

APPENDIX B
WATERSHED DATA ACQUISITION

The compilation of watershed information for SAMI's aquatic and terrestrial effects assessments involved identification and acquisition of data collected over a range of spatial and temporal scales. Regionally extensive information was mainly limited to stream water composition data obtained for one or only a few points in time. More comprehensive information, including stream water composition data obtained for multiple points in time, as well as soil and vegetation data, was available for a number of intensively studied watersheds and geographically limited research areas.

1. Regionally Extensive Data Sources

The National Stream Survey

- *Stream water composition*

A one-time synoptic sampling survey to obtain acid-base chemistry data for regional surface waters was conducted in 1986 as part of the National Acid Precipitation Assessment Program (Kaufmann et al., 1988). Data obtained for the SAMI region included: 69 sites in WV, 36 sites in VA, 40 sites in NC, 21 sites in TN, and 19 sites in GA. Contact: Alan Herlihy, U.S. EPA, Corvallis, Oregon.

Environmental Monitoring and Assessment Program

- *Stream water composition*

Acid-base chemistry data were obtained for regional surface waters through aquatic monitoring components of the U.S. EPA Environmental Monitoring and Assessment Program. Data obtained for the SAMI region included: 154 sites in WV, 180 sites in VA, and 3 sites in NC. Contact: Alan Herlihy, U.S. EPA, Corvallis, Oregon.

Virginia Trout Stream Sensitivity Survey

- *Stream water composition*

Acid-base chemistry data were obtained for 304 streams sampled in a 1987 synoptic survey of native brook trout streams in western Virginia mountain watersheds associated with non-carbonate bedrock. Additional time-series data (quarterly samples beginning in 1988) were obtained for a subset of 60 streams representing a lithologic stratification of the streams in the larger population. Contact: Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

U.S.D.A. Forest Service TN/NC/SC Stream Surveys

- *Stream water composition*

Acid-base chemistry data were obtained for streams sampled in a 1999-2000 synoptic survey of National Forest streams in North Carolina and Tennessee. Data were obtained for 36 sites in NC and 29 sites in TN. Contact: Bill Jackson, U.S.D.A. Forest Service, Asheville, North Carolina.

Direct-Delayed Response Project

- *Soils information*

Chemical analyses of soils were obtained for a subset of watersheds associated with the National Stream Survey as part of the National Acid Precipitation Assessment Program (Church et al., 1992). Contact: Robbins Church, U.S.EPA, Corvallis, Oregon.

2. Geographically Intensive Data Sources

Otter Creek and Dolly Sods Wildernesses (WV)

- *Stream water composition*

A one-time synoptic sampling survey was conducted in May 1994 providing acid-base chemistry for surface water sites in Otter Creek Wilderness (OCW) and Dolly Sods Wilderness (DSW) (Webb et al., 1997). Data for the SAMI assessment were obtained for 8 major tributaries in OCW and 5 major tributaries in DSW. Contact: Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

- *Soils information*

Chemical analyses were obtained for recent samples from represented soil series in OCW and DSW. Contact: Anthony Jenkins, U.S.D.A. Natural Resource Conservation Service, Fayetteville, West Virginia.

- *Mineralogical information*

Bedrock maps and general lithology were summarized by Webb et al., (1997) based on earlier geologic maps and reports. Contact: Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

- *Vegetation information*

Descriptions of vegetation characteristics were provided with soil sampling site descriptions. Contact: Anthony Jenkins, U.S.D.A. Natural Resource Conservation Service, Fayetteville, West Virginia.

Fernow Experimental Forest (WV)

- *Stream water composition*

Acid-base chemistry data were obtained for 3 control (undisturbed) watersheds sampled weekly beginning in 1987. Daily discharge data were also obtained. Contact: Mary Beth Adams, U.S.D.A. Forest Service, Timber and Watershed Laboratory, Parsons, West Virginia.

- *Soils information*

Chemical analyses were obtained for soil samples collected in 1988 from one of the watersheds and considered representative of the other watersheds. Soil water chemistry was obtained during 1989-1995 from one of the watersheds. Contact: Mary Beth Adams, U.S.D.A. Forest Service, Timber and Watershed Laboratory, Parsons, West Virginia.

Sulfate adsorption data were obtained for an adjacent Fernow watershed, providing a reasonable surrogate (Lusk, 1988).

- *Mineralogical information*

Soil mineralogy data were obtained for an adjacent Fernow watershed, providing a reasonable surrogate (Lusk, 1988).

- *Vegetation information*

Descriptions of vegetation characteristics were obtained for one of the watersheds and considered representative of the other watersheds. Contact: Mary Beth Adams, U.S.D.A. Forest Service, Timber and Watershed Laboratory, Parsons, West Virginia.

Total above ground biomass data for Fernow forests was obtained from Adams (1999).

James River Face Wilderness (VA)

- *Stream water composition*

A one-time synoptic sampling survey was conducted in January 1991 providing acid-base chemistry for 4 watersheds. Contact: Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia. (Note: additional data

were obtained for 2 sites sampled quarterly beginning in 1991. The data for these sites are included in the VTSSS regional-scale data set.)

- *Soils information*

Chemical analyses were obtained one watershed considered representative of the other watersheds were obtained for samples collected in 2000. Contact: Cindy Huber, U.S.D.A. Forest Service, Roanoke, Virginia.

- *Mineralogical information*

Bedrock maps and general lithology obtained from Spencer (1968).

- *Vegetation information*

Descriptions of vegetation characteristics were provided with soil sampling site descriptions and Rawinski et al. (1996).

Shenandoah National Park (VA)

- *Stream water composition*

Weekly stream water sampling beginning 1979-1992 provided acid-base chemistry for 6 watersheds. Continuous discharge gaging provided for 5 of the watersheds. Contact: Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

- *Soils information*

Chemical analyses were obtained for samples collected in 2 of the watersheds (White Oak Run and North Fork of Dry Run). Contact: Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

- *Mineralogical information*

Bedrock maps and general lithology obtained from Gathright (1976).

- *Vegetation information*

Descriptions of vegetation characteristics were provided by parkwide vegetation mapping. Contact: Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

Lewis Fork Wilderness (VA)

- *Stream water composition*

Quarterly stream water sampling data were obtained for Lewis Fork through the regional-scale VTSSS sampling program. Contact: Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

- *Soils information*

Chemical analyses were obtained for samples collected in 2000. Contact: Cindy Huber, U.S.D.A. Forest Service, Roanoke, Virginia.

- *Mineralogical information*

Bedrock maps and general lithology obtained from U.S.D.A. geologic map coverage. Contact: Cindy Huber, U.S.D.A. Forest Service, Roanoke, Virginia.

- *Vegetation information*

Descriptions of vegetation characteristics were provided with soil sampling site descriptions.

White Top Mountain (VA)

- *Soils information*

Chemical analyses were obtained for 2 samples collected near the summit. Soil solution chemistry data were obtained for samples collected from 25 sites in the summit area. Contact: Alan Mays, Tennessee Valley Authority, Norris, Tennessee.

- *Mineralogical information*

Provided in site descriptions of Joslin and Wolfe (1992).

- *Vegetation information*

Descriptions of vegetation characteristics were provided by Joslin and Wolfe (1992).

Clinch Ranger District (VA)

- *Stream water composition*

Acid-base chemistry data for stream water samples collected 4 times during the period 1996-2000 were obtained for 5 streams in the Clinch Ranger District of the Jefferson National Forest. Contact: Cindy Huber, U.S.D.A. Forest Service, Roanoke, Virginia.

Great Smoky Mountains National Park (NC)

- *Stream water composition*

Acid-base chemistry data were obtained for samples collected at 7 sites in 2000 for association with available soil data. Contacts: Jim Renfro, Great Smoky Mountains National Park, Gatlinburg, TN; Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

- *Soils information*

Chemical analyses of soil samples, as well as soil solution chemistry data, were provided for Noland Divide, Becking, and Beech sites in Johnson and Lindberg (1992).

Chemical analyses of soil samples, as well as soil solution chemistry data, were provided for sites in the Raven Fork-Enloe Creek basin in Jones et al. (1983). Additional detailed records of sampling and analyses were also obtained. Contact: Alan Mays, Tennessee Valley Authority, Norris, Tennessee.

Chemical analyses of soil samples, as well as soil solution chemistry data, were obtained for Cove Mountain and Twin Creek sites. Contact: Alan Mays, Tennessee Valley Authority, Norris, Tennessee.

- *Mineralogical information*

Soil mineralogical information for the Noland Divide, Becking, and Beech sites was provided in site descriptions in Johnson and Lindberg (1992).

- *Vegetation information*

Descriptions of vegetation characteristics were provided with soil sampling site descriptions in Johnson and Lindberg (1992) and Johnson and Lindberg (1992), as well as with soil sampling site descriptions for Cove Mountain and Twin Creek sites.

Black Mountain (NC)

- *Stream water composition*

A single site on the South Fork of Upper Creek was sampled for analysis of acid-base chemistry in 2000. Contacts: Pat Brewer, SAMI, Asheville, North Carolina; Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia.

- *Soils information*

Chemical analyses were provided for one site sampled in the South Fork of Upper Creek watershed in 1985. Contact: Pat Brewer, SAMI, Asheville, North Carolina.

Joyce Kilmer/Shining Rock Wilderness (NC)

- *Stream water composition*

Acid-base chemistry data were obtained for samples collected weekly in 1999 at one site in Joyce Kilmer. Contact: Jim Vose, Coweeta Hydrologic Laboratory, Otto, North Carolina. (Note: additional stream water composition data were obtained for Joyce Kilmer/Shining Rock Wilderness through regional synoptic sampling

conducted by the U.S.D.A. Forest Service. These data are included in the U.S.D.A. Forest Service TN/NC/SC Stream Surveys data set.)

- *Soils information*

Chemical analyses were provided for one site sampled in Joyce Kilmer. Contact: Jim Vose, Coweeta Hydrologic Laboratory, Otto, North Carolina.

- *Mineralogical information*

Soil mineralogy data were provided with soil sampling site descriptions. Contact: Jim Vose, Coweeta Hydrologic Laboratory, Otto, North Carolina.

- *Vegetation information*

Descriptions of vegetation characteristics were provided with soil sampling site descriptions. Contact: Jim Vose, Coweeta Hydrologic Laboratory, Otto, North Carolina.

Laurel Branch (TN)

- *Stream water composition*

Acid-base chemistry data were obtained for samples collected monthly on Laurel Branch in 1986-1987 (Olem et al., 1988).

- *Soils information*

Chemical analyses were provided for multiple sites sampled in 1987. Contact: Alan Mays, Tennessee Valley Authority, Norris, Tennessee.

- *Mineralogical information*

Soil mineralogy data were provided with soil sampling site descriptions. Contact: Alan Mays, Tennessee Valley Authority, Norris, Tennessee.

- *Vegetation information*

Descriptions of vegetation characteristics were provided in Olem et al. 1988).

Cohutta Wilderness (GA)

- *Stream water composition*

Acid-base chemistry data were obtained for samples collected on 4 streams in 1992-1994. Contact: Dave Wergowske, U.S.D.A. Forest Service, Montgomery, Alabama.

- *Soils information*

Chemical analyses were provided for sites sampled in 2000. Contact: Dave Wergowske, U.S.D.A. Forest Service, Montgomery, Alabama.

- *Mineralogical information*

Soil mineralogy data were provided with soil series descriptions. Contact: Dave Wergowske, U.S.D.A. Forest Service, Montgomery, Alabama.

Sipsey Wilderness (GA)

- *Stream water composition*

Acid-base chemistry data were obtained for samples collected on 3 streams in 1991-1994. Contact: Dave Wergowske, U.S.D.A. Forest Service, Montgomery, Alabama.

- *Soils information*

Chemical analyses were provided for sites sampled in 2000. Contact: Dave Wergowske, U.S.D.A. Forest Service, Montgomery, Alabama.

- *Mineralogical information*

Soil mineralogy data were provided with soil series descriptions. Contact: Dave Wergowske, U.S.D.A. Forest Service, Montgomery, Alabama.

References

- Adams, M.B. 1999. Acidic deposition and sustainable forest management in the central Appalachians, USA. *Forest Ecology and Management*, 122, 17-28.
- Church, M.R., P.W. Shaffer, D.L. Thornton, D.L. Cassell, C.I. Liff, M.G. Johnson, D.A. Lammers, J.J. Lee, G.R. Holdren, J.S. Kern, L.H. Liegel, S.M. Pierson, D.L. Stevens, B.P. Rochelle, and R.S. Turner, 1992. Direct/Delayed Response Project: Future Effects of Long-Term Sulfur Deposition on Surface Water Chemistry in the Mid-Appalachian Region of the Eastern United States. EPA/600/R-92/186, U.S. Environmental Protection Agency, Washington DC.
- Gathright, II, T.M. 1976. Geology of Shenandoah National Park. Virginia Division of Mineral Resources, Charlottesville, VA.
- Johnson, D.W., and S.E. Lindberg. 1992. Atmospheric Deposition and Forest Nutrient Cycling. Ecological Studies, Springer-Verlag, New York.
- Jones, H.C. J.C. Noggle, R.C. Young, J.M. Kelly, H. Olem, R.J. Ruane, R.W. Pasch, G.J. Hyfantis, and W.J. Parkhurst. 1983. Investigation of the Cause of Fish Kills in Fish-Rearing Facilities in Raven Fork Watershed. Division of Air and Water Resources, Tennessee Valley Authority.

- Joslin, J.D., and M.H. Wolfe. 1992. Red spruce soil solution chemistry and root distribution across a clout water deposition gradient. *Canadian Journal of Forest Research*, 22, 893-904.
- Kaufmann, P.R., A.T. Herlihy, J.W. Elwood, M.E. Mitch, W.S. Overton, M.J. Sale, J.J. Messer, K.A. Cougan, D.W. Peck, K.H. Rechhow, A.J. Kinney, S.J. Christi, D.D. Brown, C.A. Hagley, and H.I. Jager, 1988. Chemical Characteristics of Streams in the Mid-Atlantic and Southeastern United States. Volume I: Population Descriptions and Physico-Chemical Relationships. WPA/600/3-88/021a. U.S. Environmental Protection Agency, Washington DC.
- Lusk, M.G. 1988. Sulfate Dynamics and Base Cation Release in a High Elevation Appalachian Forest Soil. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA.
- Olem, H., D.A. Lietzke, and P.A. Mays. 1988. Episodic Changes in Stream Water Quality in the Southern Blue Ridge Province. Division of Air and Water Resources, Tennessee Valley Authority.
- Rawinski, T.J., K.N. Hickman, J. Waller-Eling, G.P. Fleming, C.S. Austin, S.D. Helmick, C. Huber, G. Kappesser, F.C. Huber, Jr., T. Bailey, and T.K. Collins. 1996. Plant Communities and Ecological Land Units of the Glenwood Ranger District, George Washington and Jefferson National Forests, Virginia. Natural Heritage Technical Report 96-20. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA.
- Spenser, E.W., 1968. Geology of the Natural Bridge, Sugarloaf Mountain, Buchanan, and Arnold Valley Quadrangles. Virginia Department of Conservation and Economic Development, Division of Mineral Resources, Charlottesville, VA.
- Webb, J.R., R.D. Fitzhugh, and T.H. Furman, 1997. The acid-base status of surface waters in Otter Creek and Dolly Sods Wildernesses. Project Completion Report to Monongahela National Forest, Elkins, WV.