General Technical Report RM-188. Washington, D.C.: U.S. Department of Agriculture, Forest Service.
- Martin, K.D., T.J. Schommer, and V.L. Coggins. 1996. Literature review regarding the compatibility between bighorns and domestic sheep. *Northern Wild Sheep and Goat Council Proceedings* 10:72–77.
- Meehan, W.R. (ed.) 1991. *Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats*. Special Publication 19. Bethesda, Maryland: American Fisheries Society.
- Meehan, W.R., F.J. Swanson, and J.R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. In *Proceedings. Symposium on the Importance, Preservation, and Management of the Riparian Habitat*, July 9, 1977. Tucson, Arizona.
- Megahan, W., and W. Kidd. 1972. Effects of logging and logging roads on erosion and sediment deposition from steep terrain. *Journal of Forestry* 70(3):136–141.
- IMPLAN Group, Inc. 2011. Report generated through IMPLAN software. Reports available through IMPLAN Group, LLC. Available at: [http://implan.com/V4/index.php?option=com\\_content&view=frontpage&Itemid=70](http://implan.com/V4/index.php?option=com_content&view=frontpage&Itemid=70). Accessed August 7, 2013.
- Miller, J.R., L.A. Joyce, R.L. Knight, and R.M. King. 1996. Forest roads and landscape structure in the Southern Rocky Mountains. *Landscape Ecology* 11(2):115–127.
- Moir, W.H., B. Geils, M.A. Benoit, and D. Scurlock. 1997. Ecology of Southwestern ponderosa pine forests. In *Songbird Ecology in Southwestern Ponderosa Pine Forests: A Literature Review*, edited by W.M. Block and D.M. Finch. USFS General Technical Report RM-GTR-92. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

- Montgomery, R.A., G.J. Roloff, and J.J. Millspaugh. 2012. Variation in elk response to roads by season, sex, and road type. *Journal of Wildlife Management* 77:313–325.
- Monz, C.A., D.N. Cole, Y. Leung, and J.L. Marion. 2009. Sustaining visitor use in protected areas: Future opportunities in recreation ecology research based on the USA experience. *Environmental Management*. DOI 10.1007/s00267-009-9406-5.
- Morgan, T., and C. Keegan. 2011. Wood products processing, unpublished data. Missoula, Montana: Bureau of Business and Economic Research, University of Montana.
- Mule Deer Working Group. 2003. *Mule Deer: Changing Landscapes, Changing Perspectives*. Cheyenne, Wyoming: Western Association of Fish and Wildlife Agencies, Mule Deer Working Group.
- Musselman, R., and W. Slauson. 2004. Water chemistry of high elevation Colorado wilderness lakes. *Biogeochemistry* 71:387–414.
- Mutel, C.F., and J.C. Emerick. 1984. *From Grassland to Glacier: The Natural History of Colorado*. Boulder, Colorado: Johnson Books.
- National Agriculture Statistics Service. 2010. Colorado Agricultural Statistics 2010. Available at: [http://www.nass.usda.gov/Statistics\\_by\\_State/Colorado/Publications/Annual\\_Statistical\\_Bulletin/bulletin2010.pdf](http://www.nass.usda.gov/Statistics_by_State/Colorado/Publications/Annual_Statistical_Bulletin/bulletin2010.pdf). Accessed August 6, 2013.
- National Atmospheric Deposition Program. 2011. *National Atmospheric Deposition Program 2010 Annual Summary*. Data Report 2011-01. Urbana-Champaign, Illinois: Illinois State Water Survey, University of Illinois.
- National Interagency Fire Center. 2012. *Interagency Standards for Fire and Fire Aviation Operations* (Redbook). Boise, Idaho: National Interagency Fire Center. Available at: [http://www.nifc.gov/policies/pol\\_ref\\_redbook\\_2012.html](http://www.nifc.gov/policies/pol_ref_redbook_2012.html). Accessed August 6, 2013.
- National Park Service (NPS). 2010. National Park Service consultation letter to the San Juan National Forest for Air Quality Technical Support Document, San Juan Supplemental Environmental Impact Statement, May 17, 2010.
- National Wild and Scenic Rivers System. 2013. Informational website. Available at: <http://www.rivers.gov/rivers/>. Accessed August 6, 2013.
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Arlington, Virginia. Available at: <http://www.natureserve.org/explorer>. Accessed August 6, 2013.
- Nelson-Moore, J. L., Collins, D. B. and Hornbaker, A. L., 1978, Radioactive mineral occurrences of Colorado and bibliography: Colorado Geological Survey Bulletin 40, 1061 p.
- New Mexico Department of Workforce Solutions. 2012. Economic Research and Analysis Bureau. Available at: <http://www.dws.state.nm.us/LMI>. Accessed August 7, 2013.
- New Mexico Environment Department. 2009. *Air Quality Modeling Study for the Four Corners Region*. Available at: <http://www.nmenv.state.nm.us/aqb/4C/Documents/FinalRepRev20090806.pdf>. Accessed August 6, 2013.

- Nickens, P.R. n.d. [1990s]. *The Destruction of Archaeological Sites and Data*. Available at: <http://stage.historicpreservation.gov/%7Bdyn.file%7D/9ff7b47227884757aed4d43896ab86d0/Nickens-%20book%20excerpt%20on%20Risk%20to%20Archeological%20Sites.pdf>. Accessed August 6, 2013.
- Norwest Corporation. 2009. *Northern San Juan Basin Groundwater Modeling Project—Final Report*. Sponsored by BP American Production Company, Chevron U.S.A. Inc., Conoco Phillips Company, Southern Ute Indian Tribe, and XTO Energy Inc. Denver: Norwest Corporation.
- Noss, R.F., and L.D. Harris. 1989. Habitat connectivity and the conservation of biological diversity: Florida as a case history. In *Proceedings of the 1989 Society of American Foresters*. Spokane, Washington.
- Nydick, K., J. Crawford, M. Bidwell, C. Livensperger, I. Rangwala, and K. Cozzetto. 2012. *Climate Change Assessment for the San Juan Mountain Regions, Southwestern Colorado, USA: A Review of Scientific Research*. Mountain Studies Institute Report 2010-04. Silverton, Colorado: Mountain Studies Institute.
- Oliver, A., M. Kram, P. Lyons, S. Neid, R. Rondeau, T. Schulz, C. Pague, and K. Sochi. 2008. *San Juan Forest Biodiversity Monitoring Framework Project*. Prepared by The Nature Conservancy of Colorado.
- O'Rourke, P.M. 1980. *Frontier in Transition*. Number 10, Chapter IX. Denver: Bureau of Land Management, Colorado State Office.
- Orr, H.K. 1975. Recovery from soil compaction on Bluegrass Range in the Black Hills. *Transactions of the ASAE*:1076–1081.
- Parks, C.G., E.L. Bull, and T.R. Torgersen. 1997. Field guide for the identification of snags and logs in the interior Columbia River Basin. General Technical Report PNW-GTR-390. Portland, Oregon: U.S. Department of Agriculture, Forest Service.
- Patton, D.R. 1975. Abert squirrel cover requirements in southwestern ponderosa pine. Research Paper RM-145. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.
- Payne, N.F., and F. Copes (eds.) 1988. *Wildlife and Fisheries Improvement Handbook*. Wildlife and Fisheries Administrative Report (unnumbered). Washington, D.C.: U.S. Department of Agriculture, Forest Service, Wildlife and Fisheries.
- Pearson, M., D. Foreman, B. Miller, J. Smith, T. Hogan, and M. Soule. 2003. Section 9: A conservation vision for the Southern Rockies. In *Southern Rockies Wildlands Vision: A Science-Based Approach to Re-wilding the Southern Rockies*, edited by M. DeMarco, Golden, Colorado: Colorado Mountain Club Press.
- Peck, S. 1998. *Planning for Biodiversity, Issues and Examples*. Washington D.C.: Island Press.
- Pickering, C.P., W. Hill, D. Newsome, and Y. Leung. 2010. Comparing hiking, mountain biking and horse riding impacts on vegetation and soils in Australia and the United States of America. *Journal of Environmental Management* 91(3):551–562.

- Pitblado, B.L. 1993. Paleoin Indian Occupation of Southwest Colorado. M.A. thesis, University of Arizona, Tucson.
- Powers, R.F., D.H. Alban, R.E. Miller, A.E. Tiarks, C.G. Wells, P.E. Avers, R.G. Cline, R.O. Fitzgerald, and N.S. Loftus. 1990. Sustaining site productivity in North American forests: Problems and prospects. In *Sustained Productivity of Forest Soils, Proceedings of the 7th North American Forest Soils Conference*, edited by S.A. Gessel, D.S. Lacate, G.F. Weetman, and R.F. Powers, pp. 49–79. Vancouver, British Columbia, July 1988. Vancouver: University of British Columbia.
- Preston, C.R., and H.E. Kingery. 1998. The Colorado environment. Pages 21-32 in *Colorado Breeding Bird Atlas*, edited by H.E. Kingery, pp. 21–32. Denver: Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Colorado Wildlife Heritage Foundation.
- Prichard, D. 1998. *A User Guide to Assessing Proper Functioning Condition and Supporting Science for Lotic Areas*. BLM Technical Reference 1737-15. Washington, D.C.
- Priesler, H., A. Ager, and M. Wisdom. 2006. Statistical methods for analyzing responses of wildlife to human disturbance. *Journal of Applied Ecology* 43:164–172.
- Pritchett, W.L., and R.F. Fisher. 1987. *Properties and Management of Forest Soils*. 2nd ed. New York: John Wiley.
- Red Willow Production Company. 2010. Emission Reductions via Low Bleed Pneumatics at Separator Units. Available at: [http://www.mountainstudies.org/sites/default/files/pdf/research/AirQualityForum/AQForum2010/Folk\\_dump\\_controllers\\_presentation\\_for\\_airtoxics\\_forum.pdf](http://www.mountainstudies.org/sites/default/files/pdf/research/AirQualityForum/AQForum2010/Folk_dump_controllers_presentation_for_airtoxics_forum.pdf). Accessed August 19, 2013
- Redders, J.S. 2012. Vegetation of the San Juan Public Lands. Working White Paper, 8/15/01, updated 12/7/2012.
- Reed, A.D. 1988. Ute Cultural Chronology. In *Archaeology of the Eastern Ute: A Symposium*, edited by P.R. Nickens, pp. 232. Occasional Papers No. 1. Colorado Council of Professional Archaeologists, Denver.
- Reed, A.D., and M.D. Metcalf. 1999. *Colorado Prehistory: A Context for the Northern Colorado River Basin*. Colorado Council of Professional Archaeologists, Denver.
- Reed, R.A., J. Johnson-Barnard, and W.L. Baker. 1996. Fragmentation of a forested Rocky Mountain landscape, 1950–1993. *Biological Conservation* 75:267–277.
- Region 9 Economic Development District of Southwest Colorado Inc. 2006. The Social and Economic Effects of Second Homes In Southwest Colorado Phase 2 – Homeowners Survey, draft July 10, 2006. Prepared by Donna K. Graves, Information Services, Durango, Colorado.
- Reid, L., and T. Dunne. 1984. Sediment production from forest road surfaces. *Water Resources Research* 20(1):61–78.
- Reynolds, R.T., M. Graham, H. Rieser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwin, R. Smith, and E.L. Fisher. 1992. *Management Recommendations for the Northern Goshawk in the Southwestern United States*. General Technical Report RM-217. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service.

- Robinson, S.K. 1992a. The breeding season: Introduction. In *Ecology and Conservation of Neotropical Migrant Landbirds*, edited by J.M. Hagan and D.W. Johnston, pp. 405–407. Washington, D.C.: Smithsonian Institution Press.
- . 1992b. Population dynamics of breeding neotropical migrants in a fragmented Illinois landscape. In *Ecology and Conservation of Neotropical Migrant Landbirds*, edited by J.M. Hagan and D.W. Johnston, pp. 408–418. Washington, D.C.: Smithsonian Institution Press.
- Robson, S.G. and E.R. Banta. 1995. *Ground Water Atlas of the United States, Arizona, Colorado, New Mexico, Utah*. USGS. Available at: [http://pubs.usgs.gov/ha/ha730/ch\\_c/index.html](http://pubs.usgs.gov/ha/ha730/ch_c/index.html). Access August 6, 2013.
- Rocky Mountain Region. 2010. *Field Guide to Diseases and Insects of the Rocky Mountain Region*. General Technical Report RMRS-GTR-241. U.S. Department of Agriculture, Forest Service, Rocky Mountain Region.
- Rocky Mountain Region. 2012. *The 2012 Aerial Detection Survey Summary for the Rocky Mountain Region (R2) of the US Forest Service* [updated 12/20/2012]. Lakewood, Colorado: U.S. Department of Agriculture, Forest Service.
- Romin, L.A., and J.A. Muck. 2002. *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances*. Salt Lake City, Utah: U.S. Fish and Wildlife Service, Utah Field Office.
- Romme, W.H., M.L. Floyd, and D. Hanna. 2009. *Historical Range of Variability and Current Landscape Condition Analysis: South Central Highlands Section, Southwestern Colorado & Northwestern New Mexico*. Fort Collins, Colorado: Colorado Forest Restoration Institute.
- Romme, W.H., L. Floyd-Hanna, D. Hanna, and E. Bartlett. 2001. Aspen's ecological role in the West. In *Sustaining Aspen in Western Landscapes: Symposium Proceedings*, compiled by W.D. Shepperd, D. Binkley, D.L. Bartos, T.J. Stohlgren, and L.G. Eskew, pp. 243–259. Grand Junction, Colorado, June 13–15, 2000. Proceedings RMRS-P-18. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Romme, W.H., L. Floyd-Hanna, J.P. Lindsey, D. Hanna, and J.S. Redders. 1997. *Composition, Structure, and Disturbance Regime of an Old-Growth Spruce-Fir Forest in the San Juan Mountains, SW CO, USA*. Durango, Colorado.
- Rood, S.B., and J.M. Mahony 1990. Collapse of riparian poplar forests downstream from dams in western prairies: Probable causes and prospects for mitigation. *Environmental Management* 14(4):451–464.
- Rosenberg, D.K., B.R. Noon, and E.C. Meslow. 1997. Biological corridors: form, function, and efficiency. *BioScience* 47(10):677–687.
- Rosenfield, R.N., J. Bielefeldt, J.L. Affeldt, and D.J. Beckmann. 1996. Urban nesting biology of Cooper's hawks in Wisconsin. In *Raptors in Human Landscapes, Adaptations to Built and Cultivated Environments*, edited by D. Bird, D. Varland, and J. Negro, pp. 41–44. New York: Academic Press.

- Rosenfield, R.N., J.W. Grier, and R.W. Fyfe. 2007. Reducing management and research disturbance. In *Raptor Research and Management Techniques*, edited by D.M. Bird and K.L. Bildstein, pp. 351–364. Blaine, Washington: Hancock House Publishers.
- Rowland, M.M., M.J. Wisdom, B.K. Johnson, and J.G. Kie. 2000. Elk distribution and modeling in relation to roads. *Journal of Wildlife Management* 64:672–684.
- 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 *The Starkey Project: A Synthesis of Long-term Studies of Elk and Mule Deer*, edited by M.J. Wisdom, pp. 42–52. 2004 Transactions of the North American Wildlife and Natural Resources Conference. Lawrence, Kansas: Alliance Communications Group.
- Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000 [rev. 2006]. *Canada Lynx Conservation Assessment and Strategy*. Forest Service Publication R1-00-53. Missoula, Montana: U.S. Department of Agriculture Forest Service, U.S. Fish and Wildlife Service, U.S. Department of the Interior Bureau of Land Management, and U.S. Department of the Interior National Park Service.
- Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, G.M. Koehler, C.J. Krebs, K.S. McKelvey, and J.R. Squires. 2000. *Ecology and Conservation of Lynx in the United States*. Boulder, Colorado: University Press of Colorado.
- Rural Planning Institute. 2004. *San Juan Interviews*. Available at: <http://ocs.fortlewis.edu/forestPlan/reports/SanJuanInterviews.PDF>. Accessed August 6, 2013.
- Ryan, K.C., and A.T. Jones (eds.). 2003. *Wildland Fire in Ecosystems: Effects of Fire on Cultural Resources and Archaeology*. General Technical Report RMRS-GTR-42- volume 3. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- S.S. Papadopoulos and Associates Inc. 2006. In conjunction with Colorado Geological Survey. *Coalbed Methane Stream Depletion Assessment Study – Northern San Juan Basin, Colorado*. Sponsored by State of Colorado.
- Saab, V.A., H.D.W. Powell, N.B. Kotliar, and K.R. Newlon. 2005. Variation in fire regimes of the Rocky Mountains: Implications for avian communities and fire management. In *Fire and Avian Ecology in North America*, edited by V.A. Saab and H.D.W. Powell, pp. 76–96. Studies in Avian Biology No. 30.
- Sage-grouse National Technical Team. 2011. *A Report on National Greater Sage-Grouse Conservation Measures*. December 21.
- Sando, R.W. 1978. Natural fire regimes and fire management: Foundations for direction. *Western Wildlands* 4(4):34–44.
- San Juan Citizens Alliance. 2005. *A Citizen's Wilderness Proposal*. On file at the Dolores Public Lands Office, Dolores, Colorado.
- 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* 73:1052–1061.

- Schmid, J.M., and S.A. Mata. 1996. *Natural Variability of Specific Forest Insect Populations and their Associated Effects in Colorado*. General Technical Report RM-GTR-275. Washington, D.C.: U.S. Department of Agriculture, Forest Service.
- Schuler, J., and R. Briggs. 2000. Assessing application and effectiveness of forestry best management practices in New York. *Northern Journal of Applied Forestry* 17(4):125–134.
- Schultz, C. 2001. Characteristics of trees used by cavity-nesting birds in western Colorado. Unpublished report on file, Columbine Ranger District Office, Bayfield, Colorado.
- Schultz, T.T. 1991. Nongame wildlife communities in grazed and ungrazed montane riparian sites. *Great Basin Naturalist* 51:286–292.
- Scott, P.K., 2003, Paradox Basin, Colorado, Maps, Cross Sections, and Database for Oil, Gas, and CO2 Fields: Colorado Geological Survey Resource Series 43.
- Sedgwick, J.A. 2001. Geographic variation in the song of willow flycatchers: Differentiation between *Empidonax traillii adastus* and *E.t. extimus*. *Auk* 118:366–379.
- Seyedbagheri, K.A. 1996. Idaho forestry best management practices: Compilation of research on their effectiveness. General Technical Report INT-339. Ogden, Utah: U.S. Department of Agriculture, Forest Service.
- Seymore, R.S., and M.L.J. Hunter. 1999. Maintaining Biodiversity in Forested Ecosystems: Part 1 - Principles of Ecological Forestry, pp. 22–61. Cambridge: Cambridge University Press.
- Sheley R.L., and J.K. Petroff (eds.). 1999. *Biology and Management of Noxious Rangeland Weeds*. Oregon University Press.
- Sibold, J.S., T.T. Veblen, and M.E. Gonzalez. 2006. *Spatial and Temporal Variation in Historic Fire Regimes in Subalpine Forests across the Colorado Front Range in Rocky Mountain National Park, CO, USA*. Denver, Colorado.
- Simon, W., B. Horn, and D. Wegner. 2000. Appendix 6A. *Fisheries Report, Current and Historical Review of Animas Watershed Fisheries*. Prepared for Animas River Stakeholders Group. In: *Use Attainability Analysis for the Animas River Watershed*. 2001. Durango, Colorado: U.S. Department of the Interior, Bureau of Reclamation.
- Smith, D.G. 1988. Ferruginous hawk. In *Handbook of North American Birds*, edited by R.S. Palmer, pp. 135–151. New Haven, Connecticut: Yale University Press.
- Smith, J.P., S.J. Slater, and M.C. Neal. 2010. An assessment of the effects of oil and gas field activities on nesting raptors in the Rawlins, Wyoming, and Price, Utah field offices of the Bureau of Land Management. BLM Technical Note 433. Prepared for the Bureau of Land Management. Salt Lake City: HawkWatch International, Inc.
- Sogge, M.K., S.J. Sferra, and E.H. Paxton. 2008. Tamarix as habitat for birds: Implications for riparian restoration in the Southwestern United States. *Restoration Ecology* 16:146–154.
- Solar Energy Development Programmatic Environmental Impact Statement (PEIS) Information Center. 2013. Online center for public information and involvement in the Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States (Solar PEIS). Available at: <http://solareis.anl.gov/index.cfm>. Accessed August 6, 2013.

- Southern Rockies Ecosystem Project. 2006. *Linkage Assessment Methodology, Linking Colorado's Landscapes Phase II Report*. Denver: Southern Rockies Ecosystem Project.
- Spangler, J.D. 2006. *Site Condition and Vandalism Assessment of Archaeological Sites, Lower and Middle Arch Canyon, San Juan County, Utah*. Ogden, Utah: Colorado Plateau Archaeological Alliance.
- Sperling's Best Places. 2012. Compare cost of living. Available at: <http://www.bestplaces.net/>. Accessed August 6, 2013.
- State of Colorado. State Noxious Weed List (8 CCR 1203-10): Available at: [http://www.colorado.gov/cs/Satellite?c=Document\\_C&childpagename=ag\\_Main%2FDocument\\_C%2FCBONAddLinkView&cid=1251627113847&pagename=CBONWrapper](http://www.colorado.gov/cs/Satellite?c=Document_C&childpagename=ag_Main%2FDocument_C%2FCBONAddLinkView&cid=1251627113847&pagename=CBONWrapper). Accessed August 6, 2013.
- State of Colorado. 2008. *Colorado Statewide Comprehensive Outdoor Recreation Plan*. Available at: <http://www.parks.state.co.us/Trails/LWCF/SCORPplan/Pages/2008SCORP.aspx>. Accessed August 6, 2013.
- State of Colorado, Bureau of Land Management, and Colorado State Historic Preservation Officer. 1998. State Protocol Agreement between the Colorado State Director of the BLM and the Colorado State Historic Preservation Officer regarding the manner in which BLM will meet its responsibilities under the National Historic Preservation Act and the National Programmatic Agreement among BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers.
- Sullins, M., and E. Garner. (n.d. [2007]). Cost of living index for Colorado Counties, 2007. Colorado State University Extension.
- Swetnam, T.W. 1990. *Fire History and Climate in the Southwestern United States*. General Technical Report RM-191. Rocky Mountain Forest and Range Experiment Station.
- Swetnam, T.W., and C.H. Baisan. 1996. Historic fire regime patterns in the southwestern United States since AD 1700. In *Fire Effects in Southwestern Forests: Proceedings of the Second La Mesa Fire Symposium, March 29-31, 1994*, edited by C.D. Allen, pp. 11–32. General Technical Report RM-GTR-286. Fort Collins, Colorado: U.S. Department of Agriculture, Rocky Mountain Forest and Range Experiment Station.
- Swetnam, T.W., and J.L. Betancourt. 1990. Fire-southern oscillation relations in the Southwestern United States. *Science* 249:1017–1021.
- Swift, L.W., Jr. 1984. Gravel and grass surfacing reduces soil loss from mountain roads. *Forest Science*. 30(3): 657-670. Thrash, G., and J. Powers. 2007. Oil and gas well drilling costs. Report on file at San Juan Public Lands Center, Durango, Colorado.
- Tinker, D.B., C.A.C. Resor, G.P. Beauvais, K.F. Kipfmüller, C.I. Fernandes, and W.L. Baker. 1998. Watershed analysis of forest fragmentation by clearcuts and roads in a Wyoming forest. *Landscape Ecology* 13:149–165.
- Topper, R., K.L. Spray, W.H. Bellis, J.L. Hamilton, and P.E. Barkmann. 2003. *Ground Water Atlas of Colorado*. Denver: Colorado Geological Survey.

- Touchan, R., C.D. Allen, and T.W. Swetnam. 1996. Fire history in ponderosa pine and mixed conifer forests of the Jemez Mountains, northern New Mexico. In *Fire Effects on Southwestern Forests: Proceedings of the 2nd La Mesa Fire Symposium, March 29-31, 1994*, pp.11–32. General Technical Report RM-GTR-286. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.
- Touchan, R.C., T.W. Swetnam, and H.D. Grissino-Mayer. 1993. Effects of livestock grazing on pre-settlement fire regimes in New Mexico. In *Proceedings of the Symposium on Fire in Wilderness and Park Management: Past Lessons and Future Opportunities, Missoula, MT, March 30–April 1, 1993*.
- 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.
- Turner, M.G. 2010. Disturbance and landscape dynamics in a changing world. *Ecology* 91(10):2833–2849.
- U.S. Census Bureau. 2000. Census 2000 Summary File 1, Matrices PCT12 and P13.
- . 2002a. Web site created January 25, 2002, U.S. Census Bureau, Systems Support Division. <http://www.census.gov/main/www/cen2000.html>
- . 2002b. Historical census statistics on population totals by race, 1790 to 1990, and by Hispanic origin, 1970 to 1990. Population Division Working Paper No. 56. Available at: <http://www.census.gov/population/www/documentation/twps0056/twps0056.html>. Accessed July 13, 2012.
- . 2010a. State & County Quick Facts: La Plata County. Available at: <http://quickfacts.census.gov/qfd/states/08/08067.html>. Accessed July 13, 2012.
- . 2010b. 2010 Census Summary File 1, Table P1, P29, P36, and P42.
- . 2010c. 2010 Census, DP-1, Profile of general population and housing characteristics: 2010, 2010 demographic profile data.
- . 2010d. 2006–2010 American Community Survey, S0701, Geographic Mobility by Selected Characteristics in the United States, 2006-2010 American Community Survey 5-Year Estimates.
- . 2010e. 2006-2010 American Community Survey, S1701, Poverty Status in the Past 12 Months, 2006-2010 American Community Survey 5-Year Estimates.
- . 2011. Longitudinal Employer-Household Dynamics (LED) – OnTheMap. Available at: <http://lehdmap3.did.census.gov/themap3/>. Accessed May 10, 2012.
- U.S. Department of Agriculture and U.S. Department of the Interior (USDA and USDI). 1995. *Federal Wildland Fire Management Policy*. December 12, 1995, updated 2001.
- . 2001. National Fire Plan. A report to the President in response to the wildfires of 2000. Washington, D.C: U.S. Department of Agriculture and U.S. Department of the Interior.

- . 2008. *Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide*. Washington, D.C. Available at: <http://www.nwccg.gov/pms/RxFire/rxfireguide.pdf>. Accessed August 6, 2013.
- . 2009. *Guidance for Implementation of Federal Wildland Fire Management Policy*. Washington, D.C. Available at: [http://www.nifc.gov/policies/policies\\_documents/GIFWFMP.pdf](http://www.nifc.gov/policies/policies_documents/GIFWFMP.pdf). Accessed August 6, 2013.
- U.S. Department of Agriculture (USDA) Forest Service (USFS). 1980. An approach to water resources evaluation of non-point silvicultural sources (a procedural handbook). U.S. Environ. Prot. Agency, Environ. Res. Laboratory, Athens, GA. EPA-600/8-80-012. 861 p.
- . 1983. *San Juan National Forest Land and Resource Management Plan*. as amended. Durango, Colorado: U.S. Department of Agriculture, Forest Service.
- . 1996. Management and Control of Noxious Plants on the San Juan/Rio Grande National Forests, Decision Notice and FONSI 1996
- U.S. Forest Service. 1998a. The San Juan-Rio Grande National Forests Wilderness Management Direction. Amendment to San Juan and Rio Grande National Forest Land Management Plans.
- . 2000. *Screening Methodology for Calculating ANC Change to High Elevation Lakes*. USDA Forest Service, Rocky Mountain Region.
- . 2004a. *American Marten Species Assessment for the San Juan National Forest*. San Juan National Forest, Durango, Colorado.
- . 2004b. *American Elk Species Assessment for the San Juan National Forest*. San Juan National Forest, Durango, Colorado.
- . 2004c. *Hairy Woodpecker Species Assessment for the San Juan National Forest*. San Juan National Forest, Durango, Colorado.
- . 2004d. SJPL Fire Management Plan. On file at San Juan Public Lands Center, Durango, Colorado).
- . 2005. *Aquatic, Riparian, and Wetland Ecosystem Assessment, Anthropogenic Influences Transportation Module*. San Juan National Forest, Colorado.
- . 2006a. Forest Service Handbook 2509.25: Watershed Conservation Practices Handbook, Chapter 10, Management Measures and Design Criteria. Denver: U.S. Department of Agriculture. U.S. Forest Service. Rocky Mountain Region (Region 2).
- . 2006b. *San Juan National Forest Aquatic Ecosystem Assessment*. Durango: U.S. Forest Service, San Juan National Forest, Rocky Mountain Region.
- . USFS. 2006-2008. San Juan Habitat Assessments. Series of 26 Habitat Assessments. San Juan National Forest, Durango, CO.
- . 2007a. Final Decision for SJCBM Scenic Mitigations Conditions of Approval; Visual Resource Management for Fluid Minerals Best Management Practices; and Visual Resource Management BMP's for Fluid Minerals

- 
- . 2007b. The USFS Woody Biomass Utilization Desk Guide, National Technology and Development Program 2400—Forest Management, September 2007. Available at: [http://www.forestsandrangelands.gov/Woody\\_Biomass/documents/biomass\\_deskguide.pdf](http://www.forestsandrangelands.gov/Woody_Biomass/documents/biomass_deskguide.pdf). Accessed August 6, 2013.
- . 2007c. *Programmatic Agreement Between the U.S. Department of Agriculture, Forest Service, And the Advisory Council on Historic Preservation, Regarding Rangeland Management Activities on National Forest System Lands*. On file, San Juan Public Lands Center, Durango, Colorado.
- . 2007d. FSM 2323.2, Wilderness Management, Congressional Grazing Guidelines. W.O. Amendment 2300-90-2. National Headquarters, Washington, D.C. January 22, 2007.
- . 2008a. Memorandum of understanding between the USDA Forest Service and the U.S. Fish and Wildlife Service for the conservation of migratory birds. FS Agreement # 08-MU-1113-2400-264, signed 12/08/2008. Unpublished document. 13 pages.
- . 2008b. Supplemental Biological Assessment for the Southern Rockies Lynx Amendment. May 27, 2008. U.S. Forest Service, Region 2, Lakewood, Colorado. 132 pp.
- . 2008c. FSM 2360, Revised 2008: USFS Heritage Program Management
- . 2008d. *Standard Range Recission Strategy for Cultural Resources, San Juan National Forest*. On file, San Juan National Forest, Durango, Colorado.
- . 2010a. Inter-Agency Southern Rockies Lynx Project Decision Screens. Golden, Colorado: U.S. Forest Service, Rocky Mountain Region.
- . 2010b. All Services Receipts, Final Detail Report PNF (ASR 10-03) for San Juan National Forest, 2011 report. On file at San Juan Public Lands Center, Durango, Colorado.
- . 2011. San Juan National Forest National Visitor Use Monitoring. Available at San Juan Public Lands Center, Durango, Colorado.
- . 2012a. Weminuche Wilderness Air Quality – Resource Concern Thresholds. [http://www.fs.fed.us/air/technical/class\\_1/wilds.php?recordID=84](http://www.fs.fed.us/air/technical/class_1/wilds.php?recordID=84)
- . 2012b. Letter to U.S. Fish and Wildlife Service from the San Juan National Forest requesting concurrence on Southwestern willow flycatcher habitat management procedures. Unpublished document, San Juan National Forest, 15 Burnett Court, Durango, Colorado. 4 pages.
- . 2012c. Natural Resource Manager, Infrastructure Database, Engineering/Roads and Recreation/Trails modules.
- . 2013. Biological Assessment of the Land and Resource Management Plan for the San Juan National Forest 2013 LRMP Revision. Unpublished document, USDA Forest Service, San Juan National Forest, 15 Burnett Court, Durango, Colorado. 134 pages.
- . 2009–2011a. Timber Cut and Sold Report for San Juan National Forest. Washington, D.C. Available at: <http://www.fs.fed.us/forestmanagement/products/index.shtml>. Accessed February 16, 2012.
-

- . 2009–2011b. Periodic Timber Sale Accomplishment Report for San Juan National Forest. Washington, D.C. Available at: <http://www.fs.fed.us/forestmanagement/products/index.shtml>. Accessed February 17, 2012.
- U.S. Department of the Interior - National Park Service and State of Colorado Department of Natural Resources - Water Conservation Board. 1979. Colorado and Lower Dolores Rivers Wild and Scenic River Study and Final Environmental Impact Statement. Denver, Colorado.
- U.S. Department of Agriculture, Forest Service and Bureau of Land Management (USFS and BLM). 1982. USDA/USDI guidelines for eligibility, classification, and management of river areas. *Federal Register* 47(173), supplements the Wild and Scenic Rivers Act.
- . 2006. Environmental Impact Statement for the Northern San Juan Basin Coal Bed Methane Project in La Plata and Archuleta Counties (2006 FEIS 2007)
- . 2007. *Final Environmental Impact Statement for the Northern San Juan Basin Coal Bed Methane (NSJB-CBM) Project*. Final Environmental Impact Statement and Record of Decision.
- . 2012. Invasives Species Action for the San Juan National Forest, Tres Rios Field Office, and Canyons of the Ancients National Monument 2012.
- . Handbook 701, Landscape Aesthetics
- USDA Forest Service (USFS) and Colorado Department of Natural Resources. 2008. *Southern Rockies Lynx Amendment Record of Decision*. U.S. Department of Agriculture, Forest Service and Colorado Department of Natural Resources. Available at: [http://www.fs.fed.us/r2/projects/lynx/documents/record\\_of\\_decision.pdf](http://www.fs.fed.us/r2/projects/lynx/documents/record_of_decision.pdf).
- USDA Forest Service (USFS), National Park Service, and U.S. Fish and Wildlife Service (USFWS). 2010. Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase I Report – Revised (2010). Natural Resources Report NPS/NRPC/NRR – 2010/232. Denver: National Park Service.
- USDA Forest Service and U.S. Fish and Wildlife Service (USFS and USFWS). 2000. *Canada Lynx Conservation Agreement*. USFS Agreement #00-MU-11015600-013. Missoula, Montana.
- . 2006. Canada Lynx Conservation Agreement. USFS Agreement #00-MU-11015600-013. Missoula, MT. Unpublished. 13 pp.
- . 2009. *Implementation Guide to the Southern Rockies Lynx Amendment (SRLA)*. Available at: <http://www.fs.usda.gov/detail/r2/landmanagement/planning/?cid=stelprdb5356865>. Accessed August 6, 2013.
- U.S. Department of Commerce, Bureau of Economic Analysis. 2012. State and Local Area Personal Income and Employment Summary (CA04). Washington, D.C. Available at: <http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1&isuri=1&acrdn=5>. Accessed July 13, 2012.
- U.S. Department of Energy and Bureau of Land Management (DOE and BLM). 2008. *Final Programmatic Environmental Impact Statement (PEIS), Designation of Energy Corridors on*

- 
- Federal Land in the 11 Western States* (DOE/EIS-0386). Washington, D.C: U.S. Department of Energy and Bureau of Land Management.
- U.S. Department of the Interior. 2013. County Payment in Lieu of Taxes Database. Available at: <http://www.doi.gov/pilt/county-payments.cfm>. Access August 6, 2013.
- U.S. Department of Transportation, Federal Highway Administration. 2007. Colorado Forest Highway Route Descriptions, May 2007. Available at: <http://www.cflhd.gov/FHRoadInv/documents/cofh2008.pdf>. Accessed August 6, 2013.
- U.S. Energy Information Administration. 2011. Colorado wellhead prices 2010. Available at: [http://www.eia.gov/dnav/ng/hist/na1140\\_sco\\_3a.htm](http://www.eia.gov/dnav/ng/hist/na1140_sco_3a.htm). Accessed August 6, 2013.
- U.S. Environmental Protection Agency (EPA). 1995. AP 42, Compilation of Air Pollutant Emission Factors. Available at: <http://www.epa.gov/ttnchie1/ap42/>. Accessed July 30, 2013.
- U.S. Fish and Wildlife Service (USFWS). 1987. Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin.
- . 1990a. Bonytail Chub Recovery Plan. USDI Fish and Wildlife Service
- . 1990b. Humpback Chub Recovery Plan.
- . 1991. *Colorado Squawfish Recovery Plan*. Denver: U.S. Fish and Wildlife Service.
- . 1994a. *Uncompahgre Fritillary Butterfly Recovery Plan*. Denver: U.S. Department of the Interior.
- . 1994b. Endangered and threatened wildlife and plants: Determination of critical habitat for four Colorado River endangered fishes: Razorback sucker, Colorado squawfish, humpback chub, and bonytail chub. Final Rule. *Federal Register*. March 21, 1994.
- . 1995. *San Juan Basin Recovery Implementation Program*. Albuquerque: U.S. Fish and Wildlife Service, Region 2.
- . 1998. *Greenback Cutthroat Trout Recovery Plan*. Denver.
- . 2002a. *Southwestern Willow Flycatcher Recovery Plan*. i-ix + 210 pp., Appendices A-O. Albuquerque.
- . 2002b. *Razorback sucker (Xyrauchen texanus) Recovery Goals: Amendment and Supplement to the Razorback Sucker Recovery Plan*. Denver: U.S. Fish and Wildlife Service, Mountain-Prairie Region (6).
- . 2002c. Endangered and threatened wildlife and plants: Review of plant and animal taxa that are candidate proposed for listing as endangered or threatened. Annual notice of findings on recycled petitions. Annual description of progress on listing actions. *Federal Register* 67(114):40657–40679.
- . 2003a. *Birding in the United States: A Demographic and Economic Analysis*. Addendum to the 2001 National Survey of Fishing, Hunting and Wildlife Associated Recreation. Report 2001-1. Washington, D.C.: U.S. Fish and Wildlife Service.
-

- . 2003b. *San Juan River Basin Recovery Implementation Program*. Program Highlights 2002-2003 [Web Page]. Available at: <http://www.fws.gov/southwest/sjrip/pdf/20022003highlights.pdf>. Accessed July 3, 2003.
- . 2004. Proposed designation of critical habitat for the southwestern willow flycatcher (*Empidonax traillii extimus*): Proposed Rule. *Federal Register* 69(196):60706.
- . 2005. Final list of bird species to which the Migratory Bird Treaty Act does not apply. Notice of Availability. *Federal Register* 49:12710–12716.
- . 2008. *Birds of Conservation Concern 2008*. Arlington, Virginia: Division of Migratory Bird Management.
- . 2009. *Continental Divide National Scenic Trail Comprehensive Plan*. Washington, D.C.
- . 2010. *Knowlton's Cactus (Pediocactus knowltonii) 5-Year Review: Summary and Evaluation*. Albuquerque: U. S. Fish and Wildlife Service.
- . 2011a. *Mesa Verde Cactus (Sclerocactus mesae-verde) – 5-Year Review Summary and Evaluation*. Albuquerque: U.S. Fish and Wildlife Service, New Mexico Ecological Field Services Office.
- . 2011b. Endangered and threatened wildlife and plants; Determination of endangered status for *Ipomopsis polyantha* (Pagosa skyrocket) and threatened status for *Penstemon debilis* (Parachute beardtongue) and *Phacelia submutica* (DeBeque phacelia). *Federal Register* 76(144).
- . 2011c. Letter from Allan Pfister (Western Colorado Supervisor) to Dan Dallas (Rio Grande NF Forest Supervisor) regarding guidance on Section 7 consultation procedures for the southwestern willow flycatcher including survey needs and habitat definition for Southwestern Colorado including the San Juan National Forest. Unpublished document, ES/CO:FSRioGrandeNF/SL VPLC TAILS 65413-2011-TA-0078. Grand Junction, Colorado: U.S. Fish and Wildlife Service.
- . 2012a. Endangered and threatened wildlife and plants; Designation of critical habitat for *Ipomopsis polyantha* (Pagosa skyrocket), *Penstemon debilis* (Parachute beardtongue), and *Phacelia submutica* (DeBeque phacelia). *Federal Register* 77(156).
- . 2012b. Endangered and threatened wildlife and plants; 90-day finding on a petition to list the southern white-tailed ptarmigan and the Mt. Rainier white-tailed ptarmigan as threatened with critical habitat. Notice of 90-day petition finding and initiation of status review. *Federal Register* 77:33143–33155.
- . 2012c. *Mexican Spotted Owl Recovery Plan, First Revision*. Albuquerque, New Mexico: Southwest Region, U.S. Fish and Wildlife Service. Available at: [http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/MSO/2012MSO\\_Recovery\\_Plan\\_First\\_Revision\\_Final.pdf](http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/MSO/2012MSO_Recovery_Plan_First_Revision_Final.pdf). Accessed August 6, 2013.
- . 2012d. Concurrence letter in response to USFS request for concurrence regarding guidance on Section 7 consultation procedures for the southwestern willow flycatcher. Unpublished document, ES/CO:FSSJNF TAILS 06E24100-2013-TA-0028. Grand Junction, Colorado: U.S. Fish and Wildlife Service.

- 
- . 2013a. Species profile for Mesa Verde cactus. Available at: <http://ecos.fws.gov>. Accessed August 6, 2013.
- . 2013b. Endangered and threatened wildlife and plants; Threatened status for the distinct population segment of the North American wolverine occurring in the contiguous United States; Establishment of a nonessential experimental population of the North American wolverine in Colorado, Wyoming, and New Mexico; Proposed Rules. *Federal Register* 78:7864–7890.
- . 2013c. Endangered and threatened wildlife and plants; Endangered status for Gunnison sage-grouse. Proposed Rule. *Federal Register* 78:2486–2538.
- . 2013d. Endangered and threatened wildlife and plants; Designation of critical habitat for Gunnison sage-grouse. Proposed Rule. *Federal Register* 78:2540–2570.
- . 2013e. Service identifies important habitat recovery of southwestern willow flycatcher. News release: Phoenix: Arizona Ecological Services.
- . 2013f. Endangered and threatened wildlife and plants; Establishment of a nonessential experimental population of the North American wolverine in Colorado, Wyoming, and New Mexico; Proposed Rule. *Federal Register* 78:7890–7905.
- U.S. Geological Survey (USGS). 1983a. *Regional Hydrology of the Dolores River Basin, Eastern Paradox Basin, Colorado and Utah*. Water-Resources Investigations Report 83-4217. Lakewood, Colorado: U.S. Department of the Interior, U.S. Geological Survey.
- . 1983b. *Regional Hydrology of the Blanding-Durango Area, Southern Paradox Basin, Colorado and Utah*. Water-Resources Investigations Report 83-4218. Lakewood, Colorado: U.S. Department of the Interior, U.S. Geological Survey.
- . 1992. *Lithology of Evaporite Cycles and Cycle Boundaries in the Upper Part of the Paradox Formation of the Hermosa Group of Pennsylvanian Age in the Paradox Basin, Utah and Colorado*. Survey Bulletin 2000-B. Denver: U.S. Department of the Interior, U.S. Geological Survey.
- . 1996. *Hydrology, Chemical Quality, and Characterization of Salinity in the Navajo Aquifer in and Near the Greater Aneth Oil Field, San Juan County, Utah*. Water-Resources Investigations Report 96-4155. Lakewood, Colorado: U.S. Department of the Interior, U.S. Geological Survey.
- . 2006. Biological soil crusts. Available at: <http://www.soilcrust.org/>. Accessed August 6, 2013.
- . 2013. National Oil and Gas Assessment 2013 Updates (updated periodically). Available at: <http://energy.usgs.gov/OilGas/AssessmentsData/NationalOilGasAssessment/AssessmentUpdates.aspx>. Accessed August 6, 2013.
- Utah Department of Natural Resources. 2006. *Range-Wide Conservation Agreement and Strategy for Roundtail Chub (Gila robusta), Bluehead Sucker (Catostomus discobolus), and Flannelmouth Sucker (Catostomus latipinnis)*. Publication Number 06-18. Prepared for the Colorado River Fish and Wildlife Council.
-

- Van Loenen R.E. and A.B. Gibbons (eds.). 1997. Mineral Resource Potential and Geology of the San Juan National Forest, Colorado. U.S. Geological Survey Bulletin 2127, 140 pp., 4 plates. Washington, D.C.: U.S. Geological Survey.
- Veblen, T.T., K.S. Hadley, E.M. Nel, T. Kitzberger, M. Reid, and R. Villalba. 1994. Disturbance regime and disturbance interactions in a Rocky Mountain subalpine forest. *Journal of Ecology* 82:125–135.
- Veblen, T.T., K.S. Hadley, and M.S. Reid. 1991. Disturbance and stand development of a Colorado subalpine forest. *Journal of Biogeography* 18:707–716.
- Wan S., D. Hui, and Y. Luo. 2001. Fire effects on nitrogen pools and dynamics in terrestrial ecosystems: A meta-analysis. *Ecological Applications* 11(5):1349–1365.
- Weitzel, D.L. 2002. *Conservation and Status Assessments for the Bluehead Sucker (Catostomus discobolus), Flannelmouth Sucker (Catostomus latipinnis), Roundtail Chub (Gila robusta), and Leatherside Chub (Gila copei): Rare Fishes West of the Continental Divide, Wyoming*. Cheyenne, Wyoming: Wyoming Fish and Game Department.
- Westerling, A., H.G. Hidalgo, D.R. Cayan, and T.W. Swetnam. 2006. Warming and Earlier Spring Increase Western U.S. Wildfire Activity. In *Science*. 18 August 2006. Volume 313, pp 950-943.
- Western Water Assessment. 2007. Intermountain West Climate Summary, January 2007. Available at: [http://wwa.colorado.edu/climate/iwcs/archive/IWCS\\_2007\\_Jan.pdf](http://wwa.colorado.edu/climate/iwcs/archive/IWCS_2007_Jan.pdf) . Accessed August 7, 2013.
- . 2008. *Climate Change in Colorado. A Synthesis to Support Water Resources Management and Adaptation*. Prepared for Colorado Water Conservation Board. Boulder, Colorado: University of Colorado at Boulder.
- Wheeler, C.A. 1997. Current distributions and distributional changes of fish in Wyoming west of the Continental Divide. M.S. thesis, University of Wyoming, Laramie.
- White, C.M., and T.L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. *Condor* 87:14–22.
- White, C.M., N.J. Van Lanen, D.C. Pavlacky, Jr., J.A. Blakesley, R.A. Sparks, J.A. Fogg, M.F. McLaren, J.J. Birek, and D.J. Hanni. 2012. *Integrated Monitoring in Bird Conservation Regions (IMBCR): 2011 Annual Report*. Brighton, Colorado: Rocky Mountain Bird Observatory. Available at: [http://rmbo.org/v3/Portals/0/Documents/Science/Reports/2011\\_IMBCR\\_report.pdf](http://rmbo.org/v3/Portals/0/Documents/Science/Reports/2011_IMBCR_report.pdf). Accessed August 7, 2013.
- White, E.M., and D.J. Stynes. 2010. *Updated Spending Profiles for National Forest Recreation Visitors by Activity*. Washington, D.C.: U.S. Department of Agriculture, Forest Service and City: Oregon State University.
- Wildland Fire Leadership Council. 2011. Forests and Rangelands. National Cohesive Wildland Fire Management Strategy. Available at: <http://www.forestsandrangelands.gov/strategy/>.

- Winternitz, B.L. 1998. Hairy woodpecker. In *Colorado Breeding Bird Atlas*, edited by H.E. Kingery, pp. 262–263. Denver: Colorado Bird Atlas Partnership and Colorado Division of Wildlife.
- Winward, A.H. 2004. *Sagebrush of Colorado: Taxonomy, Distribution, Ecology, and Management*. Denver: Colorado Division of Wildlife.
- Wise, A. 2010. *Cultural Resource Inventory of the Beaver Meadows and Sauls Creek Landscape Travel Management Route Designation Project, La Plata, Archuleta, and Hinsdale Counties, Colorado*. On file, San Juan Public Lands Center, Durango, Colorado.
- Wolfe, M.L., J.F. Kimball, and T.M. Schildwachter. 2002. Refuges and elk management. In *North American Elk: Ecology and Management*, edited by D.E. Toweill and J.W. Thomas, pp. 583–615. Washington D.C.: Smithsonian Institution Press.
- Worrall, J.J., G.E. Rehfeldt, A. Hamann, E. H. Hogg, S.B. Marchetti, M. Michaelian, and L.K. Gray. 2013. Recent declines of *Populus tremuloides* in North America linked to climate. *Forest Ecology and Management*.
- Worrall, J.J., L. Egeland, T. Eager, R.A. Mask, E.W. Johnson, P.A. Kemp, and W.D. Shepperd. 2008. Rapid mortality of *Populus tremuloides* in southwestern Colorado, USA. *Forest Ecology and Management* 255:686–696.
- Wright, H.A., and A.W. Bailey. 1982. *Fire Ecology: United States and Southern Canada*. New York: John Wiley and Sons.
- Wu, R. 1999. Fire history and forest structure in the mixed conifer forest of southwest Colorado. M.S. thesis, Department of Forest Sciences, Colorado State University, Fort Collins, Colorado.
- Yanishevsky, R., and S. Petring-Rupp. 1998. Management of breeding habitat for selected bird species in Colorado. Unpublished report. Denver: Colorado Division of Wildlife.
- Yarmoloy, C., M. Bayer, and V. Geist. 1988. Behavior responses and reproduction of mule deer, *Odocoileus hemionus*, does following experimental harassment with an all-terrain vehicle. *Canadian Field-Naturalist* Ottawa ON 102.3:425–429.
- Young, M.K. (ed.). 1995. *Conservation Assessments for Inland Cutthroat Trout*. General Technical Report RM-256. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service.

### **BLM and Forest Service Manuals and Handbooks**

- . BLM Handbook 8410-1. *Visual Resource Inventory*.
- . BLM Handbook 8431-1. *Visual Resource Contrast Rating*.
- . BLM Manual 1613. *Areas of Critical Environmental Concern*.
- . BLM Manual 9015. *Integrated Weed Management*. Rel. 9-321.
- . BLM Handbook H1624-1. *Planning for Fluid Mineral Resources*. Rev. December 19.
- . BLM H-8550-1. *Interim Policy Management and Guidelines for Lands Under Wilderness Review*.
- . BLM Emergency Fire Rehabilitation Handbook, H-1742

- . BLM Manual 8270. *Paleontological Resource Management*.
- . BLM Manual H-4180-1. *Rangeland Health Standards*.
- . BLM Manual 8330. *Policy on Reasonable Accommodations for Persons with Disabilities*.
- . BLM Manual 8100. *The Foundations for Managing Cultural Resources*. Rel. 8-72.
- . BLM Manual 8110. *Identifying and Evaluating Cultural Resources*. Rel. 8-73.
- . BLM Manual 8120. *Tribal Consultation Under Cultural Resources*. Rel. 8-74.
- . BLM Manual H-8120-1. *General Procedural Guidance for Native American Consultation*. Rel. 8-75.
- . BLM Manual 8130. *Planning for Uses of Cultural Resources*. Rel. 8-76.
- . BLM Manual 8140. *Protecting Cultural Resources*. Rel. 8-77.
- . BLM Manual 8150. *Permitting Uses of Cultural Resources*. Rel. 8-78.
- . BLM Manual 8170. *Interpreting Cultural Resources for the Public*. Rel. 8-79.
- . BLM Handbook H-1601-1. *Land Use Planning Handbook*. Rel. 1-1693.
- . BLM Manual 9113 - Roads.
- . BLM Manual 1626. *Travel and Transportation Manual (Public)*. Rel. 1-1731.
- . BLM Manual 6400. *Wild and Scenic Rivers System on BLM Lands*. Rel. 6-136.
- . BLM Handbook H-8342. *Travel and Transportation Handbook*. Rel. 8-82.
- . BLM Manual 6280. *Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation (Public)*. Rel. 6-139.
- . BLM Manual 6720, Aquatic Resource Management
- . BLM Manual Part 411. *Policies and Standards for Managing Museum Collections*.

USDA Forest Service. Standard Range Recission Strategy for Cultural Resources, San Juan National Forest.

- . 2400 - Timber Management – Forest Service Manual for Timber Management
- . 2409.11 - National Forest Log Scaling Handbook
- . 2409.11a - National Forest Cubic Scaling Handbook
- . 2409.12 - Timber Cruising Handbook
- . 2409.12a - Timber Volume Estimator Handbook

- . 2409.12b - Timber and Forest Products Trespass/Theft Procedures Handbook
- . 2409.13 - Timber Resource Planning Handbook
- . 2409.13a - Timber Permanent Plot Handbook
- . 2409.14 - Timber Management Information System Handbook
- . 2409.15 - Timber Sale Administration Handbook
- . 2409.17 - Silvicultural Practices Handbook
- . 2409.18 - Timber Sale Preparation Handbook
- . 2409.19 - Renewable Resources Handbook
- . 2409.21e - Timber Management control Handbook
- . 2409.21h - Timber Management Data Handbook
- . 2409.22 - Timber Appraisal Handbook
- . 2409.26 - Silvicultural Practices Handbook
- . 2409.26b - Reforestation Handbook
- . 2409.26c - Timber stand Improvement Handbook
- . 2409.26d - Silvicultural Examination and Prescription Handbook
- . 2409.26e - Nursery Handbook
- . 2409.26f - Seed Handbook
- . 2409.26g - Tree Improvement Handbook
- . 40 CFR 1502.23. Non-market valuation
- . Forest Service grazing permit handbook direction at FSH 2209.13
- . Forest Service grazing regulations at 36 CFR Part 222
- . Forest Service Manual (FSM) 2900
- . FSM 2324.21
- . FSM: Policy for management of paleontological resources on NFS lands forthcoming.
- . Forest Service range management manual direction at FSM 2200
- . FSH 1909.12
- . FSH 2309.18: This provides direction for designing, building and maintaining USFS trails.
- . FSM 2600, Wildlife, Fish, and Sensitive Plant Habitat

- . FSH 2609.13, Wildlife and Fisheries Program Management Handbook
- . FSH 7309.11: This provides direction for managing USFS facilities.
- . FSH 7709.55 (Travel Planning Handbook).
- . FSM 2070
- . FSM 2300: This provides direction for management and planning in relation to recreation, Wilderness, and related resources.
- . FSM 2622
- . FSM 2709, 2710, and 2720: These provide the legal framework for special uses on USFS lands.
- . FSM 4063.03. Research Natural Areas
- . FSM 7300: This provides direction for planning, development, and managing facilities on USFS lands.
- . FSM 7400 and 7409.11: These provide direction for administration and managing drinking water systems, waste water systems, effluents, solid waste systems and food services.
- . FSM 7700 (Travel Management);
- . 2001. Publication FS-710, The Built Environment Image Guide. Available at: [http://www.fs.fed.us/recreation/programs/beig/01\\_frontmatter.pdf](http://www.fs.fed.us/recreation/programs/beig/01_frontmatter.pdf). Access August 2, 2013.
- . Rocky Mountain Region Soil and Water Conservation Practices Handbook, FSH 2509.2
- . Rocky Mountain Region special management and protective measures in wetlands and riparian areas (FSH 2509.25-2006-1)
- . Special Areas: Roadless Area Conservation. Final Rule. *Federal Register* 66 (9):3244–3273.

## 5.2 List of Acronyms

ACEC	Area of Critical Environmental Concern
AML	Appropriate Management Level
AMP	Allotment Management Plan
ANC	acid neutralizing capacity
APD	Application for Permit to Drill
ASQ	allowable sale quantity
ATV	all-terrain vehicle
AUM	animal unit month
BA	Biological Assessment
BCF	billion cubic feet
BCR	Bird Conservation Region
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BO	Biological Opinion
CAMx	Comprehensive Air Quality Model with Extensions
CCF	centrum cubic feet
CDNST	Continental Divide National Scenic Trail
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH <sub>4</sub>	methane
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
COA	Condition of Approval
COGCC	Colorado Oil and Gas Conservation Commission
CPW	Colorado Parks and Wildlife
CRA	Colorado Roadless Area
CSU	Controlled Surface Use
CWCB	Colorado Water Conservation Board
DAU	Data Analysis Unit
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCA	Energy Policy and Conservation Act
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FLAG	Federal Land Managers' Air Quality Related Values Work Group
FLPMA	Federal Land Policy and Management Act
FRCC	Fire Regime Condition Class
FSH	Forest Service Handbook

FSM	Forest Service Manual
g/hp-h	grams per horsepower-hour
GIS	geographic information system
GMU	Game Management Unit
GSGP	Gothic Shale Gas Play
HMA	herd management area
hp	horsepower
HUC	Hydrologic Unit Code
IMPROVE	Interagency Monitoring of Protected Visual Environments
IRA	Inventoried Roadless Area
kg/ha-yr	kilograms/hectare-year
km	kilometer
KRCRA	Known Recoverable Coal Resource Area
LCAS	Lynx Conservation Assessment Strategy
LGMIF	Local Government Mineral Impact Fund
LN	lease notice
LRMP	Land and Resource Management Plan
MA	Management Area
MBTA	Migratory Bird Treaty Act
MCF	thousand cubic feet
mg/L	milligrams per liter
MIG, Inc.	Minnesota IMPLAN Group, Inc.
Mm-1	inverse megameters
MMBF	million board feet
MMBO	million barrels of oil
<i>MMCF</i>	million cubic feet
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NAL	not available for lease
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest Service
NHPA	National Historic Preservation Act
NI	no impact
NO <sub>2</sub>	nitrogen dioxide
NO <sub>3</sub>	nitrate
NOI	Notice of Intent
NO <sub>x</sub>	nitrogen oxide
NSJB	Northern San Juan Basin
NSJB-CBM	Northern San Juan Basin Coalbed Methane
NSO	No Surface Occupancy
NVUM	National Visitor Use Monitoring
O <sub>3</sub>	ozone
OHV	off-highway vehicle

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OMC	organic mass by carbon
ORV	outstandingly remarkable value
Pb	lead
PCA	potential conservation area
PEIS	Programmatic Environmental Impact Statement
PILT	payment in lieu of taxes
PL	Public Law
PLAA	Paradox Leasing Analysis Area
PM <sub>2.5</sub>	particulate matter smaller than 2.5 microns in diameter
PM <sub>10</sub>	particulate matter smaller than 10 microns in diameter
PNV	present net value
POG	Four Corners Air Quality Task Force Policy Oversight Group
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
RFD	Reasonable Foreseeable Development
RMP	Resource Management Plan
RNA	research natural area
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
RPA	Forest and Rangeland Renewable Resources Planning Act
SBA	special botanical area
SFP	special forest product
SIO	scenic integrity objective
SJNF	San Juan National Forest
SLT	standard lease terms
SO <sub>2</sub>	sulfur dioxide
SO <sub>4</sub>	sulfate
SRMA	Special Recreation Management Area
TCF	trillion cubic feet
TL	timing limitation
TRFO	Tres Rios Field Office
TSI	timber stand improvement
TSPQ	timber sale program quantity
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
VRI	Visual Resource Inventory

VRM	Visual Resource Management
WSA	wilderness study area
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act
WUI	wildland urban interface
µg/m <sup>3</sup>	microsiemens per cubic meter

## 5.3 Glossary

This glossary defines terms used by the USFS and the BLM to explain natural resource concepts and management activities specific to this LRMP and FEIS. Some definitions may vary between the land management agencies.

**abandoned mine:** An abandoned hard rock mine on or affecting public lands administered by the Bureau of Land Management, at which exploration, development, mining, reclamation, maintenance, and inspection of facilities and equipment, and other operations ceased as of January 1, 1981 (the effective date of the Bureau of Land Management's surface management regulations codified at 43 CFR 3809) with no evidence demonstrating that the miner intends to resume mining.

**Abandoned Mine Lands Program:** A Bureau of Land Management program that focuses on reclaiming hard rock abandoned mine lands on or affecting public lands administered by the Bureau of Land Management.

**acid mine drainage:** The outflow of acidic water from usually abandoned, metal ore mines.

**actual use:** Animal unit months of forage consumed by permitted livestock based on the actual numbers of permitted livestock placed on the respective grazing allotment and actual pasture grazing dates submitted by the livestock grazing permittee and confirmed by periodic agency field checks.

**adaptive management:** The process of implementing management decisions incrementally, so that changes can be made if the desired results are not being achieved. Adaptive management acknowledges that our understanding of complex ecological systems is limited and we may make mistakes, but the seriousness of these mistakes can be reduced by placing forest management into a consciously experimental framework, carefully observing the ecosystem's response to our well-intentioned efforts, and modifying our actions appropriately as we learn more about the ecosystem.

**affected environment:** A physical, biological, social, and economic environment within which human activity is proposed. The natural, physical, and human-related environment that is sensitive to changes from the alternatives.

**air pollutant:** Any substance in air that could, if in high enough concentration, harm humans, animals, vegetation, or materials. Air pollutants may include almost any natural or artificial matter capable of being airborne, in the form of solid particles, liquid droplets, gases, or a combination of these.

**air pollution:** The contamination of the atmosphere by any toxic or radioactive gases and particulate matter as a result of human activity.

**air quality:** Refers to standards for various classes of land as designated by the Clean Air Act (Public Law 88-206: January 1978).

**allotment:** A designated area of land available for livestock grazing upon which a specified number and kind of livestock are permitted to graze for a certain period. Allotments generally consist of federal and state lands and/or private lands. An allotment may include one or more separate pastures. Livestock numbers and periods of use are specified via grazing permits for each allotment.

Allotments are administered to standard when the responsible manager determines and documents

that the permittee is in compliance and that applicable resource management standards are being met. Where the permittee is not in compliance, necessary corrective actions are initiated and documented.

**allotment management plan (AMP):** A written plan that implements agency land use plans' goals and objectives through a National Environmental Policy Act grazing decision for one of more grazing allotments. The AMP includes supportive measures, if required, designed to attain specific management goals, including desired conditions, for the grazing allotment. An AMP is prepared in consultation with the grazing permittee(s), lessee(s), and other interested publics. Livestock grazing management objectives are considered in relation to other uses of the range and to renewable resources, such as watersheds, vegetation, and wildlife. The AMP documents seasons of use, the number of livestock to be permitted, needed range improvements, and grazing systems.

**alternative:** A choice of two or more things. For National Environmental Policy Act purposes, alternatives to the Proposed Action must be examined in the planning process. The discussion of alternatives must define the issues and provide a clear basis for choice by the decision-maker and the public (40 CFR 1502.14).

**amenity:** Resource use, object, feature, quality, or experience that is pleasing to the mind or senses; typically refers to values for which monetary values are not or cannot be established, such as scenic or wilderness values.

**amenity migration:** The movement of people for pleasure rather than economic reasons.

**analysis area:** The geographic area defining the scope of analysis for the project. Sometimes for a particular resource, the analysis area may have to be larger when effects have potential to extend beyond the boundaries of the proposal. May also be referred to as the "planning area."

**Analysis of the Management Situation (AMS):** Assessment of the current management direction. It includes a consolidation of existing data needed in order to analyze and resolve identified issues, a description of current Bureau of Land Management guidance, and a discussion of existing problems and opportunities for solving them.

**animal unit month (AUM):** The amount of forage necessary for the sustenance of one cow, an "animal unit" or its equivalent for a period of 1 month (43 CFR 4100).

**annual mortality:** The average annual volume of sound wood (free from decay) in growing-stock trees that died from natural causes during the period between inventories.

**annual operating instructions:** Annual instructions, developed with livestock permittees, documenting livestock pasture rotations, seasons of use, forage utilization and/or residual levels, etc. Annual operating instructions implement project-level National Environmental Policy Act decisions documented in the allotment management plan.

**appraisal well:** a well drilled after a discovery well to gain more information on the producing reservoir such as the elevation of the oil-water contact. Appraisal wells are often cored. An appraisal well is a step-out or delineation well.

**aquatic ecosystems:** Water-dependent environments that serve as habitat for interrelated and interacting communities and populations of plants and animals. Includes the stream channel, lake or estuary bed, water, biotic communities, and the habitat features that occur therein.

**Areas of Critical Environmental Concern (ACECs):** Areas within the public lands where special management attention is required (when such areas are developed or used, or where no development is required) in order to protect and prevent irreparable damage to important historic, cultural, and/or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards.

**atmospheric deposition:** Air pollution produced when acid chemicals are incorporated into rain, snow, fog, or mist and fall to the Earth. Sometimes referred to as "acid rain," it comes from sulfur oxides and nitrogen oxides, products of burning coal and other fuels and from certain industrial

processes. If the acid chemicals in the air are blown into areas where the weather is wet, the acids can fall to Earth in the rain, snow, fog, or mist. In areas where the weather is dry, the acid chemicals may become incorporated into dusts or smokes.

**anthropogenic influences:** Relating to or resulting from the influence that humans have on the natural world or environment.

**Authorized Officer:** The U.S. Forest Service or Bureau of Land Management employee who has the authority to select and/or carry out a specific planning action.

**avoidance area:** Areas with sensitive resource values where rights-of-way and Section 302 permits, leases, and easements would be strongly discouraged. Authorizations made in avoidance areas would have to be compatible with the purpose for which the area was designated and not otherwise be feasible on lands outside the avoidance area.

**backcountry byways:** Vehicle routes that traverse scenic corridors utilizing secondary or backcountry road systems. National backcountry byways are designated by the type of road and vehicle needed to travel the byway.

**base property:** Land and improvements owned and used by the permittee for a farm or ranch operation and specifically designated by him to qualify for a term grazing permit.

**beneficial outcomes** (also referenced as “recreation benefits”): These include improved conditions, maintenance of desired conditions, prevention of worse conditions, and the realization of desired experiences.

**beneficial uses:** Attributes that are considered useful products of the resource.

**benthic macroinvertebrates:** Aquatic organisms, without a backbone or spine and visible to the naked eye, living at the bottom of a stream, river, lake, or body of water on, under, and around rocks, sediment, debris, logs, etc.

**best available science:** Peer-reviewed and other quality-controlled literature, studies, or reports related to planning or project issues.

**best management practices (BMPs):** Methods, measures, or practices to prevent or reduce water pollution including, but not limited to, structural and non-structural controls, operation and maintenance procedures, other requirements, scheduling, and distribution of activities. Usually, BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, economic, and technical feasibility.

**big game:** Those species of large mammals normally managed as a sport hunting resource. Generally includes elk, moose, white-tailed deer, mule deer, mountain goat, bighorn sheep, black bear, and mountain lion.

**biota:** The combined flora and fauna of a region.

**Biological Assessment (BA):** An evaluation conducted for federal projects requiring an environmental statement in accordance with legal requirements under Section 7 of the Endangered Species Act (16 USC 1536(c)). The purpose of the assessment is to determine whether the Proposed Action is likely to affect any endangered or threatened species.

**biological diversity:** The full variety of life in an area including the ecosystems, plant and animal communities, species and genes, and the processes through which individual organisms interact with one another and with their environment (USFS 1991). More simply it is defined as the variety of life and its processes.

**Biological Evaluation:** A documented U.S. Forest Service review of U.S. Forest Service programs or activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, proposed, or sensitive species (FSM 2670.5). Objectives of the Biological Evaluation are to ensure that U.S. Forest Service actions do not contribute to loss of viability of any native or desired

non-native plant or animal species (including threatened, endangered, proposed, or sensitive plant and animal species) or contribute to trends toward federal listing of any species, and to comply with the requirements of the Endangered Species Act that actions of federal agencies not jeopardize or adversely modify critical habitat of federally listed species (Forest Service Manual – Region 2 Supplement 2672.41).

**biological soil crusts:** A complex mosaic of cyanobacteria, green algae, lichens, mosses, microfungi, and other bacteria (Belnap et al. 2001) that function as living mulch by retaining soil moisture and discouraging annual weed growth. They reduce wind and water erosion, fix atmospheric nitrogen, and contribute to soil organic matter (Eldridge and Greene 1994). Also known as cryptogamic, cryptobiotic, microbiotic, or microphytic soil crusts.

**broodstock:** A group of mature fish used for breeding purposes to restock or enhance the numbers of fingerlings or fry in streams and lakes.

**candidate species:** Species for which the U.S. Fish and Wildlife Service has sufficient information on their status and threats to support proposing the species for listing as endangered or threatened under the Endangered Species Act, but for which issuance of a proposed rule is currently precluded by higher-priority listing actions. Separate lists for plants, vertebrate animals, and invertebrate animals are published periodically in the *Federal Register* (from M6840, Special Status Species Manual)

**canopy:** The branches and leaves that form the crowns of trees, shrubs, or herbs. Canopy usually refers to the uppermost layer of vegetation, but can be used to describe lower layers in a multi-storied forest.

**canopy cover:** The percentage of the ground surface covered by the vertical downward projection of the outermost perimeter of the plant foliage in a given area.

**capability:** The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices at a given level of management intensity. Capability depends on current conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices, such as protection from insects and disease.

**carrying capacity:** The average number of livestock and/or wildlife that may be sustained on a management unit compatible with management objectives for the unit. In addition to the site characteristics, it is a function of management goals and management intensity. The maximum population or level of activity that can be supported without degradation of the habitat or the population.

**casual use:** Activities that involve practices that do not ordinarily cause any appreciable disturbance or damage to the public lands, resources, or improvements and, therefore, do not require a right-of-way grant or temporary use permit (43 CFR 2800). Also means any short-term non-commercial activity that does not cause appreciable damage or disturbance to the public lands, their resources or improvements, and is not prohibited by closure of the lands to such activities (43 CFR 2920). Casual use generally includes the collecting of geochemical, rock, soil, or mineral specimens using hand tools, hand panning, and non-motorized sluicing. It also generally includes use of metal detectors, gold spears, and other battery-operated devices for sensing the presence of minerals, and hand battery-operated dry washers. Casual use does not include use of mechanized earth-moving equipment, truck-mounted drilling equipment, suction dredges, motorized vehicles in areas designated as closed to off-road vehicles, chemicals, or explosives. It also does not include occupancy or operations where the cumulative effects of the activities result in more than negligible disturbance.

**cave:** Any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the earth or within a cliff or ledge and large enough to permit a person to enter, whether the entrance is excavated or naturally formed. Such term shall include any natural pit, sinkhole, or other opening that is an extension of a cave entrance or that is an integral part of the cave (36 CFR 290).

**cavity:** The hollow excavated in a tree that is used by birds or mammals for roosting and/or reproduction.

**Class I area:** The Clean Air Act defines Class I areas as national parks over 6,000 acres and national wilderness areas over 5,000 acres that were in existence before August 1977. (The Weminuche wilderness and Mesa Verde National Park are Class I areas.)

**Class II area:** In general, all areas not designated as a Class I area are considered a Class II area for air quality protection.

**Clean Air Act of 1963, as amended:** Federal legislation governing air pollution control.

**Clean Water Act, as amended in 1977:** Legislation enacted by Congress in 1977 to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. This act was formerly known as the Federal Water Pollution Control Act (33 USC 1344).

**climate:** The composite or generally prevailing weather conditions of a region throughout the year, averaged over a series of years.

**closed:** Generally denotes that an area is not available for a particular use or uses; refer to specific definitions found in laws, regulations, or policy guidance for application to individual programs. For example, 43 CFR 8340.0-5 sets forth the specific meaning of “closed” as it relates to off-highway vehicle use, and 43 CFR 8364 defines “closed” as it relates to closure and restriction orders (from H-1601-1, Bureau of Land Management Land Use Planning Handbook).

**closed road:** A road or segment that is restricted from certain types of use during certain seasons of the year. The prohibited use and the time period of closure must be specified.

**Code of Federal Regulations (CFR):** The official, legal tabulation or regulations directing federal government activities.

**Colorado Roadless Rule:** The culmination of a National Environmental Policy Act process involving all U.S. Forest Service inventoried roadless areas within the state of Colorado. The resulting Colorado Roadless Rule prescribes new management criteria for these areas and changed the boundaries of some roadless area units.

**commercial forest products:** Saw logs, small roundwood, biomass, and other forest products removed in the process of harvesting or cutting trees from U.S. Forest Service lands.

**community:** A group of one or more populations of plants and animals in a common spatial arrangement; an ecological term used in a broad sense to include groups of various sizes and degrees of integration.

**community recreation-tourism market:** A community, or communities, dependent on public lands recreation and/or related tourism use, growth, and/or development. Major investments in facilities and visitor assistance are authorized within Special Recreation Management Areas where the strategy is to target demonstrated community recreation-tourism market demand. Here, recreation management actions are geared toward meeting primary recreation-tourism market demand for specific activity, experience, and benefit opportunities. These opportunities are produced through maintenance of prescribed natural resource and/or community setting character and by structuring and implementing management, marketing, monitoring, and administrative actions accordingly.

**Conditions of Approval (COAs):** Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

**conifer:** Any of a group of needle- and cone-bearing evergreen trees.

**connectivity:** A condition in which the special arrangement of vegetation types allows organisms to move freely across the landscape.

**conservation strategy:** A management plan to conserve or sustain particular ecosystem elements such as rare species or habitats.

**consumptive water use:** Use that permanently removes water from a watershed or a confined aquifer from which it is withdrawn by activities that result in substantial evaporation and evapotranspiration.

**Council on Environmental Quality:** An advisory council to the President of the United States established by the National Environmental Policy Act. It reviews federal programs to analyze and interpret environmental trends and information.

**cover:** Vegetation used by wildlife for protection from predators, breeding, and rearing of young (hiding cover) or to ameliorate conditions of weather (thermal cover).

**criteria:** Data and information that are used to examine or establish the relative degrees of desirability among alternatives or the degree to which a course of action meets an intended objective.

**critical habitat:** An area occupied by a threatened or endangered species on which are found those physical and biological features: 1) essential to the conservation of the species, and 2) which may require special management considerations or protection.

**crucial winter range:** That part of the overall range where 90% of the individuals are located during the average five winters out of 10 from the first heavy snowfall to spring green-up or during a site-specific period of winter as defined for each Colorado Parks and Wildlife data analysis unit.

**cryptogamic soil or crust:** A thin crust made up of mosses, lichens, algae, and bacteria, known collectively as cryptogams. Cryptogams function as soil builders, forming a spongy layer that helps protect soil from erosion, absorbs moisture, and provides nitrogen and other nutrients for plant growth. Also referred to as cryptobiotic or microbiotic soils or crusts.

**cultural resource:** Any prehistoric or historic site that is more than 50 years old. The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) having scientific, prehistoric, or social values.

**cumulative impacts:** Combined impacts of the past, present, and reasonably foreseeable future actions. For example, the impacts of a proposed timber sale and the development of a mine together result in cumulative impacts.

**deferment:** The delay of grazing to achieve a specific management objective. A strategy aimed at providing time for plant reproduction, establishment of new plants, restoration of plant vigor, a return to environmental conditions appropriate for grazing, or the accumulation of forage for later use.

**deferred grazing:** The deferment of grazing in a non-systematic rotation with other land units.

**deferred rotation:** Any grazing system that provides for a systematic rotation of the deferment among pastures.

**demographic:** Related to the vital statistics of human populations (size, density, growth, distribution, etc.) and the effect of these on social and economic conditions.

**denning habitat:** The environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens. Denning habitat must be within daily travel distance of winter snowshoe hare habitat—the typical maximum daily distance for females is about 3 to 6 miles. Denning habitat includes mature and old growth forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris or areas where down trees are jack-strawed.

**designated roads and trails:** Specific roads and trails identified by the land management agency where motorized vehicle use is authorized. Road and trail designations include the types of vehicles authorized to operate on a specific route and may also include a time of year (season) when motorized use is allowed.

**destination recreation-tourism market:** National or regional recreation-tourism visitors and other constituents who value public lands as recreation-tourism destinations. Major investments in facilities

and visitor assistance are authorized within Special Recreation Management Areas where the strategy is to target demonstrated destination recreation-tourism market demand. Here, recreation management actions are geared toward meeting primary recreation-tourism market demand for specific activity, experience, and benefit opportunities. These opportunities are produced through maintenance of prescribed natural resource and/or community setting character and by structuring and implementing management, marketing, monitoring, and administrative actions accordingly.

**developed recreation:** Outdoor recreation requiring significant capital investment in facilities to handle a concentration of visitors on a relatively small area. Examples are ski areas, resorts, and campgrounds.

**development well:** a well drilled into a producing reservoir that already is reasonably well delineated. The development well will have several producing wells on adjacent drilling and spacing units. Development wells are drilled to efficiently drain the reservoir and have very low risk.

**direct impacts (direct effects):** Impacts that are caused by the action and occur at the same time and place.

**dispersed recreation:** Outdoor recreation in which visitors are diffused over relatively large areas. Where facilities or developments are provided, they are more for access and protection of the environment than for the comfort or convenience of the people.

**disposal:** Transfer of public land out of federal ownership to another party through sale, exchange, the Recreation and Public Purposes Act, Desert Land Entry, or other land law statutes.

**disturbance:** A discrete event, either natural or human-induced, that causes a change in the existing condition of an ecosystem.

**diversity:** An expression of community structure. The relative distribution and abundance of different plant and animal communities and species within an area. It is "high" if there are many equally abundant species. It is "low" if there are only a few equally abundant species.

**dynamic equilibrium:** Stream systems normally function within natural ranges of flow, sediment movement, temperature, and other variables, in what is termed "dynamic equilibrium."

**easement:** A right afforded a person or agency to make limited use of another's real property for access or other purposes.

**ecological integrity:** The capability of an ecosystem to maintain its composition, structure, and function over time, thus maintaining the productivity of the land and a diversity of plants and animals.

**ecosystem:** Areas with living organisms interacting with each other and with their physical environment. They are dynamic entities shaped by natural processes and disturbances including succession, fire, floods, and wind. Ecosystems occur at various scales, with smaller ones found within larger ones.

**ecosystem diversity:** The variety of ecosystem types including their composition, structure, and processes.

**ecotone:** An ecological community of mixed vegetation formed by the overlapping of adjoining communities.

**edge:** The place where plant communities meet or where successional stages or vegetative conditions within plant communities come together (Thomas 1979).

**effects:** "Effect" and "impact" are synonymous as used in this document. Environmental consequences (the scientific and analytical basis for comparison of alternatives). Effects may be either direct, which are caused by the action and occur at the same time and place, or indirect, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable, or cumulative.

**elk security areas:** Habitat that allows elk to remain in a defined area despite an increase in stress or

disturbance associated with the hunting season or other human activities (Lyon and Christensen 1992).

**eligibility:** Qualification of a river for inclusion into the National Wild and Scenic Rivers System through the determination (professional judgment) that it is free-flowing and, with its adjacent land area, possesses at least one river-related value considered to be outstandingly remarkable (from M-8351, Bureau of Land Management Wild and Scenic Rivers Policy and Program).

**emission:** A release into the outdoor atmosphere of air contaminants.

**endangered species:** Any species of animal or plant in danger of extinction throughout all or a significant portion of its range and so designated by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

**Endangered Species Act of 1973 (ESA):** A law that sets a policy for conserving animal and plant species that are in danger of extinction.

**environment:** The physical conditions that exist within the area that will be affected by a proposed project, including land, water, minerals, flora, fauna, and objects of historical or aesthetic significance. The area involved is the area in which significant effects would occur either directly or indirectly as a result of the project. The "environment" includes both natural and human-made conditions.

**environmental analysis:** An analysis of alternative actions and their predictable environmental effects, including physical, biological, economic, and social consequences and their interactions; short- and long-term effects; and direct, indirect, and cumulative effects.

**environmental impact statement (EIS):** A detailed written statement as required by Section 12(2)(C) of the National Environmental Policy Act (40 CFR 1508.11). An analytical document prepared under the National Environmental Policy Act that portrays potential impacts to the human environment of a Proposed Action and its possible alternatives. An EIS is developed for use by decision makers to weigh the environmental consequences of a potential decision.

**ephemeral streams:** Streams that flow only as a direct response to rainfall or snowmelt events. They have no base flow.

**erodible soils:** Soils that are highly susceptible to detachment and movement when disturbed

**erosion:** Detachment or movement of soil or rock fragments by water, wind, ice, or gravity. Accelerated erosion is much more rapid than normal, natural, or geologic erosion, primarily as a result of the influence of activities of people, animals, or natural catastrophes.

**even-aged management:** Actions resulting in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20% of the age of the stand at harvest rotation age.

**even-aged regeneration harvest:** A timber cutting procedure that creates a new age class of trees by using methods including clearcutting, seed tree, shelterwood, and coppice.

**exclusion areas:** Areas with sensitive resource values where rights-of-way and Section 302 permits, leases, and easements would not be authorized.

**explicit recreation management objective:** Specifically targeted recreation activity, experience, and/or benefit opportunities (i.e., recreation opportunity outputs) and their attainment (i.e., recreation outcomes).

**exploratory well:** a well drilled in order to locate an undiscovered petroleum reservoir, either by discovering a new field or a new shallower or deeper reservoir in a previously discovered field. An exploratory well can also be drilled to significantly extend the limits of a discovered reservoir.

**Extensive Recreation Management Area:** A public lands unit identified in land use plans containing all acreage not identified as a Special Recreation Management Area. Recreation management actions within an Extensive Recreation Management Area are limited to only those of a custodial

nature.

**feasible:** Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.

**Federal Land Policy and Management Act of 1976 (FLPMA):** Public Law 94-579, October 21, 1976, often referred to as the Bureau of Land Management's "Organic Act," which provides the majority of the Bureau of Land Management's legislated authority, direction policy, and basic management guidance (from Bureau of Land Management National Management Strategy for OHV Use on Public Lands).

**Federal Register:** A daily publication that reports Presidential and federal agency documents.

**federally listed species:** Species that are listed by the U.S. Department of the Interior, U.S. Fish and Wildlife Service, or the National Oceanic and Atmospheric Administration, National Marine Fisheries Service as threatened or endangered.

**fellfield:** An alpine plant community dominated by cushion plants (forbs) that occurs on wind-swept sites with shallow, rocky, well-drained soils.

**fens:** Groundwater-fed wetlands that support high biodiversity and unique plant communities. Soil in a fen is saturated with water. Saturation creates low-oxygen conditions that slow down decomposition and promotes the accumulation of organic peat over time.

**final regeneration harvest:** Timber harvest designed to regenerate a forest stand or release a regenerated stand. This includes clearcut, removal cut of a shelterwood or seed tree system, and selection cut.

**Fire Regime Condition Class (FRCC):** Fire Regime Condition Classes are a measure describing the degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings. One or more of the following activities may have caused this departure: fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects or disease, or other management activities.

**Fire Regime Condition Class (FRCC) 1:** Lands whose fire regimes are within the historical range of variation and whose vegetation attributes (species composition, structure, and function) are intact.

**fire suppression:** All work activities connected with fire-extinguishing operations, beginning with discovery of a fire and continuing until the fire is completely out.

**fish habitat:** The place where a population of fish species lives and its surroundings; includes the provision of life requirements such as food and cover.

**fishery:** The total population of fish in a stream or body of water and the physical, chemical, and biological factors affecting that population.

**floodplain:** The lowland and relatively flat areas adjoining inland and coastal waters, including, at a minimum, that area subject to a 1% or greater chance of flooding in any given year.

**flora:** The plant life characteristic of a region, period, or special environment.

**fluid minerals:** Oil, gas, coal bed natural gas, and geothermal resources.

**forage:** Plant material that is available for animal consumption.

**forage reserve:** A designation for allotments on which there is no current term permit obligation for some or all of the estimated livestock grazing capacity and where there has been a determination made to use the available forage on the allotment to enhance management flexibility for authorized livestock use.

**forb:** An herbaceous plant without a woody stem other than those in the grass (Poaceae), sedge (Cyperaceae), or rush (Juncaceae) families.

**forest land:** Land that has at least 25% canopy cover of trees.

**forest cover type:** A descriptive classification of forest land based on the present vegetative species composition and/or locality (i.e., lodgepole pine, mixed conifer). Most stands are given a classification (stratum label), based on aerial photo interpretation, that includes the forest cover type, size class, density class, and stand development phase.

**forest regulation:** The control of stocking, harvests, growth, and yields on lands designated as suited for timber production to meet management objectives including sustained yield of timber products.

**forest road or trail:** A road or trail wholly or partly within or adjacent to and serving the National Forest System and that is necessary for the protection, administration and utilization of the National Forest System and the use and development of its resources.

**forest transportation atlas:** A display of the system of roads, trails, and airfields of an administrative unit.

**forest transportation system:** The system of roads, trails, and airfields on National Forest System lands.

**form:** The mass or shape of an object, which appears unified, often defined by edge, outline, and/or surrounding space.

**fragmentation:** Process by which habitats are increasingly subdivided into smaller units, resulting in their increased insularity, as well as losses of total habitat area.

**functional at-risk:** 1) Condition in which vegetation and soil are susceptible to losing their ability to sustain naturally functioning biotic communities. Human activities, past or present, may increase the risks; 2) Uplands or riparian-wetland areas that are properly functioning, but a soil, water, or vegetation attribute makes them susceptible to degradation and lessens their ability to sustain natural biotic communities. Uplands are particularly at risk if their soils are susceptible to degradation. Human activities, past or present, may increase the risks.

**grade:** A slope states as so many feet per mile or as feet/feet (%).

**granite soils:** Soils derived from granite bedrock or granite parent materials.

**grassland:** Areas dominated by grasses and forbs. These areas include foothill and mountain grasslands and grasslands vegetation types.

**grazing preference:** The total number of animal unit months on public land apportioned and attached to base property owned or controlled by a permittee or lessee.

**ground cover:** The percentage of biotic and abiotic material (other than bare soil) covering the ground surface, including litter, mosses, lichens, vegetation basal area, and rock fragments. Ground cover plus bare soil equals 100%.

**growing stock:** A timber inventory classification of live commercial trees meeting specified standards of quality or vigor. Cull trees are excluded. Only includes trees 5.0 inches diameter at breast height and larger.

**habitat:** An environment that meets a specific set of physical, biological, temporal or spatial characteristics that satisfy the requirements of a plant or animal species or group of species for part or all of their life cycle. The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

**habitat connectivity:** Habitat arrangements that allow organisms to move freely across the landscape.

**habitat structural stages:** Any of several developmental stages of tree stands described in terms of tree size and the extent of canopy closure they create (Wills 1987).

**habitat type:** An aggregation of all land areas potentially capable of producing similar plant

communities at climax.

**hardwoods:** A conventional term for the wood of broadleaf trees. In the decision area these trees are generally confined to areas near water.

**Heavy metals:** Elements having an atomic weight between 63.546 and 200.590, and a specific gravity greater than 4.0, such as copper, iron, manganese, lead arsenic, mercury, zinc, etc.

**herb:** A flowering plant whose above ground stem is not woody; graminoids and forbs.

**Herd Management Area (HMA):** Public land under the jurisdiction of the Bureau of Land Management that has been designated for special management emphasizing the maintenance of an established wild horse or burro herd.

**hazardous substances:** Comprehensive Environmental Response, Compensation, and Liability Act term identifying those substances designated pursuant to Section 1321(b)(2)(A) of Title 33, or 42 USC 9602, or listed in 40 CFR 302 or 355.

**hazardous substance release:** Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant).

**hazardous waste:** Refers to a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may pose a substantial threat to human health and the environment.

**hiding cover:** Vegetation, primarily trees, capable of hiding 90% of a standing adult animal from the view of a human at a distance of 200 feet or less.

**historic range of variation (HRV):** The range of ecological conditions, including vegetation structure and natural disturbance regimes that occurred during the reference period; the period of indigenous settlement from about 1500 to the late 1800s.

**hydrophytic plant:** A plant that grows in water or in very moist ground, usually found in riparian areas and wetlands.

**impacts:** "Effect" and "impact" are synonymous as used in this report. See definition for **effects**.

**impaired water body:** Streams and lakes that are not meeting their designated uses due to excess pollutants.

**indirect effects:** Secondary effects that occur in locations other than the initial action or significantly later in time.

**integrated pest management (Forest Service Manual 2900):** A pest (in this context an invasive species) control strategy based on the determination of an economic, human health, or environmental threshold that indicates when a pest population is approaching the level at which control measures are necessary to prevent a decline in the desired conditions (economic or environmental factors). In principle, integrated pest management is an ecologically based holistic strategy that relies on natural mortality factors, such as natural enemies, weather, and environmental management, and seeks control tactics that disrupt these factors as little as possible. Integrated pest management techniques are defined within four broad categories: 1) biological, 2) cultural, 3) mechanical/physical, and 4) chemical techniques.

**integrated prescription:** A multiple-use management practice used to select and schedule applications on a specific area to attain desired conditions and objectives. This prescription identifies and quantifies outputs, effects, benefits, and costs of all resources to the extent practical.

**Interdisciplinary Team:** A group of resource professionals with different expertise that collaborate to develop and evaluate resource management decisions.

**intermittent stream:** A stream that flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow. During the dry season and throughout minor drought periods, these streams will not exhibit flow. Geomorphological characteristics are not well defined and are often inconspicuous. In the absence of external limiting factors (pollution, thermal modifications, etc.), biology is scarce and adapted to the wet and dry conditions of the fluctuating water level.

**invasive species:** A non-native to the ecosystem under consideration, and its introduction causes, or is likely to cause, economic or environmental harm or harm to human health (Executive Order 13112).

**irretrievable impact:** Commitment of a resource would be considered “irretrievable” when the project would directly eliminate the resource, its productivity, and/or its utility for the life of the project.

**irreversible impact:** The commitment of a resource would be “irreversible” if the project started a “process” (chemical, biological, and/or physical) that could not be stopped. As a result, the resource or its productivity, and/or its utility would be consumed, committed, or lost forever.

**issue indicators:** A “yardstick” for measuring or comparing any changes associated with each issue or concern by alternative.

**jurisdictional wetland:** A wetland area delineated and identified by specific technical criteria, field indicators, or other information for purposes of public agency jurisdiction. The public agencies that administer jurisdictional wetlands are the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and the Natural Resources Conservation Service.

**K factor:** A soil erodibility factor used in the universal soil loss equation that is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. Estimation of the factor takes several soil parameters into account, including soil texture, percent of sand greater than 0.10 mm, soil organic matter content, soil structure, soil permeability, clay mineralogy, and coarse fragments. K factor values range from 0.02 to 0.64, the greater values indicating the highest susceptibilities to erosion.

**key habitat:** Specific areas within the geographic area occupied by a species in which are found those physical and biological features 1) essential to the conservation of the species and 2) that may require special management considerations or protection.

**key viewpoint:** The point(s) commonly in use or potentially in use where the view of a management activity is the most disclosing; the location that provides the means of studying the visual impact of alternatives to the landscape.

**land classification:** When, under criteria of 43 CFR 2400, a tract of land has potential for either retention for multiple use management or for some form of disposal, or for more than one form of disposal, the relative scarcity of the values involved and the availability of alternative means and sites for realization of those values will be considered. Long-term public benefits will be weighed against more immediate or local benefits. The tract will then be classified in a manner, which will best promote the public interest.

**land tenure adjustments:** Ownership or jurisdictional changes are referred as “land tenure adjustments.” To improve the manageability of the public lands and improve their usefulness to the public, the Bureau of Land Management has numerous authorities for “repositioning” lands into a more consolidated pattern, disposing of lands, and entering into cooperative management agreements. These land pattern improvements are completed primarily through the use of land exchanges, but also through land sales, jurisdictional transfers to other agencies, and through the use of cooperative management agreements and leases.

**land use allocation:** The identification in a land use plan of the activities and foreseeable development that are allowed, restricted, or excluded for all or part of the planning area, based on desired future conditions.

**land use plan:** A set of decisions that establish management direction for land within an administrative area, as prescribed under the planning provisions of the Federal Land Policy and Management Act of 1976; an assimilation of land use plan–level decisions developed through the planning process outlined in 43 CFR 1600, regardless of the scale at which the decisions were developed.

**lands generally suited for timber harvest:** Lands where timber production is compatible with the attainment of desired conditions and objectives established by the Land and Resource Management Plan, and other lands where salvage sales or other timber harvest is necessary for multi-purpose objectives other than timber production.

**landscape:** The aspect of the land that is characteristic of a particular region or area. Landscape character is the combination of physical, biological, and cultural attributes that gives an area its visual and cultural identity. Each attribute contributes to the uniqueness of the landscape and gives a particular place meaning and value and helps to define a “sense of place.” Landscape character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity and scenic sustainability. Landscape visibility addresses the relative importance and sensitivity of what is seen and perceived in the landscape. It is a function of many important and interconnected considerations such as number and context of viewers, duration of views, degree of discernible detail (which depends in part on the position of the viewer, i.e. the landscape may be superior, level with, or inferior) and seasonal variation. Landscape visibility inventory and analysis consists of three elements, including travel ways and use areas, concern levels and distance zones.

**lease:** Section 302 of the Federal Land Policy and Management Act of 1976 provides the Bureau of Land Management’s authority to issue leases for the use, occupancy, and development of the public lands. Leases are issued for purposes such as a commercial filming, advertising displays, commercial or non-commercial croplands, apiaries, livestock holding or feeding areas not related to grazing permits and leases, harvesting of native or introduced species, temporary or permanent facilities for commercial purposes (does not include mining claims), residential occupancy, ski resorts, construction equipment storage sites, assembly yards, oil rig stacking sites, mining claim occupancy if the residential structures are not incidental to the mining operation, and water pipelines and well pumps related to irrigation and non-irrigation facilities. The regulations establishing procedures for the processing of these leases and permits are found in 43 CFR 2920.

**lek:** A specific location where male grouse congregate and strut to attract and breed with female grouse. Most male grouse return to the same lek every year.

**lifeways:** The manner and means by which a group of people lives; their way of life. Components include language(s), subsistence strategies, religion, economic structure, physical mannerisms, and shared attitudes.

**limited (Bureau of Land Management):** Designated areas and trails where the use of off-road vehicles is subject to restrictions, such as limiting the number or types of vehicles allowed, dates and times of use (seasonal restrictions), limiting use to existing roads and trails, or limiting use to designated roads and trails. Under the designated roads and trails designation, use would be allowed only on roads and trails that are signed for use. Combinations of restrictions are possible, such as limiting use to certain types of vehicles during certain times of the year.

**linkage area:** An area that provides connectivity between blocks of habitat. Linkage areas occur both within and between geographic areas, where basins, valleys, or agricultural lands separate blocks of habitat, or where habitat naturally narrows between blocks.

**litter:** The dead vegetation on the ground surface usually consisting of leaves, needles, twigs, and bark.

**live cull:** Live trees that are 5.0 inches diameter at breast height and larger, which are 66% rotten or unable to produce a saw log.

**livestock:** Species of domestic animals including cattle, sheep, horses, burros, and goats.

**locatable minerals:** Minerals subject to exploration, development, and disposal by staking mining claims as authorized by the Mining Law of 1872, as amended. This includes deposits of gold, silver, and other uncommon minerals not subject to lease or sale.

**long-term sustained-yield timber capacity:** The highest wood yield that may be sustained under specified management intensities consistent with multiple-use objectives after stands have reached desired conditions.

**lower montane:** A terrestrial community that generally is found in drier and warmer environments than the montane terrestrial community. The lower montane community supports a unique clustering of wildlife species.

**lynx analysis units:** An area of at least the size used by an individual lynx, from about 25 to 50 square miles. A lynx analysis unit is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

**lynx habitat:** Primarily coniferous forests that provide a prey base of snowshoe hare.

**lands with wilderness characteristics:** Bureau of Land Management land areas found to have wilderness characteristics after an objective inventory and evaluation.

**macroinvertebrates:** Small animals that do not develop a backbone or spine, are found in streams, rivers, wetlands, and lakes, and are large enough to be seen with the eye without the use of a microscope.

**maintenance level:** Maintenance levels define the level of service provided by, and maintenance required for, a specific road. There are five maintenance levels that are described as follows:

- **Level 1** - Assigned to intermittent service roads during the time they are closed to vehicular traffic. Closures must be for 1 or more years. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities.
- **Level 2** - Assigned to roads open for use by high clearance vehicles. Roads in this maintenance level are low speed, single lane and native surface.
- **Level 3** - Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.
- **Level 4** - Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated.
- **Level 5** - Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.

**management area (MA):** An area of land used in planning that consists of similar analysis area, has one prescription assigned, and may not be contiguous.

**management direction:** A statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

**management indicator species (MIS):** A species of wildlife, fish, or plant whose health and vigor are believed to accurately reflect the health and vigor of other species having similar habitat and protection needs to those of the selected indicator species.

**mastication:** The altering of live or dead vegetation into small chunks by grinding, shredding, or chopping using a front-end or boom-mounted rotary blade or drum-type head. It is often used on shrubby vegetation, like Gambel oak, but can also be used in and around woodland vegetation (like

pinyon-juniper) or other relatively small trees (i.e., up to 10 inches in diameter). Mastication is generally used to break up fuel connectivity between ground fuels and canopy fuels.

**mean annual increment and culmination of mean annual increment:** The total increment of increase of volume of a stand (standing crop plus thinning) up to a given age divided by that age. Culmination of mean annual increment is the age in the growth cycle of an even-aged stand at which the average annual rate of increase of volume is at a maximum. In land management plans, mean annual increment is expressed in cubic measure and is based on the expected growth of stands, according to intensities and utilization guidelines in the plan document or set of documents.

**mechanical fuels treatment:** Any method to masticate or thin vegetation by hand or by machine (including thinning with chainsaws or any commercial machine, shredder, chipper, or similar equipment.)

**mechanical transport:** This includes any contrivance that moves people or material in or over land, water, or air that has moving parts, that provides a mechanical advantage to the user, and that is powered by a living or non-living power source. This includes, but is not limited to, bicycles, game carriers, carts, and wagons. It does not include wheelchairs when used as necessary medical appliances. It also does not include skis, snowshoes, rafts, canoes, sleds, travois, or similar primitive devices without moving parts.

**mechanical treatment:** Any of a variety of methods for cutting woody vegetation (usually trees but also including shrubs, junipers, or oakbrush) that utilizes machinery, ranging from chainsaws, to mastication equipment (e.g., hydroaxe), to feller-bunchers. The treatment could involve just cutting and spreading of woody vegetation or removing some or most of cut material from the site.

**metapopulation:** A set of partially isolated populations belonging to the same species. The populations are able to exchange individuals and re-colonize sites in which the species has recently become extinct.

**mineral:** Any naturally formed inorganic material/solid or fluid inorganic substance that can be extracted from the earth, or any of various naturally occurring homogeneous substances (as stone, coal, salt, sulfur, sand, petroleum, water, or natural gas) obtained for human use, usually from the ground. Under federal laws, considered as locatable (subject to the general mining laws), leasable (subject to the Mineral Leasing Act of 1920), and salable (subject to the Materials Act of 1947).

**mineral entry:** The filing of a claim on public land to obtain the right to any locatable minerals it may contain.

**mineral estate:** The ownership of minerals, including rights necessary for access, exploration, development, mining, ore dressing, and transportation operations.

**mineral materials:** Materials such as sand and gravel and common varieties of stone, pumice, pumicite, and clay that are not obtainable under the mining or leasing laws, but that can be acquired under the Materials Act of 1947, as amended.

**mitigation measure:** Actions taken to reduce or eliminate effects (impacts) from management actions, including 1) avoiding the impact altogether by not taking certain action or parts of an action; 2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; 3) rectifying the impacts by repairing, rehabilitating, or restoring the affected environment; 4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and 5) compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20).

**modification:** A visual quality objective meaning activities by humans may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middle ground.

**monitoring and evaluation:** The evaluation, on a sample basis, of management practices to determine how well objectives are being met, as well as the effects of those management practices

on the land and environment.

**montane:** Inhabiting the cool, moist ecological zone located near the timberline and usually dominated by evergreen trees.

**motor vehicle:** Any vehicle that is self-propelled, other than a vehicle operated on rails and any wheelchair or mobility device, including those that are battery powered, that are designed solely for use by a mobility-impaired person for locomotion, and that are suitable for use in an indoor pedestrian area.

**motor vehicle use map:** A map reflecting designated roads, trails, and areas on an administrative unit or a Ranger District of the National Forest System.

**motorized wheeled vehicle:** Includes all types of motorized wheeled vehicles capable of or designed for travel on or immediately over land or other natural terrain (motorcycles, four-wheel drive vehicles, all-terrain vehicles, sport utility vehicles, pickup trucks, etc.) and includes those vehicles that have the driving wheels moving inside endless tracks or capable of conversion to such method of travel.

**multiple use:** The management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to changing needs and conditions; the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.

**National Environmental Policy Act of 1969 (NEPA):** An act that encourages productive and enjoyable harmony between humans and their environment; promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of people; enriches the understanding of the ecological systems and natural resources important to the nation; and establishes a Council on Environmental Quality; 40 CFR 1500–1508 are the regulations for implementing the act.

**National Environmental Policy Act (NEPA) process:** All measures necessary to comply with the requirements of Section 2 and Title 1 of the National Environmental Policy Act. An interdisciplinary process, mandated by the National Environmental Policy Act, which concentrates decision-making around issues, concerns, alternatives and the effects of alternatives on the environment.

**National Forest Management Act (NFMA):** A law passed in 1976 as amendments to the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of regional and forest plans and the preparation of regulations to guide that development.

**National Forest System (NFS):** All national forest lands reserved or withdrawn from the public domain of the United States; all national forest lands acquired through purchase, exchange, donation, or other means, the national grasslands and land utilization projects administered under Title 111.

**National Forest System (NFS) road:** A forest road other than a road that has been authorized by a legally documented right-of-way held by a state, county, or other local public road authority.

**National Forest System (NFS) trail:** A forest trail other than a trail that has been authorized by a legally documented right-of-way held by a state, county, or other local public road authority.

**National Wild and Scenic Rivers System:** A system of nationally designated rivers and their immediate environments that have outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, and other similar values and are preserved in a free-flowing condition. The system

consists of three types of streams: 1) recreation—rivers or sections of rivers that are readily accessible by road or railroad and that may have some development along their shorelines and may have undergone some impoundments or diversion in the past; 2) scenic—rivers or sections of rivers free of impoundments with shorelines or watersheds still largely undeveloped but accessible in places by roads; and 3) wild—rivers or sections of rivers free of impoundments and generally inaccessible except by trails, with watersheds or shorelines essentially primitive and waters unpolluted.

**native fish:** Fish species that are indigenous to a region's waters, as opposed to introduced or exotic fish.

**native species:** Species that normally live and thrive in a particular ecosystem.

**naturalness:** Refers to an area that "generally appears to have been affected primarily by the forces of nature, with, the imprint of man's work substantially unnoticeable" (Section 2[c] of the Wilderness Act of 1964).

**NatureServe:** A non-profit conservation organization that provides the scientific information and tools needed to help guide effective conservation actions. It represents an international network of biological inventories—known as natural heritage programs or conservation data center—operating in all 50 U.S. states, Canada, Latin America, and the Caribbean.

**NatureServe conservation status rankings:** A suite of factors that are used to assess the extinction or extirpation risk of plants, animals, and ecosystems. The three broad categories that factor into these rankings include rarity, trends, and threats. Global conservation status rankings include secure (G5), apparently secure (G4), vulnerable (G3), imperiled (G2), critically imperiled (G1), possibly extinct or eliminated (GH), and presumed extinct or eliminated (GX). The Colorado Natural Heritage Program provides a similar statewide conservation status rank (reported as "S" ranks).

**net annual growth:** The average net annual increase in the volume of trees during the period between inventories. Components include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus the net volume of trees reaching the minimum size class during the year, minus the volume of trees that died during the year, and minus the net volume of trees that became cull trees during the year.

**No Action Alternative:** The No Action Alternative is required by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The No Action Alternative provides a baseline for estimating the effects of other alternatives. Where a project activity is being evaluated, the No Action Alternative is defined as one where no action or activity would take place.

**non-functional:** Riparian areas that lack the soil, water, or vegetation attributes to function properly and that are highly susceptible to degradation.

**non-functioning condition:** 1) Condition in which vegetation and ground cover are not maintaining soil conditions that can sustain natural biotic communities; 2) riparian-wetland areas are considered to be in non-functioning condition when they do not provide adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality, or other normal characteristics of riparian areas. The absence of a floodplain may be an indicator of non-functioning condition.

**non-game species:** Those species of animals that are not managed as a sport hunting resource.

**non-point source pollution:** Pollution whose source is not specific in location; the sources of the pollutant discharge are dispersed, not well defined, or constant. Examples include sediments from logging activities and runoff from agricultural chemicals.

**not suitable for timber production:** Forest land for which timber production is not a management objective (36 CFR 219.12 and Forest Service Manual 1921.12). These are lands where: 1.) statute, executive order, or regulation prohibits timber production on the land, or the Secretary of Agriculture or the Chief of the U.S. Forest Service have withdrawn the land from timber production; 2.) the land is not forest land; 3.) timber production would not be compatible with the achievement of desired

conditions and objectives established by the Land and Resource Management Plan for those lands; or 4) timber is generally not suitable for harvest.

**nutrient cycling:** This is a concept that describes how nutrients move from the physical environment into living organisms and subsequently are recycled back to the physical environment. This circular movement of nutrients is essential to any given ecosystem, and it must be balanced and stable for the systems to be maintained. There are many different nutrient cycles, each with its own particular pathways, but the most important are those involving the elements carbon, oxygen, nitrogen, and phosphorus.

**noxious weeds:** Plants designated as noxious by the Secretary of Agriculture or by the responsible state official. They are usually an invasive species. They generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (Public Law 93-639), a noxious weed is one that causes disease or has other adverse effects on people or their environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

**off-highway vehicle (OHV):** Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain. Travel on or immediately over land, water, or other natural terrain, excluding 1) any non-amphibious registered motorboat; 2) any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes; 3) any vehicle whose use is expressly authorized by the Authorized Officer, or otherwise officially approved; 4) vehicles in official use; and 5) any combat or combat support vehicle when used for national defense.

**off-road:** Any motorized travel that is not on the designated road and trail system.

**old growth:** Forest lands that meet the old growth descriptions for the Rocky Mountain Region as outlined in Mehl (1992). Old growth forests represent the late stages of forest development and are primarily distinguished by old trees, large trees, snags, and large wood on the forest floor.

The criteria used for determining old growth forests on the San Juan National Forest and Tres Rios Field Office are based on the Rocky Mountain Regional Guidelines (with slight modifications), which are documented in a publication called *Old-Growth Forests in the Southwest and Rocky Mountain Regions Proceedings of a Workshop*, March 9–13, 1992 Portal, Arizona, General Technical Report RM-213. The criteria for each cover type are as follows:

- **Ponderosa pine old growth:** Age  $\geq 200$ ; diameter at breast height  $\geq 16$  inches; large trees per acre ( $\geq 16$  inches diameter at breast height)  $\geq 10$ ; rot + dead/broken tops per acre  $\geq 1$ ; and snags (10 inches min diameter at breast height)  $\geq 2$
- **Mixed conifer old growth:** Age  $\geq 200$ ; diameter at breast height  $\geq 16$  inches; large trees per acre ( $\geq 16$  inches diameter at breast height)  $\geq 10$ ; rot + dead/broken tops per acre  $\geq 1$ ; snags (10 inches min diameter at breast height)  $\geq 2$ ; and layers  $\geq 2$
- **Spruce/fir old growth:** Age  $\geq 200$ ; diameter at breast height  $\geq 16$  inches; large trees per acre ( $\geq 16$  inches diameter at breast height)  $\geq 10$ ; rot + dead/broken tops per acre  $\geq 1$ ; snags (10 inches min diameter at breast height)  $\geq 2$ ; and layers  $\geq 2$
- **Aspen Seral:** Age  $\geq 100$ ; diameter at breast height  $\geq 14$  inches; large trees per acre ( $\geq 14$  inches diameter at breast height)  $\geq 10$ ; rot + dead/broken tops per acre  $\geq 1$ ; and understory of conifer present (Note: aspen is considered seral old growth if the stand meets the criteria and there is conifer in the understory. It is considered climax old growth if the stand meets the criteria and there is no conifer in the understory.)
- **Aspen Climax:** Age  $\geq 100$ ; diameter at breast height  $\geq 14$  inches; large trees per acre ( $\geq 14$  inches diameter at breast height)  $\geq 10$ ; rot + dead/broken tops per acre  $\geq 1$ ; and understory of conifer absent
- **Pinyon-Juniper:** Age  $\geq 200$ ; diameter at root crown  $\geq 12$  inches; large trees per acre ( $\geq 12$

inches diameter at root crown)  $\geq 30$ ; rot + dead/broken tops per acre  $\geq 1$ ; and snags (10 inches min diameter at root crown)  $\geq 1$

**open (Bureau of Land Management):** Designated areas and trails where off-road vehicles may be operated, subject to operating regulations and vehicle standards set forth by land management agencies; or an area where all types of vehicle use is permitted at all times, subject to the standards set forth by land management agencies.

**organic soils:** A soil that contains greater than 20% organic matter throughout the solum.

**outstanding waters:** An outstanding waters designation offers the highest level of water quality protection available under the Clean Water Act and Colorado regulations. This designation is designed to prevent any degradation from existing conditions.

**outstandingly remarkable values (ORVs):** Values among those listed in Section 1(b) of the Wild and Scenic Rivers Act: “scenic, recreational, geological, fish and wildlife, historical, cultural, or other similar values...” Other similar values that may be considered include ecological, biological or botanical, paleontological, hydrological, scientific, or research values (from M-8351, Bureau of Land Management Wild and Scenic Rivers Policy and Program).

**ozone (O<sub>3</sub>):** A faint blue gas produced in the atmosphere from chemical reactions of such sources as burning coal, gasoline and other fuels, and chemicals found in products including solvents, paints, hairsprays, etc.

**paleontological resource:** The Omnibus Public Lands Act of 2009 defines the term “paleontological resource” as any fossilized remains, traces, or imprints of organisms, preserved in or on the earth’s crust, that are of paleontological interest and that provide information about the history of life on earth, except that the term does not include—

1) any materials associated with an archaeological resource (as defined in Section 3(1) of the Archaeological Resources Protection Act of 1979 [16 USC 470bb(1)], or 2) any cultural item (as defined in Section 2 of the Native American Graves Protection and Repatriation Act [25 USC 3001]).

**perennial stream:** Perennial streams carry flowing water continuously throughout the year, regardless of weather conditions. They exhibit well-defined geomorphological characteristics and in the absence of pollution, thermal modifications, or other human-made disturbances have the ability to support aquatic life. During hydrological drought conditions, the flow may be impaired.

**Season-long grazing:** Livestock grazing that occurs over the entire permitted season of use.

**permitted livestock:** Livestock presently being grazed under a permit or those that were grazed under a permit during the preceding season, including their offspring retained for herd replacement.

**permitted use (Bureau of Land Management):** The forage allocated by, or under the guidance of, an applicable land use plan for livestock grazing in an allotment under a permit or lease, and is expressed in animal unit months (AUMs) (43 CFR 4100.0-5) (from H-4180-1, Bureau of Land Management Rangeland Health Standards Manual).

**permitted use (U.S. Forest Service):** The number of animals, period of use, and location of use specified in Part 1 of the grazing permit.

**plan amendment:** The system that provides a step-by-step process for considering multiple resource values, resolving conflicts, and making resource management decisions.

**phytoplankton:** Minute floating plants, usually algae, distributed throughout a body of water as deep as light penetrates.

**planning criteria:** The factors used to guide development of the resource management plan, or revision, to ensure that it is tailored to the issue previously identified and to ensure that unnecessary data collection and analysis are avoided. Planning criteria are developed to guide the collection and use of inventory data and information, analysis of the management situation, design and formulation of alternatives, estimation of the effects of alternatives, evaluation of alternatives, and selection of the

preferred alternative.

**planning horizon:** The overall time period that spans all activities covered in the Land and Resource Management Plan and all future conditions and effects of proposed actions that would influence the planning decisions. This is typically considered 50 years.

**population:** Organisms of the same species that occur in a particular place at a given time. In statistics, the aggregate of all units forming the subject of study; otherwise, a community of individuals that share a common gene pool.

**potential conservation area (PCA):** Colorado Natural Heritage Program's term used as a planning tool to delineate a geographic area focused on capturing the ecological processes that are necessary to support the continued existence of a particular element of natural heritage significance.

**potential natural vegetation:** The stable vegetation community that could occupy a site under current climatic conditions without further influence by humans. Often used interchangeably with "potential natural community."

**preferred alternative:** The agency's preferred alternative, one or more, that is identified in the environmental impact statement (40 CFR 1502.14).

**prescribed burning:** The intentional application of fire to wildland fuels in either their natural or modified state under such conditions as to allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives (i.e., silviculture, wildlife management, reduction of fuel hazard, etc.).

**prescribed fire:** A fire purposely ignited to meet specific objectives (see prescribed burning).

**prevention of significant deterioration (PSD):** An air pollution-permitting program intended to ensure that air quality does not diminish in attainment areas.

**primary succession:** The establishment and subsequent changes in a community from newly formed habitats without plants (e.g., sand dunes, lava flows, or newly exposed rock). Involves much modification of the environment by early colonists, i.e., pioneer species (such as lichens and mosses, beach grasses), which, in terrestrial environments, stabilize and enrich or even generate soil.

**primitive and unconfined recreation:** Non-motorized, non-mechanized (except as provided by law), and undeveloped types of recreational activities. Bicycles are considered mechanical transport.

**productivity:** The capacity of National Forest Service lands and their ecological systems to provide the various renewable resources in certain amounts in perpetuity (36 CFR 219.16).

**programmatic environmental impact statement:** An environmental impact statement that establishes a broad management direction for an area by establishing a goal, objective, standard, management prescription and monitoring and evaluation requirement for different types of activities that are permitted. It also can establish what activities are not permitted within the specific area(s). This document does not mandate or authorize the permitted activities to proceed.

**project:** The whole of an action, which has the potential for resulting in a physical change in the environment.

**project area:** The geographic area defining the scope of this document and the alternatives proposed by it.

**project file:** An assemblage of documents that contains all the information developed or used during an environmental analysis. This information may be summarized in an Environmental Assessment or an Environmental Impact Statement. The project file becomes part of the administrative record for judicial review in case of legal action.

**proper functioning condition:** 1) An element of the Fundamental of Rangeland Health for watersheds, and therefore a required element of state or regional standard and guidelines under 43 CFR 4180.2(b); 2) condition in which vegetation and ground cover maintain soil conditions that can

sustain natural biotic communities; 3) riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality, filter sediment, capture bedload, and aid floodplain development; improving floodwater retention and groundwater recharge; developing root masses that stabilize stream banks against cutting action; developing diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supporting greater biodiversity (the functioning condition of riparian-wetland areas is influenced by geomorphic features, soil, water, and vegetation); 4) uplands function properly when the existing vegetation and ground cover maintain soil conditions capable of sustaining natural biotic communities. The functioning condition of uplands is influenced by geomorphic features, soil, water, and vegetation.

**proposed action:** For a special use permit, a description of the project as proposed by the project proponent in the Special Use Permit application.

**protected areas:** Large, mostly unaltered, undeveloped, and unroaded lands dedicated to the protection and maintenance of biological diversity (International Union for Conservation of Nature 1994).

**Bureau of Land Management lands:** Any land or interest in land owned by the United States and administered by the Secretary of the Interior through the Bureau of Land Management.

**public scoping:** Giving the public the opportunity for free, unhampered, speaking or writing concerning the intentions, activity, or influence of a project on the community and environment.

**range analysis:** Systematic acquisition and evaluation of rangeland resource data needed for allotment management planning and overall land management.

**range improvement:** An authorized physical modification or treatment that is designed to improve production of forage, change vegetation composition, control patterns of use, provide water, stabilize soil and water conditions, and restore, protect, and improve the condition of rangeland ecosystems to benefit livestock, wild horses and burros, and fish and wildlife. The term includes, but is not limited to, structures, treatment projects, and use of mechanical devices or modifications achieved through mechanical means (43 CFR 4100).

**rangelands:** Lands that produce or are capable of producing forage for grazing and browsing animals. They include grasslands, forblands, shrublands, and forested lands.

**rangeland condition:** The present state of a rangeland relative to the potential of that rangeland, usually associated with the composition, abundance, and distribution of plant species relative to the potential natural community for that rangeland.

**Ranger District:** An administrative subdivision of the National Forest System, supervised by a District Ranger who reports to the Forest Supervisor.

**reasonable foreseeable development (RFD) scenario:** The prediction of the type and amount of oil and gas activity that would occur in a given area. The prediction is based on geologic factors, past history of drilling, projected demand for oil and gas, and industry interest.

**reclamation:** Returning disturbed land to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

**Record of Decision (ROD):** A concise public document disclosing the decision made following preparation of an environmental impact statement and the rationale used to reach that decision.

**Recreation and Public Purposes Act of 1926:** The Recreation and Public Purposes Act provided for the lease and sale of public lands determined valuable for public purposes. The objective of the act is to meet the needs of state and local government agencies and non-profit organizations by leasing or conveying public land required for recreation and public purpose uses. Examples of uses made of Recreation and Public Purposes Act lands are parks and greenbelts, sanitary landfills, schools, religious facilities, and camps for youth groups. The act provides substantial cost benefits for

land acquisition and provides for recreation facilities or historical monuments at no cost.

**recreation experiences:** Psychological outcomes realized either by recreation-tourism participants as a direct result of their on-site leisure engagements and recreation-tourism activity participation or by non-participating community residents as a result of their interaction with visitors and guests within their community and/or interaction with public land (Bureau of Land Management/U.S. Forest Service) and other public and private recreation-tourism providers and their actions.

**recreation management zones (RMZs):** Sub-units within a Special Recreation Management Area managed for distinctly different recreation products. Recreation products are composed of recreation opportunities, the natural resource and community settings within which they occur, and the administrative and service environment created by all affecting recreation-tourism providers within which recreation participation occurs.

**recreation niche:** The place or position within the strategically targeted recreation-tourism market for each Special Recreation Management Area that is most suitable (i.e., capable of producing certain specific kinds of recreation opportunities) and appropriate (i.e., most responsive to identified visitor or resident customers), given available supply and current demand, for the production of specific recreation opportunities and the sustainable maintenance of accompanying natural resource and/or community setting character.

**recreation opportunities:** Favorable circumstances enabling visitors' engagement in a leisure activity to realize immediate psychological experiences and attain more lasting, value-added beneficial outcomes.

**Recreation Opportunity Spectrum (ROS):** The ROS offers a framework to establish the desired setting conditions of access, remoteness, naturalness, built environment, social encounters, visitor impacts, and management for all areas of the San Juan National Forest and Tres Rios Field Office. These conditions are shown on the Established ROS Settings Map.

- Projects and activities shall be consistent with the established ROS settings. Because this map shows broad desired setting conditions for the entire planning area, site-specific analysis is generally necessary to further refine desired setting conditions that may apply to site-specific projects.
- Pristine areas provide outstanding opportunity for solitude, natural quiet, and isolation; sights and sounds of development do not intrude on the experience. Lands are managed to protect and perpetuate their pristine conditions. Encounters with others are rare. All travel is cross-country. There is no lasting evidence of camping activity, social trails, or other human impacts. Indirect methods of accomplishing management objectives predominate.
- Primitive areas are an essentially unmodified natural environment. These areas offer a moderate degree of solitude and natural quiet, and are managed to allow natural ecological change to occur uninterrupted. Human influence on vegetation is minimal. There may be evidence of campsites. Campsites are dispersed; usually one will not hear or see visitors at adjacent campsites. Maintained trails exist and user-established trails are evident. Evidence of management is minor.
- Semi-primitive areas are managed to protect the natural environment and provide access to primitive or pristine areas. Encounters with other users may be frequent in some concentrated use areas. Constructed and maintained trails support access to popular destinations. Use is often heavily concentrated day use; however, overnight camping occurs. Management emphasizes sustaining and protecting natural conditions. Management actions to mitigate visitor use impacts may be noticeable. Human use and activities within the area may be evident.
- **Semi-primitive non-motorized** non-wilderness backcountry areas are characterized by a quiet, predominantly natural-appearing environment. Resource modification and utilization practices are not evident. Recreation opportunities are primarily those that provide opportunities for self-reliance and challenge. Concentrations of users are low. Common recreation activities include hiking, mountain biking, hunting, fishing, backpacking, and camping.

- **Semi-primitive motorized** landscapes are similar in naturalness to semi-primitive non-motorized landscapes with motorized travel. Travel is over designated trails or high-clearance, four-wheel drive roads. Roads are designed primarily for low speeds and with native surfacing. Road and trail density provide for a sense of remoteness and solitude. Common recreation activities include motorized trail riding, four-wheel driving, visiting cultural sites, hunting, fishing, and dispersed camping.
- **Roaded natural** lands are generally high use travel corridors with a high level of visitor services and associated development. Concentrations of users can be moderate to high. The areas often take on a mosaic of development and resource evidence from highly modified areas to pockets of unmodified lands. Conventional motorized use is provided for in construction standards such as road widths and surface hardening. Road development levels are native surfaced high-clearance to levels that will accommodate passenger vehicles. Off-highway vehicle travel is common on forest roads and trails. Road and trail densities are moderate to high and interaction with the other users is to be expected. Developed campgrounds, picnic areas, trailhead, and interpretive sites may be present within this setting. Constructed recreation facilities provide for resource protection, visitor information and comfort. Hunting, fishing, biking, hiking, and viewing scenery are common activities.
- **Rural** areas are substantially modified, although they may have natural-appearing elements. Facilities are almost always designed for a large number of people and roads are generally paved. Rural areas are characterized by substantially modified natural environment. The landscape is often dominated by human-caused geometric patterns; there is also a dominant sense of open, green-space. Development of facilities is for user comfort such as pavement on roads and trails, and convenience amenities within campgrounds. Common facilities within this setting would be visitor centers, developed campgrounds that provide electricity and showers, areas with multiple facility developments such as lodges, campgrounds, and recreation residences. Driving for pleasure, viewing scenery and cultural features, camping, and picnicking are common activities.

**recreation settings:** The collective, distinguishing attributes of landscapes that influence, and sometimes actually determine, what kinds of recreation opportunities are produced.

**recreation setting character conditions:** The distinguishing recreational qualities of any landscape, objectively defined along a continuum ranging from primitive to urban landscapes, expressed in terms of the nature of the component parts of its physical, social, and administrative attributes. These recreational qualities can be both classified and mapped. This classification and mapping process should be based on variation that either exists (i.e., setting descriptions) or is desired (i.e., setting prescriptions) among component parts of the various physical, social, and administrative attributes of any landscape. The Recreation Opportunity Spectrum is one of the existing tools for doing this.

**recreation-tourism market:** Recreation-tourism visitors, affected community residents, affecting local governments and private sector businesses, or other constituents and the communities or other places where these customers originate (local, regional, national, or identify primary recreation-tourism markets for each Special Recreation Management Area).

**recreation visitor days:** One 12-hour period of recreation. It can be one person for 12 hours, two people for 6 hours, 12 people for 1 hour, etc.

**reference period:** The period of indigenous settlement from about 1500 to the late 1800s. It is a time when broad-scale climatic conditions were similar to those of today, but Euro-American settlers had not yet introduced the sweeping ecological changes (including timber harvest, livestock grazing, fire suppression, water diversions, dams, and roads) that have greatly altered many Rocky Mountain landscapes.

**recreational river:** Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

**remnant plant species:** A remnant or fragment of the vegetation of an area that remains from a former period when the vegetation was more widely distributed.

**resilient:** The capability to withstand or recover from disturbance or change.

**resource management plan (RMP):** A Bureau of Land Management planning document, prepared in accordance with Section 202 of the Federal Land Policy and Management Act, that establishes, for a given area of land, land use allocations, coordination guidelines for multiple use, objectives, and actions to be achieved. It presents systematic guidelines for making resource management decisions for a planning area. An RMP is based on an analysis of an area's resources, existing management, and capability for alternative uses. RMPs are issue oriented and developed by an interdisciplinary team with public participation.

**restoration:** The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. It is an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity, and sustainability.

**rest rotation grazing:** A grazing management scheme in which rest periods for individual pastures, paddocks, or grazing units, generally for the full growing season, are incorporated in a grazing rotation

**restricted road:** A National Forest System road or segment that is restricted from a certain type of use or all uses during certain seasons of the year or yearlong. The use being restricted and the time period must be specified. The closure is legal when the Forest Supervisor has issued an order and posted that order in accordance with 36 CFR 261.

**revegetation:** The reestablishment and development of a plant cover. This may take place naturally through the reproductive processes of the existing flora, or artificially through the direct action of reforestation or reseedling.

**right-of-way (ROW):** The public lands authorized to be used or occupied for specific purposes pursuant to a ROW grant, which are in the public interest and which require ROWs over, upon, under, or through such lands.

**riparian:** A type of ecological community that occurs adjacent to streams and rivers. It is characterized by certain types of vegetation, soils, hydrology, and fauna and requires free or unbound water or conditions more moist than that normally found in the area.

**riparian area:** A form of wetland transition between permanently saturated wetlands and upland areas. Riparian areas exhibit vegetation or physical characteristics that reflect the influence of permanent surface or subsurface water. Typical riparian areas include lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels. Excluded are ephemeral streams or washes that lack vegetation and depend on free water in the soil.

**road:** A motor vehicle route over 50 inches wide, unless identified and managed as a trail that has been improved and maintained by mechanical means to ensure relatively regular and continuous use. (A way maintained strictly by the passage of vehicles does not constitute a road.)

**roadless:** Refers to the absence of roads that have been constructed and maintained by mechanical means to ensure regular and continuous use.

**roadless area:** A National Forest System area that: 1) is larger than 5,000 acres, or if smaller than 5,000 acres, contiguous to a designated wilderness or primitive area; 2) contains no roads; and 3) has been inventoried for possible inclusion in the wilderness preservation system.

**Roadless Area Review and Evaluation (RARE II):** Roadless areas inventoried in the second roadless area review and evaluation (36 CFR 219.17).

**rock art:** Petroglyphs (carvings) or pictographs (painting) used by native persons to depict their history and culture.

**rotation:** The number of years (including the regeneration period) required to establish and grow timber crops to a specified condition or maturity under even-aged management. Selected integrated

prescriptions in the land management plan provide the basis for the rotation age. This is used to calculate the contribution to long-term sustained-yield capacity for the Land and Resource Management Plan area from lands suitable for timber production.

**rotation age:** The period of years between when a forest stand (i.e., primarily even-aged) is established (i.e., regeneration) and when it receives its final harvest. This time period is an administrative decision based on economics, site condition, growth rates, and other factors.

**rotation grazing:** A component of grazing systems that require two or more pastures between which grazing animals are moved in sequence resulting in grazing periods being followed by non-grazing periods (Vallentine 1990).

**routes:** A combination of roads, trails, or ways that are used by motorized vehicles (including jeeps, all terrain vehicles, motorized dirt bikes, etc.), mechanized uses and mechanical transport (mountain bikes, wheelbarrows, game carts), pedestrians (hikers), and/or equestrians (horseback riders).

**satisfactory rangeland conditions:** Rangelands are considered to have satisfactory rangeland conditions if current conditions are meeting or moving toward the desired conditions identified in an allotment management plan or in a land health determination. Desired conditions in an allotment management plan or land health determination are developed using Bureau of Land Management Colorado Public Land Health Standards (Bureau of Land Management 1997) and/or the Rangeland Analysis and Management Training Guide (Rocky Mountain Region 1996), respectively.

**scenic byways:** Highway routes, which have roadsides or corridors of special aesthetic, cultural, or historic value. An essential part of the highway is its scenic corridor. The corridor may contain outstanding scenic vistas, unusual geologic features, or other natural elements.

- Scenic attractiveness is a measure of the landscape's scenic importance based on common human perceptions of the intrinsic scenic beauty of landforms, rock forms, water forms, vegetation patterns, and cultural features. There are three levels of inherent scenic attractiveness that classify the scenic quality of natural landscapes.
- **Class A - Distinctive:** areas where features of landform, vegetative patterns, water forms and rock formation are of unusual or outstanding scenic quality.
- **Class B - Common:** areas where features contain variety in form, line, color and texture or combinations thereof but tend to be common throughout the landscape province and are not outstanding scenic quality.
- **Class C - Undistinguished:** areas whose features have little change in form, line, color, or texture. Includes all areas not found under Classes A and B.
- Scenic sustainability is a measure of the degree to which the ecosystem is likely able to restore, maintain, or continue to exhibit the positive dominant attributes of the landscape character. It is a continuum that ranges from high to low. High scenic sustainability is a prediction that all positive dominant attributes of the landscape character are perpetuated (during the planning period), moderate is a prediction that there is some loss of attributes, and low is the loss of most or all attributes.
- Scenic integrity is a measure of the lack of noticeable human-caused disturbance in the area that detracts from the dominant, valued attributes of landscape character. The baseline from which to measure scenic integrity is dependent on a complete and accurate description of the important and dominant positive landscape character attributes that are viewed at the time of measurement. It can be used to describe scenery in the past, as it presently exists, and as predicted in the future. Scenic integrity is a continuum that ranges from very high to low. Landscapes with a high degree of scenic integrity have virtually no discordant elements and contain only positive human alterations. They are intact, unimpaired and appear to be in good visual condition. On the opposite end of the continuum, landscapes with low scenic integrity usually have negative human alterations and are in poor visual condition. They often contain discordant and contrasting features such as geometric shapes resulting from vegetative

treatment, structures that do not blend with their surroundings, or roads that create large cut and fill slopes across steep hillsides.

**Scenic Integrity Levels:**

- **Very High** – refers to landscapes where the valued landscape character “is” intact with only minute if any deviations. The existing landscape character and sense of place is expressed at the highest possible level.
- **High** – refers to landscapes where the valued landscape character “appears” intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
- **Moderate** – refers to landscapes where the valued landscape character “appears slightly altered.” Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- **Low** – refers to landscape where the valued landscape character “appears moderately altered.” Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complimentary to the character within.
- **Very Low** – refers to landscapes where the valued landscape character “appears heavily altered.” Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles within or outside the landscape being viewed. However deviations must be shaped and blended with the natural terrain (landforms) so that elements such as unnatural edges, roads, landings, and structures do not dominate the compositions.

**scenic river:** A river or section of a river that is free of impoundments and whose shorelines are largely undeveloped but accessible in places by roads.

**scoping:** The procedures by which the U.S. Forest Service and the Bureau of Land Management determine the extent of analysis necessary for a proposed action, i.e., the range of actions, alternatives, and impacts to be addressed, identification of significant issues related to a proposed action, and establishing the depth of environmental analysis, data, and task assignments needed.

**scrubland:** Areas dominated by woody shrubs. These areas include sagebrush, salt desert shrub, and mountain shrub vegetation types.

**season of use:** The time during which livestock are permitted on a given range area, i.e., grazing allotment, as specified in the grazing permit or lease. Synonymous with “grazing season.”

**seasonal closure:** A temporary closure of an area or road for a part of the year.

**Section 404 permit:** A permit issued by the U.S. Army Corps of Engineers, as dictated in Section 404 of the Clean Water Act, that specifies that anyone wishing to place dredged or fill materials into the waters of the U.S. and adjacent jurisdictional wetlands shall apply to the U.S. Army Corps of Engineers for approval.

**secondary succession:** Results from changes in an area that previously had a vegetation community where disturbance (i.e., surface disturbance, insect pest or disease) reset the stage of the community to an earlier point in the succession process but did not reset it to the primary succession stage.

**sediment:** Material suspended in liquid or air. Any material carried in suspension by water, which will ultimately settle to the bottom. Sediment has two main sources: from the channel area itself and from disturbed sites.

**self-sustaining population:** A population of organisms that has appropriate characteristics, including the abundance and distribution of individuals of the population, to provide for its long-term persistence.

**semiarid:** Moderately dry; region or climate where moisture is normally greater than under arid conditions but still definitely limits the production of vegetation.

**sensitive species:** A plant or animal listed by a state or federal agency as being of environmental concern that includes, but is not limited to, threatened and endangered species.

**sensitivity level:** A particular degree or measure of viewer interest in the scenic qualities of the landscape.

**seral:** The stage of succession of a plant community that is transitional. If left alone, the seral stage will give way to another plant community that represents a further stage of succession.

**severe winter range:** Areas within the winter range where 90% of the individuals are located when annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten.

**shrub:** A plant with persistent woody stems and relatively low growth form; usually produces several basal shoots as opposed to a single bole; differs from a tree by its low stature and non-arborescent form.

**significant:** As used in the National Environmental Policy Act, requires consideration of both context and intensity. Context means that the significance of an action must be analyzed in several contexts, such as society as a whole and the affected region, interests, and locality. Intensity refers to the severity of impacts (40 CFR 1508.27).

**significant effect:** A substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, water, minerals, flora, fauna, and objects of historic or aesthetic significance.

**silvicultural system:** A planned series of treatments for tending, harvesting, and re-establishing a stand. The system name is based on the number of age classes (coppice, even-aged, two-aged, uneven-aged) or the regeneration method (clearcutting, seed tree, shelterwood, selection, coppice) used.

**snag:** A standing dead tree.

**soil quality:** The capacity of a specific kind of soil to function within natural or managed ecosystem boundaries, sustain plant and animal productivity, maintain or enhance the quality of water and air, and support human health and habitation (Natural Resources Conservation Service 2001).

**soil productivity:** The inherent capacity of a soil to support the growth of specified plants or plant communities.

**Special Recreation Management Area (SRMA):** A public lands unit identified in land use plans to direct recreation funding and personnel to fulfill commitments made to provide specific, structured recreation opportunities (i.e., activity, experience, and benefit opportunities). The Bureau of Land Management recognizes three distinct types of SRMAs: community-based, intensive, and undeveloped big open (H-1601-1, Bureau of Land Management Land Use Planning Handbook).

**special-status species:** Collectively, federally listed species, species proposed for federal listing, candidates for federal listing, Region 2 Regional Forester's sensitive species, and Colorado Bureau of Land Management State Director's sensitive species.

**Special Use Permit:** A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of National Forest System lands for some special purpose.

**species:** Any member of the currently accepted and scientifically defined plant or animal kingdoms of

organisms (U.S. Forest Service 2005). A unit of classification of plants and animals consisting of the largest and most inclusive array of sexually reproducing and cross-fertilizing individuals which share a common gene pool.

**species of concern:** Species for which the Responsible Official determines that management actions may be necessary to prevent listing under the Endangered Species Act.

**species of interest:** Species for which the Responsible Official determines that management actions may be necessary or desirable to achieve ecological or other multiple-use objectives.

**stand:** A vegetation community sufficiently uniform in composition, age, spatial arrangement, or condition to be distinguishable from an adjacent vegetation community.

**standard:** A particular action, level of performance, or threshold specified by the Forest Plan for resource protection or accomplishment of management objectives. Unlike “guidelines” which are optional, standards specified in the Forest Plan are mandatory.

**State Implementation Plan:** A detailed description of the programs a state will use to carry out its responsibilities under the Clean Air Act. State implementation plans are collections of the regulations used by a state to reduce air pollution.

**stocking:** The degree to which trees occupy the land, measured by basal area or the number of trees per given area.

**Stocking rate:** Acres of suitable rangeland required to support one animal unit month. In the western United States generally expressed as acres/animal unit month.

**structure:** The horizontal and vertical distribution of components in a vegetation community, including the height, diameter, crown layers, and stems of the plants, and the amount and arrangement of snags and down woody material.

**subalpine:** A terrestrial community that generally is found in harsher environments than the montane terrestrial community. Subalpine communities are generally colder than montane and support a unique clustering of wildlife species.

**succession:** The progressive replacement of plant communities on a site that leads to the potential natural community.

**suitability:** The appropriateness of a particular area of land for applying certain resource management practices, as determined by an analysis of the existing resource condition of that land. A unit of land may be suitable for a variety of management practices.

**suitable habitat:** Habitat that currently has the attributes needed for a given species.

**sustainability:** Obtaining yields and services from ecosystems without irreversibly affecting their resilience, natural resistance to change, or ability to meet the needs of future generations.

**summer range:** A range, usually at higher elevation, used by deer and elk during the summer; a summer range is usually much more extensive than a winter range.

**sustained yield:** Sustained yield of wood fiber that properly harvested and mitigated, would sustain the underlying ecosystem processes.

**take:** To harass, harm, pursue, hunt, shoot, kill, trap, capture, or collect a species listed under the Endangered Species Act, or to attempt to engage in any such conduct.

**taxonomic orders:** The sequence in listing of “taxa” which aids ease of use and roughly reflects the evolutionary relationships among the “taxa” (i.e., families, genera, species, etc.).

**temporary road or trail:** A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and that is not included in a forest transportation atlas.

**terrestrial ecosystem:** Ecosystems that occur in relatively dry, upland landscape positions.

**thermal cover:** Vegetation used by animals to modify the adverse effects of weather. A forest stand that is at least 40 feet in height with tree canopy cover of at least 70% provides thermal cover. These stand conditions are achieved in closed sapling-pole stands and by all older stands unless the canopy cover is reduced below 70%. Deciduous stands may serve as thermal cover in summer, but not in winter.

**threatened species:** Any species likely to become endangered within the foreseeable future throughout all or a significant portion of its range and that has been designated in the *Federal Register* by the Secretary of the Interior as such (Forest Service Manual 2670.5).

**tiering:** The use of a previously written environmental document with a broad scope to cover discussion of issues common to both.

**timber harvest:** The removal of trees for wood fiber use and other multiple-use purposes.

**timber production:** The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use (36 CFR 219.16).

**timber sale program quantity (TSPQ):** The estimated output of timber from the planning area. The estimate is displayed as an average annual cubic foot output for a decade. It includes projected outputs from lands generally suitable for timber harvest. The projected timber outputs reflect past and projected budget levels and organizational capacity to achieve the desired conditions and objectives in the Land and Resource Management Plan (36 CFR 219.12 and Forest Service Manual 1921.12).

**total maximum daily load (TMDL):** An estimate of the total quantity of pollutants (from all sources: point, non-point, and natural) that may be allowed into waters without exceeding applicable water quality criteria.

**total tree timber harvest:** A timber harvest method that removes the whole tree, including the tree top and all its branches.

**traditional cultural property:** A property that derives significance from traditional values associated with it by a social and/or cultural group such as an Indian tribe or local community. A traditional cultural property may qualify for the National Register of Historic Places if it meets the criteria and criteria exceptions at 36 CFR 60.4. See National Register Bulletin 38.

**trail:** A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail.

**tribe:** Term used to designate a federally recognized group of American Indians and their governing body. Tribes may be composed of more than one band.

**unauthorized road or trail:** A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas.

**understory:** Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

**undertaking:** A term with legal definition and application i.e., "actions carried out by or on behalf of the agency; those carried out with Federal financial assistance; those requiring a Federal permit, license, or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a federal agency." (See National Historic Preservation Act, Section 106 and Section 301(7), Appendix 5; 36 CFR Part 800).

**undeveloped recreation-tourism market:** National, regional, and/or local recreation tourism visitors, communities, or other constituents who value public lands for the distinctive kinds of dispersed recreation produced by the vast size and largely open, undeveloped character of their recreation settings. Major investments and facilities are excluded within Special Recreation Management Areas where the strategy is to target demonstrated undeveloped recreation-tourism market demand. Here,

recreation management actions are geared toward meeting primary recreation-tourism market demand to sustain distinctive recreation setting characteristics; however, major investments in visitor services are authorized both to sustain those distinctive setting characteristics and to maintain visitor freedom to choose where to go and what to do—all in response to demonstrated demand for undeveloped recreation.

**upland:** The portion of the landscape above the valley floor or stream.

**uneven-aged management:** Actions resulting in the creation of stands in which trees of different ages grow together. Cutting is usually regulated by specifying the number or proportion of trees of particular size to retain within each cut area, thereby maintaining a planned distribution of size classes.

**ungulate:** A hooved mammal such as a deer, elk, horse, sheep, or cow.

**valid existing rights:** Any lease established (and valid) prior to a new authorization, change in land designation, or in regulation.

**viable populations:** A wildlife population of sufficient size to maintain its existence over time in spite of normal fluctuations in population levels.

**visibility (air quality):** A measurement of the ability to see and identify objects at different distances.

**visitor day:** Twelve visitor hours, which may be aggregated by one or more persons in single or multiple visits.

**visitor use:** Visitor use of a resource for inspiration, stimulation, solitude, relaxation, education, pleasure, or satisfaction.

**Visual Quality Objective (VQO):** A system of indicating the potential expectations of the visual resource by considering the frequency an area is viewed and the type of landscape.

- **Maximum Modification:** A Visual Quality Objective meaning human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.
- **Modification:** A Visual Quality Objective meaning human activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middle ground.
- **Partial Retention:** A Visual Quality Objective that, in general, means human activities may be evident but must remain subordinate to the characteristic landscape.
- **Preservation:** A Visual Quality Objective that provides for ecological change only.
- **Retention:** A Visual Quality Objective that, in general, means human activities are not evident to the casual forest visitor.

**visual resource:** The visible physical features of a landscape (topography, water, vegetation, animals, structures, and other features) that constitute the scenery of an area.

**Visual Resource Inventory (VRI) classes:** For Bureau of Land Management lands, scenic conditions and anticipated effects are measured using the VRI Class.

- VRI classes are assigned through the inventory process. These are generally assigned based on a combination of scenic quality, sensitivity level, and distance zones. Inventory classes are informational in nature and provide the basis for considering visual values in the resource management plan process. They do not establish management direction and should not be used as a basis for constraining or limiting surface disturbing activities.

**Visual Resource Management (VRM):** The system by which Bureau of Land Management classifies and manages scenic values and visual quality of public lands. The system is based on research that

has produced ways of assessing aesthetic qualities of the landscape in objective terms. After inventory and evaluation, lands are given relative visual ratings (see definition for Visual Resource Management classes), which determine the amount of modification allowed for the basic elements of the landscape.

**Visual Resource Management (VRM) classes:** VRM classes define the degree of acceptable visual change within a characteristic landscape. A class is based on the physical and sociological characteristics of any given homogeneous area and serves as a management objective. Categories assigned to public lands based on scenic quality, sensitivity level, and distance zones. Each class has an objective, which prescribes the amount of change allowed in the characteristic landscape.

- **VRM Class I Objective:** To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- **VRM Class II Objective:** To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.
- **VRM Class III Objective:** To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- **VRM Class IV Objective:** To provide for management activities that requires major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

**volatile organic compounds (VOCs):** Volatile organic chemicals that produce vapors readily, at room temperature and normal atmospheric pressure. Volatile organic chemicals include gasoline, industrial chemicals such as benzene, solvents such as toluene and xylene, and tetrachloroethylene (perchloroethylene, the principal dry cleaning solvent).

**water quality:** The biological, physical, and chemical properties of water that make it suitable for specific uses.

**water use and disposal management plan:** a comprehensive document that addresses the anticipated sources, quality, quantity, delivery, handling, storage, and disposal of both water utilized and wastewater generated during the various phases of project activities associated with fluid and solid mineral development. For wastewater, the expected locations and methods of disposal, treatment, and/or reuse that will be utilized during the life of the project shall also be included. The water use and disposal management plan must provide adequate information for the agency to complete site-specific the National Environmental Policy Act analysis and to ensure compliance with all state and federal requirements prior to approval, and the operator is required to perform all project activities in conformance with this plan.

**watershed:** The entire land area that contributes water to a particular drainage system or stream.

**wetlands:** Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, etc.

**whirling disease:** This disease is caused by a myxosporean parasite that afflicts juvenile fish (fingerlings and fry) and causes skeletal deformities and neurological damage. Fish with this disease “whirl” forward in an awkward corkscrew-like pattern of swimming, find feeding difficult, and are more vulnerable to predators.

**Wild and Scenic Study River (WSR):** Rivers identified in Section 5 of the Wild and Scenic Rivers Act for study as potential additions to the National Wild and Scenic Rivers System.

**wild river:** Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

**Wild, Scenic, and/or Recreational:** The term used in this Manual Section for what is traditionally shortened to “Wild and Scenic” rivers. Designated river segments are classified, i.e., wild, scenic, and/or recreational, but cannot overlap (from M-8351, Bureau of Land Management Wild and Scenic Study Rivers Policy and Program).

**wilderness:** A congressionally designated area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, that is protected and managed to preserve its natural conditions and that: 1) generally appears to have been affected mainly by the forces of nature, with human imprints substantially unnoticeable; 2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; 3) has at least 5,000 acres or is large enough to make practical its preservation and use in an unimpaired condition; and 4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value. The definition contained in Section 2(c) of the Wilderness Act of 1964 (78 Stat. 891).

**wilderness characteristics:** Wilderness characteristics include size, the appearance of naturalness, outstanding opportunities for solitude, or a primitive and unconfined type of recreation. They may also include ecological, geological, or other features of scientific, educational, scenic, or historical value. However Section 2(c) of the Wilderness Act of 1964 has been updated by Instruction Memorandum 2003-195, dated June 20, 2003. Indicators of an area’s naturalness include the extent of landscape modifications, the presence of native vegetation communities, and the connectivity of habitats. Outstanding opportunities for solitude or primitive and unconfined types of recreation may be experienced when the sights, sounds, and evidence of other people are rare or infrequent, in locations where visitors can be isolated, alone or secluded from others, where the use of the area is through non-motorized, non-mechanical means, and where no or minimal developed recreation facilities are encountered.

**wilderness study area (WSA):** A designation made through the land use planning process of a roadless area found to have wilderness characteristics as described in Section 2(c) of the Wilderness Act of 1964.

**wildfire:** Unplanned human or naturally caused fires in wildlands.

**wildland fire:** Any fire, regardless of ignition source, that is burning outside a prescribed fire and any fire burning on public lands or threatening public land resources, where no fire prescription standards have been prepared.

**wildland urban Interface (WUI):** The area adjacent to an at-risk community that is identified in the community wildfire protection plan, or if there is no community wildfire protection plan in place, the area 0.5 mile from the boundary.

**winter concentration area:** That part of the winter range of a species where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five winters out of 10. (winter range is defined as that part of the overall range of a species where 90% of the individuals are located during the average five winters out of 10 from the first heavy snowfall to spring green-up, or during a site specific period of winter as defined for each data analysis unit).

**winter range:** A range, usually at lower elevation, used by migratory deer and elk during the winter months; usually better defined and smaller than summer ranges.

**woody debris recruitment:** The actions that cause trees, branches, sticks, and other wood to fall into streams and rivers and influence the flow and shape of the stream channels and subsequent aquatic habitat

**Zooplankton:** Minute primary animal consumers that feed directly on phytoplankton (minute living plants) in a body of water.

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