Technical Supplement 3A

Stream Corridor Inventory and Assessment Techniques

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Cover photos: *Top*—Measuring the physical attributes of the stream is a critical step in the planning process. Assessing the ecological condition of the stream, its riparian area, flood plain, and watershed are also as critical as setting restoration goals and objectives.

Bottom—The challenge in restoring streams is to determine the current ecological condition and to project anticipated changes due to the restoration project.

Advisory Note

Techniques and approaches contained in this handbook are not all-inclusive, nor universally applicable. Designing stream restorations requires appropriate training and experience, especially to identify conditions where various approaches, tools, and techniques are most applicable, as well as their limitations for design. Note also that product names are included only to show type and availability and do not constitute endorsement for their specific use.

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Introduction

This technical supplement contains an inventory of assessment techniques. This material was developed by an interdisciplinary team composed primarily of U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) employees (USDA NRCS 2001b). This guide provides the titles, reference citations, descriptive summary, and attributes of a number of stream corridor inventory and assessment techniques that are suitable for local conservation programs. Such programs are typically pursued at the site or project level, with increasing attention given to the landscape scale to optimize future treatments, management, and monitoring. The purpose of this guide is to aid in the selection of the appropriate inventory and assessment techniques to determine the conditions of their stream corridor. It is intended that this material possibly be used to supplement the information provided in this handbook.

The methods contained in this technical supplement are listed in table TS3A–1 along with their attributes. The table provides a description of principal features and a comparison of the techniques. Techniques are grouped by the primary stream corridor setting to which they pertain and are arranged in alphabetical order. Standard dictionary definitions for terms are assumed unless otherwise noted. Explanations of attribute ratings (columns 1–6 of table TS3A–1) are:

- The ***Primary Setting*** that the particular technique addresses (many techniques are used for additional primary or secondary settings):
  - — ***Channel—flood plain***
  - — ***Riparian area***
  - — ***Water quality (properties, contaminants)***
  - — ***Aquatic habitat***
- The ***Sampling Intensity***:
  - — ***Cursory*** (preliminary: observations and estimates of conditions and attributes are made usually without the need for specific measurements or quantification)
  - — ***Detailed*** (comprehensive: conditions and attributes are itemized and specifically measured)
- The required ***Skill Level, Training,*** and ***Time*** to properly carry out the technique are rated as ***High*** (Skill level: specialists with considerable specialized expertise; Training: 3 to 5 days; Time: generally 4 or more hours per site), ***Medium*** (Skill level: specialists with basic specialized expertise; Training: 1 to 3 days; Time: generally 1 to 3 hours per site), or ***Low*** (Skill level: professionals or technicians trained in the technique; Training: 1 day or less; Time: usually less than 1 hour per site).
- The techniques are classification by ***Kind*** (***Inventory***—a collection of data or ***Assessment***—a collection of data and value judgment as to condition), ***Measure Type*** (***Qualitative*** —using charts, tables, attribute groupings or illustrations to classify or rate, or ***Quantitative*** —measurements, dimensions, quantities) and ***Proximity*** (***Onsite***—observers or data collectors physically at the site, or ***Remote***—observers or data collectors can use satellite imagery or aerial photos).
- The need for a ***Reference Site*** (***Yes, No,*** or ***Optional***)—a reference site is a representative segment or reach of a stream corridor system in dynamic equilibrium with a relatively undisturbed watershed.
- The technique's ***Suitability for Monitoring*** (***High***—suited for statistical analysis with consistent results between different collectors at the same site and accurate detection of change or trend over time, ***Medium***—reproducible or repeatable results, but generally not suited for statistical analysis, or ***Low***—not intended for monitoring purposes).

The ratings for the attributes in table TS3A–2 were developed by a team of interdisciplinary specialists with experience in stream corridor inventories and assessments. For each technique, a full citation, source address, and a brief summary are provided. Readers are encouraged to obtain and test the techniques that appear promising for their settings and requirements.

Table TS3A–1 Attributes of stream corridor assessment techniques

Column notes listed below >	1	2	3	4	5	6
Technique (to obtain a technique's citation and summary, turn to the page number listed in parentheses)	Primary setting (listed first)	Sampling intensity	Skill level, training, time	Kind, measure type, proximity	Reference site needed	Suitability for monitoring
Primary setting—Channel flood plain						
Applied River Morphology. Wildland Hydrology Consultants. D. Rosgen. 1996. Pagosa Springs, CO (14)	C	D	H–H–H	I/A–N–O	Y	M
Channel-Reach Morphology in Mountain Drainage Basins. Geological Society of America Bulletin. D.R. Montgomery and J.M. Buffington. 1997 University of Washington, Seattle, WA (14)	C	C	M–M–M	I–L–O	O	M/H
Incised Channels–Morphology, Dynamics, and Control. S.A. Schumm, M.D. Harvey, and C.C. Watson. 1984. Littleton, CO (16)	C	C	M–M–L	I–L–O	N	M
Procedures for Using Oregon Stream Habitat Data Sheet. USDA NRCS. 1988. Portland, OR (19)	C, R, A	D	M–M–L	I/A–L/N–O	N	M
Rapid Stream Assessment Protocol (RSAT) Field Methods–Appendix A. J. Galli, Sr. 1996. Metro. Washington Council of Governments, Washington, DC (21)	C, R, W, A	C	M–M–L	A–L–O	Y	L
Stream*A*Syst. Oregon State University, Extension Service. 2000. Corvallis, OR (30)	C, R, W	C	L–L–L	A–L–O	N	L
Stream Channel Reference Sites: An Illustrated Guide to Field Technique. USDA Forest Service. 1997. Fort Collins, CO (26)	C	D	H–H–H	I–N–O	Y	M
Stream Corridor Assessment Survey. K. Yetman, MD Dept. of Natural Resources. 2000. Annapolis, MD (26)	C, R, A	C	M–L–L	I/A–L–O	N	L
Stream Inventory Handbook–Level I and II. USDA Forest Service. 1996. Version 9.6. Portland, OR (27)	C, R, A	D	M–M–H	I–N–O	O	H
Streamkeeper's Field Guide–Watershed Inventory and Stream Monitoring Methods. The Adopt-A-Stream Foundation. 1966. Everett, WA (27)	C, R, A, W	D	M–M–M	I/A–L/N–O	Y	M/H
Stream Visual Assessment Protocol. USDA NRCS. 1998. Portland, OR (28)	C, R, W, A	C	L–L–L	A–L–O	N	L

Table TS3A–1 Attributes of stream corridor assessment techniques—Continued

Column notes listed below >	1	2	3	4	5	6
Technique (to obtain a technique's citation and summary, turn to the page number listed in parentheses)	Primary setting (listed first)	Sampling intensity	Skill level, training, time	Kind, measure type, proximity	Reference site needed	Suitability for monitoring
Primary setting—Riparian area						
Guidebook for Application of Hydrogeomorphic Assessments to Riverine Wetlands. U.S. Army Corps of Engineers, Waterways Exp. Station. 1995. Washington, DC (15)	R	D	H–H–H	A–L/N–O	Y	M
Integrated Riparian Evaluation Guide. USDA Forest Service. 1992. Ogden, UT (Level I) (Level II) (Level III) (16)	R, C, A R, C, A R, A	C D D	M–M–L H–H–M H–H–H	I–L–R I/A–N–O I/A–N–O	N	L
Methods for Evaluating Riparian Habitats with Applications to Management. USDA Forest Service. 1987. Ogden, UT (17)	R, C	D	H–H–H	A–N–O	N	H
National Forestry Manual: National Range and Pasture Handbook (Procedures for completing Vegetation Field Forms and Ecological Sites). USDA NRCS. 1997, 1998. Washington, DC (18)	R	D	M–H–H	I–N–O	Y	M
Preliminary Investigation (PI) for Stream Riparian Areas. USDA NRCS, Watershed Science Institute. 1996. Seattle, WA (18)	R, C, A, W	C	M–M–L	I–L/N–O	N	L
Protocols for Classifying, Monitoring and Evaluating Stream Riparian Vegetation on Idaho Rangeland Streams. Division of Environmental Quality. 1992. Boise, ID (19)	R	D	H–H–H	I–N–O	N	H
Rapid Assessment of Riparian Systems (RARS). R.D. Ohmart, et al. 1998. Arizona Game and Fish Department, Phoenix, AZ (20)	R, C	D	M–H–H	A–N–O/R	Y	M
Riparian Area Management: A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas. DOI Bureau of Land Management. 1998. Denver, CO (22)	R, C	C	M–L–L	A–L–O	Y	L
Riparian Area Management—Greenline Riparian—Wetland Monitoring. DOI Bureau of Land Management. 1993. Denver, CO (22)	R	D	M–M–M	I–N–O	N	H

Table TS3A–1 Attributes of stream corridor assessment techniques—Continued

Column notes listed below >	1	2	3	4	5	6
Technique (to obtain a technique's citation and summary, turn to the page number listed in parentheses)	Primary setting (listed first)	Sampling intensity	Skill level, training, time	Kind, measure type, proximity	Reference site needed	Suitability for monitoring
Primary setting—Riparian area—Continued						
Riparian Area Management—Inventory and Monitoring of Riparian Areas. DOI Bureau of Land Management. 1989. Denver, CO (23)	R	D	M/L–H/M/L–H/M/L	I–N–O	N	H
Riparian Area Management—Procedures for Ecological Site Inventory. DOI Bureau of Land Management. 1992. Denver, CO (23)	R, C	D	H–H–H	I–N–O	N	H
Riparian Area Management—Using Aerial Photographs to Assess Proper Functioning Condition of Riparian—Wetland Areas. DOI Bureau of Land Management. 1996. Denver, CO (24)	R, C	C	M–M–L	A–L–R	Y	L
Riparian Reserve Evaluation Techniques and Synthesis in Ecosystem Analysis at the Watershed Scale—Federal Guide for Watershed Analysis, Section II. Multiagency. 1995. Portland, OR (24)	R	D	H–M–H	A–L–O/R	N	M
Role of GIS in Selecting Sites for Riparian Restoration Based on Hydrology and Land Use. Utah State University. 1997. Logan, UT (25)	R	C	H–M–L	I/A–N–R	Y	M
RWRP Lotic Health Assessment. University of Montana. 1999. Missoula, MT (25)	R, C	C	M–M–L	A–L–O	N	M
Technology Policy Paper—Mapping Procedures for Riparian and Other Small Areas. USDA NRCS. 1997. Washington, DC (29)	R, C	D	H–M–M	I–L/N–O	N	L
Primary setting—Water quality						
Adopt-A-Stream Shoreline Survey. Massachusetts Riverways Programs. 1996. Boston, MA (13)	C	L–M–M	I/A–L–O	N	L	
Agricultural Water Quality Index. Robert B. Annis Water Resources Institute, Grand Valley State University. 1998. Allendale, MI (13)	W,C,R,A	C	M–M–M	A–L–O	N	L
Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams. U.S. Environmental Protection Agency. 1993. Seattle, WA (17)	W, A, C, R	D	M–H–H	A–N–O	Y	H

Table TS3A–1 Attributes of stream corridor assessment techniques—Continued

Column notes listed below >	1	2	3	4	5	6
Technique (to obtain a technique's citation and summary, turn to the page number listed in parentheses)	Primary setting (listed first)	Sampling intensity	Skill level, training, time	Kind, measure type, proximity	Reference site needed	Suitability for monitoring
Primary setting—Water quality—Continued						
Stream Temperature Investigations: Field and Analytic Methods (for use with SNTEMP: Stream Network Temperature Model). U.S. Fish and Wildlife Service. 1989. Fort Collins, CO (28)	W (temperature)	D	H–M–M	I–N–O	N	H
Water Quality Indicators Guide—Surface Water (chapter 2 and appendices A and F). Terrene Institute. 1996. Washington, DC (30)	W	C	M–M–M	A–L–O	N	L

Column notes:
1 Primary Setting (listed first); **C**hannel flood plain, **R**iparian area, **W**ater quality, **A**quatic
2 Sampling intensity: **C**ursory, **D**etailed
3 Skill level, training, time (each rated as): **H**igh, **M**edium, **L**ow
4 Kind: **I**nventory, **A**ssessment, Measure type: Qua**L**itative, Qua**N**titative; Proximity; **O**nsite, **R**emote
5 Reference site required: **Y**es, **N**o, **O**ptional
6 Suitability for monitoring: **H**igh, **M**edium, **L**ow

Table TS3A–2 Summaries of site assessment and investigation techniques

Adopt-A-Stream Shoreline Survey. Massachusetts Riverways Programs. J.C. Kimball and M. Van Dusen. 1996. Department of Fisheries, Wildlife and Environmental Law Enforcement, 100 Cambridge St., Boston, MA 02202. 62 p.

Summary: The survey's purpose is to help local stream teams determine vital signs of a river or stream, report immediate problems to proper authorities, and prioritize both short-term and long-range work. The water course is divided into reasonably sized segments that can be walked or canoed. Field data sheets include measurement of instream conditions, stream vegetation, streambank and corridor conditions, and presence of observable fish and wildlife species. Other data sheets include a summary sheet for a segment or reach survey, pipe survey, bridge survey, and wetlands survey.

Agricultural Water Quality Index. Robert B. Annis Water Resources Institute. Grand Valley State University, J. Cooper et al. 1998. WRI Publication #MR–98–1, One Campus Drive, Allendale, MI 49401. 75 p.

Summary: The Agricultural Water Quality Index (AWQI) is an assessment protocol that is specifically designed to evaluate the relationship between agricultural operations and water quality in agroecosystems. The AWQI is based on a series of assessments that can be examined separately and accumulated into a total score. Individual assessments include riparian zone metrics (width, completeness, vegetation types, summary), stream channel metrics (flow status, flow stability, channel sinuosity, channel structure, summary), and, optionally, a benthic macroinvertebrates metric (population diversity including indicator types). Specific recommendations for land and water management are associated with the ranked levels of individual metrics. Worksheets and scoring tables are provided.

Applied River Morphology. Wildland Hydrology Consultants. D. Rosgen. 1996. 1481 Stevens Lake Road, Pagosa Springs, CO 81147. 341 p.

Summary: The guide book includes fundamental principles of river behavior, a hierarchical stream inventory, a classification of natural rivers with illustrations, and data summaries and photographs depicting major stream types. The book contains field techniques and forms for:

–Stream classification of a reference reach

–Bank erosion prediction

–Fish habitat structure evaluation

–Sediment relations

–Hydraulics

–Channel stability evaluations

Channel-reach Morphology in Mountain Drainage Basins. Geological Society of America Bulletin, Volume 109, p. 596–611. D.R. Montgomery and J.M. Buffington. 1997. Department of Geological Sciences; request from the Geological Society of America, P.O. Box 9140, Boulder, CO 80301–9140. 15p.

Summary: A classification of channel-reach morphology in mountain drainage basins synthesizes stream morphologies into seven distinct reach types: colluvial, bedrock, and five alluvial channel types (cascade, step pool, plane bed, pool riffle, and dune ripple). Coupling reach-level channel processes with the spatial arrangement of reach morphologies, their links to hillslope processes, and external forcing by confinement, riparian vegetation, and woody material defines a process-based framework within which to assess channel condition and response potential in mountain drainage basins. The classification is broadly applicable with its primary advantage of addressing the role of large woody material.

Table TS3A–2 Summaries of site assessment and investigation techniques—Continued

Fish and Fish Habitat Standard Inventory Procedures Handbook (R1/R4—Northern/Intermountain Regions). USDA Forest Service, Intermountain Research Station. 1997. 324 25th Street, Ogden, UT 84401. 73p.

Summary: The handbook describes the standard inventory procedures for collecting fish habitat and salmonid fish species data for streams managed by the Northern Region (R1) and Intermountain Region (R4) of the Forest Service. The inventory defines the structure (pool/riffle and forming features), pattern (sequence and spacing) and dimensions (length, width, depth, area, and volume) of fish habitat; describes species composition, distribution, and relative abundance of salmonid species; and facilitates the calculation of summary statistics for habitat descriptors. The handbook is illustrated in color and includes data collection forms.

Guidebook for Application of Hydrogeomorphic Assessments to Riverine Wetlands. U.S. Army Corps of Engineers, Waterways Exp. Station. Technical Report WRP–DE–11. M. Brinson et al. 1995. Washington, DC 20314–1000. 207p.

Summary: The guidebook provides the basis (or template) for applying the hydrogeomorphic (HGM) approach for specific physiographic regions for wetland functional assessment of riverine wetlands in context with the Clean Water Act Section 404 Regulatory Program. The concept of a reference standard is used, for example, conditions exhibited by a group of reference wetlands in a physiographic region that correspond to the highest level of functioning. Fifteen functions are identified for the riverine wetland class and are valuated by an index computed using equations of selected variables from a group of 44 variables. Generic equations, detailed information, and field tally sheets are provided to document functions and develop models for a specific regional riverine subclass.

Incised Channels—Morphology, Dynamics and Control. S.A. Schumm, M.D. Harvey, and C.C. Watson. 1984. Water Resources Publications, P.O. Box 2841, Littleton, CO 80161. 200p.

Summary: The original basis of the document was a report on the geomorphic characteristics of channelized streams in northern Mississippi to determine if their future behavior could be predicted. The publication contains a literature review on incised channels, historical information on subject channels, and discussion of geomorphic evolution of incised channels. The concept of entrenched streams is introduced in chapter 5 of the document including the hypothetical sequence of arroyo evolution. A summary of incised channels is listed in chapter 7, including a description of a possible evolutionary sequence.

Integrated Riparian Evaluation Guide (Levels I, II, and III). USDA Forest Service. T. Collins, Regional Soil Scientist, et al. 1992. Regional Office, Intermountain Region, 324 25th Street, Ogden, UT 84401. 60+p.

Summary: The guide provides an integrated approach for: stratifying and classifying riparian areas according to their natural inherent characteristics, and their respective existing conditions; data collection; evaluation of riparian areas; future development and linkage of a riparian data base; preparation of a written narrative to interpret the data and suggest management applications; providing a process to prioritize or rank riparian areas based on management objectives; strengthening the riparian management implications of the Forest Land Management Plan. The approach is split into threes levels: level I is an office procedure, level II is a field procedure, and level III is a more quantitative, site-specific field data collection. Levels are progressive and should be completed in order. The guide includes data collection forms.

Table TS3A–2 Summaries of site assessment and investigation techniques—Continued

Methods for Evaluating Riparian Habitats with Applications to Management. USDA Forest Service. General Technical Report INT–221. Intermountain Research Station, W. Platts et al. 1987. 324 25th Street, Ogden, UT 84401. 177p.

Summary: The report compiles a comprehensive set of methods for resource specialists to use in managing, evaluating, and monitoring riparian conditions adjacent to streams, lakes, ponds, and reservoirs with an emphasis on streams. Issues of sampling kind and intensity, accuracy, and precision are described. Detailed procedures are given for measuring vegetation, classifying riparian communities and soils, using remote sensing, measuring water column attributes, detecting streambank morphology and alteration, mapping woody material, using benthic macroinvertebrates, and evaluating historic riparian habitats. Emphasis is on procedural details, rather than reliance on predefined data collection forms.

Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams. U.S. Environmental Protection Agency, Water Division. 1993. Region 10, 1200 Sixth Avenue, Seattle, WA 98101. 179p.

Summary: The document describes a monitoring system to assess grazing impacts on water quality in streams of the western United States. Methods described are reportedly easy to use and cost-effective (reduced sampling frequency, limited need for specialized equipment, and limited laboratory analyses). The protocols focus on attributes of the stream channel, streambank, and streamside vegetation (characteristics are sampled during low-flow summer conditions). Methodology requires an interdisciplinary team. Explanatory illustrations and various field data collection forms are included.

National Forestry Manual; National Range and Pasture Handbook Procedures for completing Vegetation Field Forms and Ecological Sites). USDA Natural Resources Conservation Service. 1998, 1997. P.O. Box 2890, Washington, DC 20013. 100+p.

Summary: The manual and handbook contain detailed procedures for completing vegetation field forms and ecological sites. The National Forestry Manual is applicable to stream riparian areas that are currently forested or have a potential for a plant community dominated by woody plants (trees) with a height potential of at least 4 meters. The National Range and Pasture Handbook is applicable to stream riparian areas that are currently in herbaceous or shrub vegetation or have a potential for a plant community dominated by herbaceous or shrub species. Detailed instructions, coding conventions, and data collection forms are provided in both the manual and handbook. Collected field data and information may be entered into a national database maintained and supported by the NRCS.

Preliminary Investigation (PI) for Stream Riparian Areas. USDA Natural Resources Conservation Service, Watershed Science Institute. 1996. c/o GEO SCI, Box 351310, UW, Seattle, WA 98195–1310. 2p.

Summary: This technique is a single page form that permits the user to record major attributes of a representative segment of a stream reach. It was developed for use with private landowners to focus attention on the existing conditions of their streams. Basic stream attributes (stream order, depth, width, gradient, entrenchment), soil conditions (bank erosion frequency, bed load fine sediments, upper bank compaction), water conditions (turbidity, presence of algae, color, temperature), plants (potential native vegetation, present vegetation, dominant terrestrial plants, aquatic species), air condition, animals (fish species, aquatic macroinvertebrates, land species), and human use attributes are collected.

Table TS3A–2 Summaries of site assessment and investigation techniques—Continued

Procedures for Using [the] Oregon Stream Habitat Data Sheet. USDA Natural Resources Conservation Service. 1998. Biology Technical Note No. 12, 101 SW Main Street, Suite 1300, Portland, OR 97204–3221. 12p.

Summary: The assessment procedure can be used on a broad reach or site-specific scale. Values that are entered on the data sheet can be estimated or measured. The intended use is for planning, baseline data, monitoring, and evaluating restoration alternatives. The procedure is not intended to replace intensive surveys conducted by professional biologists. Users of the procedure are encouraged to complete the watershed overview sheet before the habitat data sheet. The data sheet accommodates entries to identify the site, substrate composition, and bank vegetation. A series of criteria tables are used to assess and score stream habitat condition.

Protocols for Classifying, Monitoring, and Evaluating Stream/Riparian Vegetation on Idaho Rangeland Streams. Division of Environmental Quality. 1992. Report No. 8. Idaho Department of Health and Welfare, E. Cowley. 1410 North Hilton, Boise, ID 83720–9000. 37+p.

Summary: The document defines protocols and procedures for evaluating streamside vegetation and streambank stability for Idaho's small (usually less than 30 feet wide) rangeland streams. It also provides protocols for monitoring stream canopy cover, streambank stability, solar input, and establishing permanent photo points associated with livestock grazing and other activities that affect streamside vegetation and beneficial uses of water. The protocols are directed at three important pollutant sources affecting the biological integrity of streams and lakes that may result from livestock grazing: streambank erosion, water temperature, and vegetation.

Qualitative Habitat Evaluation Index [QHEI]: Rationale, Methods, and Application. State of Ohio Environmental Protection Agency. 1989. Edward T. Rankin, Ecological Assessment Section, P.O. Box 1049, 1800 WaterMark Dr., Columbus, OH 43266–0149. 51p.

Summary: The index is designed to provide a measure of habitat generally corresponding to those physical factors that affect fish communities and which are generally important to other aquatic life, such as invertebrates. The field sheet for the QHEI consists of qualitative descriptors that are checked as appropriate. Highest scores are assigned to the habitat parameters that have been shown to be correlated with streams having high biological diversity and integrity, with progressively lower scores assigned to less desirable habitat features. Individual scores are provided for the habitat components of substrate, instream cover, riparian zone and bank erosion, pool/glide quality, riffle/run quality, and gradient. A total score of 100 is possible.

Rapid Assessment of Riparian Systems (RARS)–draft report. R.D. Ohmart et al. 1998. Arizona Game and Fish Department, 2221 W. Greenway Road, Phoenix, AZ 85023. 130p.

Summary: The assessment was developed to have a tool more applicable to streams in Arizona than those currently being used throughout the West. The technique addresses riparian area classification, channel geomorphology, riparian functional analysis procedure, and riparian monitoring with photography. The objective of the developers was to collect quantitative field data to document and defend functional interpretations. The Tonto National Forest approach (Tonto Riparian Inventory and Monitoring Methods or TRIMM) was the working model for developing the assessment. The Arizona Game and Fish Department can be contacted for the final report and assessment procedure.

Table TS3A–2 Summaries of site assessment and investigation techniques—Continued

Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers—Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. U.S. Environmental Protection Agency. Office of Water (4503F), EPA841–B–99–002. 1999. Assessment and Watershed Protection Division, 401 M Street SW, Washington, DC 20460. 104p.

Summary: The document provides states with a practical technical reference for conducting cost-effective biological assessments of lotic systems. The protocols were designed as inexpensive screening tools to determine if a stream is supporting or not supporting a designated aquatic life use. They may also be appropriate for priority setting, point and nonpoint-source evaluations, use attainability analyses and trend monitoring. Worksheets are included. The protocols must be locally adapted and scaled.

Rapid Stream Assessment Protocol (RSAT) Field Methods–Appendix A. J. Galli, Sr. 1996. Dept. of Environmental Programs, Metropolitan Washington Council of Governments, 777 North Capitol St. NE, Washington, DC 20002. 35p.

Summary: The protocol is a synthesis of several techniques with applicability to nonlimestone Piedmont streams with drainage areas less than 150 square miles. RSAT employs both a reference stream and an integrated numerical scoring and verbal ranking approach. Evaluation categories include: channel stability, channel scouring/sediment deposition, physical instream habitat, water quality, riparian habitat conditions, and biological indicators (macroinvertebrates). Parameters are measured at approximately 400-foot intervals along the stream. Data is first recorded via field survey sheets and later transferred into a spreadsheet database.

Riparian Area Management: A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas. U.S. Department of Interior, Bureau of Land Management. 1998. TR 1737–15. P.O. Box 25047, Denver, CO 80225. 126p.

Summary: The guide establishes a method for evaluating the condition of riparian-wetland lotic areas and classifying segments or reaches of streams into proper functioning condition (PFC), functional at risk, nonfunctional, and unknown categories. The qualitative, yet science-based process, considers both abiotic and biotic factors as they relate to physical function. A standard checklist of 17 key questions is provided and enables users to determine the functional condition of a stream reach or segment. PFC must be conducted by an interdisciplinary team trained and familiar with the local conditions being assessed. The supporting science and related quantitative methodologies for each of the 17 questions are provided.

Riparian Area Management—Greenline Riparian-Wetland Monitoring. U.S. Department of Interior, Bureau of Land Management. 1993. TR 1737–8. National Applied Resources Sciences Center, P.O. Box 25047, Denver, CO 80225–0047. 45p.

Summary: The technical reference gives the detailed procedure for the greenline monitoring method. Greenline is a term used to essentially identify nearest-to-stream continuous riparian plant community types using a line intercept transect running parallel to the stream. It is a procedure that is both repeatable for monitoring purposes and a point of reference which minimizes problems associated with changing moisture gradient. Data collection forms are included. (Note: As of the date of this report, the Forest Service is in the process of updating the greenline methodology with plans to republish the technique as a Forest Service technical publication.)

Table TS3A–2 Summaries of site assessment and investigation techniques—Continued

Riparian Area Management—Inventory and Monitoring of Riparian Areas. U.S. Department of Interior, Bureau of Land Management. 1989. TR 1737–3. National Applied Resources Sciences Center, P.O. Box 25047, Denver, CO 80225–0047. 79p.

Summary: The technical reference contains suggested techniques and procedures for performing an extensive inventory and, if warranted, an intensive inventory. Extensive components include drainage pattern, landform, soils information, channel form and condition, vegetation types and ecological sites, flood plain characteristics, and other attributes. Intensive components include detail soil characteristics and properties, channel parameters, vegetation identification and structure, woody species characteristics, and other attributes. A section on monitoring is integrated in the technical reference. Inventory forms are included.

Riparian Area Management—Procedures for Ecological Site Inventory. U.S. Department of Interior, Bureau of Land Management. 1992. TR 1737–7. National Applied Resources Sciences Center, P.O. Box 25047, Denver, CO 80225–0047. 135p.

Summary: The technical reference provides detailed field procedures for describing and documenting riparian-wetland ecological sites (potential vegetation) which are a function of and defined by the interaction of soils, climate, hydrology, and vegetation at riparian-wetland sites. The document contains a standard site field review checklist, site correlation checklist, standard site description, and a completed, sample standard site description. The technical reference is intended for use with the National Range and Pasture Handbook, the National Forestry Manual, and the National Soil Survey Handbook available from the USDA, Natural Resources Conservation Service, P.O. Box 2890, Washington, DC 20013.

Riparian Area Management—Using Aerial Photographs to Assess Proper Functioning Condition of Riparian-Wetland Areas. U.S. Department of Interior, Bureau of Land Management. 1996 (Revised 1999). TR 1737–12. P.O. Box 25047, Denver, CO 80225. 52p.

Summary: The document provides a procedure for using aerial photography to answer proper functioning condition checklist items. It supplements TR1737–15, Riparian area management: A user guide to assessing proper functioning condition and the supporting science for lotic areas. The technical release gives the detailed procedure for gathering existing source material, analyzing equipment needs, defining reaches and areas, interpreting aerial photos, and verifying interpretations in the field. Also included are specific recommendations pertaining to needed aerial photo qualities, photo interpretation examples, and the results of large area case studies in Montana.

Riparian Reserve Evaluation Techniques and Synthesis in Ecosystem Analysis at the Watershed Scale—Federal Guide for Watershed Analysis, Section II. Multiagency. 1995. Version 2.2. Regional Ecosystem Office, P.O. Box 3623, Portland, OR 97208. 42p.

Summary: This supplement is part of the Federal guide developed to help resource managers implement direction in the record of decision (ROD) for amendments to Forest Service and Bureau of Land Management planning documents within the range of the Northern Spotted Owl. The ROD requires watershed analysis prior to the final delineation and management of the riparian reserve network in a watershed. The riparian analysis process is divided into two levels based on anticipated activities: level 1—geared toward small effects along intermittent streams, and level 2—addresses larger magnitude effects.

Table TS3A–2 Summaries of site assessment and investigation techniques—Continued

Role of GIS in Selecting Sites for Riparian Restoration Based on Hydrology and Land Use. Utah State University. 1997. G.D. Russell, C.P. Hawkins, M.P. O'Neill. Watershed Science Unit, Logan, UT 84322–5250. 13p.

Summary: The paper describes an approach to initial site selection in the San Luis Rey River watershed in southern California that uses watershed-level information on basin topography and land cover to rank the potential suitability of all sites within a watershed for either preservation or restoration. The approach requires the use of a geographic information system (GIS) to map relative wetness and land cover within a watershed. Relative potential wetness values were derived from USGS 30-meter digital elevation models; land cover was derived from a Landsat scene covering the 1,500 square kilometers study area. The paper is illustrated with color diagrams and pictures.

RWRP Lotic Health Assessment. University of Montana. 1999. Riparian and Wetland Research Program, School of Forestry. Missoula, MT 59812. 25p.

Summary: The assessment is a method for rapidly addressing a lotic site's overall health or condition. It provides a site rating useful for setting management priorities and stratifying riparian sites for remedial action or more rigorous analytical attention. It is intended to serve as a first approximation, or coarse filter, by which to identify lotic wetlands in need of closer attention so that managers can more efficiently concentrate effort. The term riparian health is used to mean the ability of a riparian reach (including the riparian area and its channel) to perform certain functions. These functions include sediment trapping, bank building and maintenance, water storage, aquifer recharge, flow energy dissipation, maintenance of biotic diversity, and primary production.**Stream Channel Reference Sites: An Illustrated Guide to Field Technique**. USDA Forest Service. General Technical Report RM–245. C. Harrelson et al. 1994. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 61p.

Summary: The guide helps users establish permanent reference sites. The minimum procedure consists of: select a site, map the site and location, measure the channel cross section, survey a longitudinal profile of the channel, measure stream flow, measure bed material, and permanently file the information with the Vigil Network. The document includes basic surveying techniques and provides guidelines for identifying bankfull indicators and measuring other important stream characteristics. The object is to establish the baseline of existing physical conditions for the stream channel. The guide is amply illustrated with diagrams and black and white pictures.

Stream Corridor Assessment Survey. Maryland Department of Natural Resources. 2000 (revised draft). K. Yetman, Watershed Restoration Division, Chesapeake and Coastal Watershed Services, Annapolis, MD 21401. 100+p.

Summary: The survey protocols help users identify environmental problems and prioritize restoration opportunities that exist within Maryland watersheds. The assessment is designed to be done by small teams of well-trained volunteers who walk 2 or more stream miles per day. Potential environmental problems identified during a survey include channelized stream sections, streambank erosion, exposed pipes, inadequate stream buffers, fish blockages, trash dumping sites, near stream construction, pipe outfalls, and general conditions of instream and riparian habitat. In conjunction with the AmeriCorp program, more than 700 miles of Maryland streams have been surveyed using the assessment protocols. This has led to more than $1 million of restoration work to date. One Maryland county has included the assessment as part of the NPDES permit system for municipal stormwater discharges.

Table TS3A–2 Summaries of site assessment and investigation techniques—Continued

Stream Inventory Handbook—Level I and II. USDA Forest Service. 1996. Version 9.6. Region 6, P.O. Box 3623, Portland, OR 97208. 76p.

Summary: The handbook provides standards for a level I (office inventory) and level II (field inventory) of stream systems. The protocol identifies core attributes necessary to evaluate the condition of a stream. It contains instructions and data forms for stream habitat conditions (flow, water quality, historical land use, valley-channel parameters, streambed substrate, flood-prone dimensions, and riparian habitat dimensions). Other data forms are included for inventorying culverts, falls, chutes, dams, marshes, braids, and fish species.

Streamkeeper's Field Guide—Watershed Inventory and Stream Monitoring Methods. The Adopt-A-Stream Foundation. T. Murdoch, M. Cheo and K. O'Laughlin. 1996. 600 128th Street SE, Everett, WA 98208. 296p.

Summary: The guide provides methods for obtaining a holistic picture of a stream's watershed, as well as collecting detailed information. The techniques presented in the guide are fairly simple, inexpensive, and can be accomplished with readily available equipment. Readers not only learn how to evaluate the physical and biological characteristics of streams using the latest quality control and quality assurance planning techniques but can also study a chapter devoted to presenting field data to a wide range of audiences. The section called Streamkeeper Tales includes inspirational examples of volunteers who have used their field data as the basis for protecting and restoring streams. The active voice of the text and the large number of humorous technical illustrations accompanied by poignant editorial cartoons make this book engaging to volunteers and scientists alike.

Stream Temperature Investigations: Field and Analytic Methods (for use with SNTEMP: Stream Network Temperature Model). U.S. Fish and Wildlife Service. 1989. Instream Flow Information Paper No. 13. Biological Report 89 (17). J. Bartholow, National Ecology Research Center, 2627 Redwing Road, Fort Collins, CO 80526–2899. 139p.

Summary: The document provides guidance to the user of the Stream Network Temperature Model (SNTEMP). Planning, executing, and using the results from a stream temperature modeling study are described. Details of field data gathering, instrumentation, and data collection priorities are given for the range of stream geometry, meteorology, and hydrology components necessary for the model's application. Each input variable is defined, and its relative data collection effort is approached from the perspective of sensitivity in predicting stream temperatures. Alternative public domain stream and reservoir temperature models and techniques are also described.

Stream Visual Assessment Protocol. USDA Natural Resources Conservation Service. B. Newton et al. 1998. 101 SW Main St., Suite 1600, Portland, OR 7204–3225. 36p.

Summary: The assessment protocol provides a basic level of stream health valuation based primarily on physical conditions for a stream reach. It is intended to be conducted with the landowner and incorporates talking points for planners to use during an assessment. Assessment elements, which receive a numerical rating based on observations and some rapid measurements, include: channel condition, hydrologic alteration, riparian zone, bank stability, water appearance, nutrient enrichment, barriers to fish movement, instream fish cover, pools, invertebrate habitat, canopy cover, manure presence, salinity, riffle embeddedness, and macroinvertebrates observed. Rating criteria and worksheets are included. The protocol works best if locally modified.

Table TS3A–2 Summaries of site assessment and investigation techniques—Continued

Technology Policy Paper—Mapping Procedures for Riparian and Other Small Areas. USDA Natural Resources Conservation Service. 1997. Soil Survey Division, P.O. Box 2890, Washington, DC 20013. 12p.

Summary: The paper outlines the procedure for mapping riparian and other small areas which were traditionally identified by spot symbols on soil survey maps. Riparian areas are typically very linear and are more difficult to map and display than upland soil polygons. Certain soils, hydrology, and vegetation criteria must be met for an area to be identified and mapped as a riparian area. Cartographic procedures for delineating point and line features are included. Examples of soil map unit descriptions and a sample soils map are provided.

Underwater Methods for Study of Salmonids in the Intermountain West. USDA Forest Service, Intermountain Research Station. 1994. Russell F. Thurow, General Technical Report INT–GTR–307, 324 25th Street, Ogden, UT 84401. 28p.

Summary: Underwater observation with snorkeling gear is a valuable tool for studying fish populations and assessing how fish use habitat in flowing waters. Precise estimates of fish abundance can be obtained using underwater counts. However, several factors, including the behavior of the target fish species and attributes of the physical habitat (stream size, water clarity, temperature, cover), can bias results. This report was developed to assist biologists in identifying and accounting for potential biases and to encourage a standardized procedure for the use of underwater techniques to survey salmonids in streams. The guide addresses the principal resident and anadromous salmonids found in the Intermountain West (Idaho, Montana, Nevada, Utah, and western Wyoming). Color illustrations and pen and ink drawings of target fish are included.

Water Quality Indicators Guide – Surface Water (chapter 2 and appendices A and F). Terrene Institute. 1996. Second Ed. 1717 K St., Suite 801, Washington, DC 20006–1504. 131p.

Summary: The guide examines five major sources of agriculturally related nonpoint source pollution: sediment, nutrients, animal waste, pesticides, and salts. Field sheets are provided to enable the user to observe and record surface water quality problems and to select appropriate remedial practices. Field sheets are arranged in matrix format with environmental indicators given for each of the five major pollutant types. Each indicator is divided into descriptions of the environment from excellent to poor with each description given a weighted numerical ranking. There are two types of field sheets: one for receiving waters and one for the lands that drain into receiving waters.

Stream*A*Syst-A Tool to Help You Examine Stream Conditions on Your Property. Oregon State University, Extension Service, 422 Kerr Administration, Corvallis, OR 97331–2119. 12p.

Summary: The publication consists of a worksheet and action plan developed for use by landowners having a stream or stream systems on their property. The worksheet's 15 questions direct the user to all aspects of stream corridor condition. The action plan correlates individual answers from the worksheet to helpful notes and contact agencies and addresses for further investigation. The assessment system is voluntary, useful for a first approximation of stream corridor conditions, and alerts the landowner of possible concerns.