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Ecological Research Series

NON-POINT WATER QUALITY MODELING IN WILDLAND MANAGEMENT: A State-of-the-Art Assessment (Volume II - Appendixes)

Environmental Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Athens, Georgia 30601

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NON-POINT WATER QUALITY MODELING IN WILDLAND MANAGEMENT A STATE-OF-THE-ART ASSESSMENT (VOLUME II - APPENDIXES)

by

Forest Service
U.S. Department of Agriculture
Washington, D.C. 20250

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FOREWORD

Environmental protection efforts are increasingly directed toward preventing adverse health and ecological effects associated with specific compounds of natural or human origin. As part of this Laboratory's research on the occurrence, movement, transformation, impact, and control of environmental contaminants, the Technology Development and Applications Branch develops management or engineering tools for assessing and controlling adverse environmental effects of non-irrigated agriculture and of silviculture.

This two-volume report presents an assessment and review of forestry management activities that can increase the non-point pollutant source potential, the effectiveness of demonstrated control techniques to reduce this potential, the usefulness and reliability of existing non-point source controls, and an evaluation of the water quality data base available for model development and testing.

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ABSTRACT

Contained in this volume are the model evaluation forms and the watershed inventory forms compiled as the basis for the conclusions reached in the state-of-the-art assessment presented in Volume I relating wildland management activities with an inventory of monitored watersheds having data suitable for model development and testing. This report was completed by the U.S. Department of Agriculture under an interagency agreement (EPA-IAG-D5-0660) with the U.S. Environmental Protection Agency.

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INTRODUCTION

PURPOSE

The main objective of this report--a result of an interagency agreement between the U.S. Environmental Protection Agency and the Forest Service, U.S. Department of Agriculture--is to define the relationship between wildland management activities and an inventory of monitored watersheds having data suitable for model development and testing.

SCOPE

The report is limited to non-point source pollution as it relates to wildland environments and management activities and excludes the effects of urban, industrial, agricultural, and mining activities on wildlands. In considers only the direct effects on the physical, chemical, or microbiological portions of the aquatic ecosystem and not the related effects on the higher life forms. The report specifically covers work on the forest service, but also that of others on non-point source predictive models.

GENERAL METHODOLOGY AND PROCEDURES

The report was compiled by a task force of 27 Forest Service personnel. Task force members were chosen for their general knowledge of water resources management and their specialized expertise in the various areas addressed in the report.

The three main tasks were: (1) relating wildland management practices to non-point pollutants and water quality, (2) identifying predictive models, and (3) identifying data bases suitable for model development and testing.

The report is divided into two volumes. Volume I contains the text material that supports the conclusions reached in the state-of-the-art assessment. Volume II contains the model evaluation forms and watershed inventory forms used by the contractors. The appendix material consists of these forms and summaries.

The forms are the original working documents and were structured to meet the needs of the project.

APPENDIX DESCRIPTION

Appendix A contains the model evaluation forms that were completed for each model evaluated. Each model was assigned a number for identification and the forms are presented sequentially. Within the sequencing, the models are grouped by predictive category. The major categories are physical and biological with further stratification under each.

Appendix B contains the watershed inventory forms that were compiled for each of the inventoried watersheds. These forms are organized by the geographical areas. Figure 2 (p. 106) of Volume I shows the geographical subdivisions. The number on the watershed inventory form (i.e. NE-1) corresponds to the suitability ranking assigned to each of the inventoried watersheds within the respective geographical areas. The lower the number the higher the suitability for model development and testing. These numbers also appear in Table 6 (p.108) of Volume I that displays data availability relating water quality to wildland management activities.

Appendix C is a summary that references the models by number and predictive category. The model numbers also appear in the model suitability matrix shown in Table 5 (p. 74) of Volume I. The model numbers are consistent with those on the model evaluation forms.

MODEL EVALUATION FORM NO. 1

Model ID	**Title:** The Hydrologic Potential of Unit Areas: The basis for Managing Water Resources. **Author:** Anderson, Henry W. Pacific Southwest Forest & Range Experiment Station, Berkeley, CA. **Date of Work:** 1975 **Source:** Proc. 2nd World Congress of Water Resources, Int. Water Resources Assn., New Delhi, India, Dec. 12-17, 1975 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Forest fires, conversion of forest or brush to grass, forest timber, harvest, time trends sediment potential. **Size of Area:** 2.6 - 7,770 sq km (1 - 3,000 sq miles) **Vegetation Zones:** Brush grass and coniferous forest zones in CA. & barren areas **Other:** Evaluation of sediment potential of unit areas
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** Water, flood, and sediment potentials were interpreted from models that expressed attributes of unit areas as variables. Principal component and regression analyses were used to select from 21 to 29 variables expressing site attributes and relating them to the six streamflow parameters
Input	**Variables Required & Time Scales:** Mean annual precipitation, rain-snow frequencies, nine geologic classes. Vegetation-type and density, and topography. **Calibration Requirements:** None
Output	**Variables Predicted & Time Scales:** Average annual discharge, average of the maximum daily discharge for the year, a 10-year maximum daily flow, the product of the annual discharge of the year and the annual maximum discharge of the year, the average minimum discharge of the year, and the 10-year minimum daily flow. The first four were normalized to a long-term (75-year) flow duration.
Misc.	**Previous Applications:** Components of the model had been used in expended sediment discharge and reservoir deposition evaluation in Ca.

Strong Points: Evaluations allow distributed outputs in both time and space of streamflow and streamflow related parameters

Weak Points: No specific application to water quality is evaluated by the model.

MODEL EVALUATION FORM NO. 2

Model ID	Title: Forests and floods in northwestern United States Author: Anderson, H.W. and Hobba, R.L. U.S. Forest Service, Berkeley Date of Work: 1959 Source: Int. Assoc. Sci. Hydrol., Pub. No. 48, pp. 30-39. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Logging, reforestation, forest fires Size of Area: 7-18,130 sq.km. (3-7,000 sq.mi.) Vegetation Zones: Coniferous forests, Pacific Northwest Other: Streamflow component sediment discharge
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: Flood causes were evaluated by analysis of floods from watersheds with wide differences in meteorological events and in topography, geology, and forest condition. Time trends in floods were used as a check on regression results.
Input	Variables Required & Time Scales: Rain vs. snow area, 2-day precipitation, antecedent precipitation and temperature, geologic rock types, area of bare cultivation, age and stocking of forest land, etc. Calibration Requirements: None.
Output	Variables Predicted & Time Scales: Peak discharge of storms and/or snow melt events.
Misc.	Previous Applications: Flood control surveys. USDA, Pacific Northwest. Strong Points: Variation of flood frequency with time and space and effect of forest management integrated into single variable. Weak Points: The implication to non-point pollution is indirect and will require separate calibration for each pollution parameter.

MODEL EVALUATION FORM NO. 3

Model ID	**Title:** Opportunities for Increasing Water Yields and Other Multiple-Use Values on Ponderosa Pine Forest Lands. **Author:** Brown, Harry E., Baker, M.B. Jr., Rogers, J.J. et al. Rocky Mountain Forest Experiment Station, Flagstaff, Arizona **Date of Work:** 1974 **Source:** USDA Forest Service Research Paper RM-129, 36 p. Dec. 1974 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Forest harvest, land clearing, brush and trash disposal **Size of Area:** Small unit watersheds **Vegetation Zones:** Ponderosa pine, alligator juniper-ponderosa pine in Central Arizona **Other:** Multiple-use evaluations including wildlife and aesthetics
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** A multiple regression to predict annual streamflow was developed from 148 observations from 12 watersheds. In the current model, the regression included winter precipitation, potential insulation and timber density.
Input	**Variables Required & Time Scales:** The potential insulation is the precentage of that at 1400 hours on a surface normal to incoming radiation; the timber variable is basal area in feet squared per acre. Winter precipitation is in inches per year. **Calibration Requirements:** None
Output	**Variables Predicted & Time Scales:** Annual streamflow
Misc.	**Previous Applications:** To the East and West Fork of ponderosa pine watersheds in Castle Creek in east and central Arizona Strong Points: The model includes variables in both energy inputs as well as an index which may imply activities under timber harvest. Interactions between precipitation and available energy and insulation and timber harvest are included. Weak Points: The relations and coefficients developed are applicable to the soil and timber areas of central Arizone; no direct application to water quality can be implied from these relations.

MODEL EVALUATION FORM NO. 4

Model ID	**Title:** The Generalized Stream Simulation System
	Author: Burnash, Robert J.C. and Ferrall, R. Larry. National Weather Service, Sacramento, CA
	Date of Work: 1971
	Source: Paper 6/6, International Symposium on Mathematical Models in Hydrology, Warsaw, Poland, July 26-31, 1971. International Association Scientific Hydrology Publication #100-102, pp. Unknown, 1975. (In press)
	Evaluator: Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___
	Activities: Any activities for which the infiltration rate, evapotranspiration rates & soil moisture storage & soil water flow are known
	Size of Area: Larger basins generally
	Vegetation Zones: Those for which evapo-transpiration rates are known
	Other: To test other models against this SFRC model, said to be the best of the explicit soil moisture accounting (EMSA) models.
Methodology	**Type:** Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___
	Summary: An explicit soil moisture accounting method of arriving at stream flow from predipitation inputs and evapotranspiration depletion of soil moisture by soil depth zones, utilizing two levels of tension water and three levels of free water from which interflow and base flow are generated.
Input	**Variables Required & Time Scales:** Precipitation, soil moisture storage capacity, calculated evapotranspiration.
	Calibration Requirements: Required
Output	**Variables Predicted & Time Scales:** Mean daily stream flow, Hence hydrograph of daily flows. Five months
Misc.	**Previous Applications:** Tested in the Napa River, Calif the Monocacy in the eastern United States - the Piedmont Plateau of Maryland.
	Strong Points: Evapotranspiration losses from soil moisture are differentiated between a more available upper zone water and a less available lower soil water.
	Weak Points: Inputs and outputs are not distributed to watershed parts, only to soil depths

MODEL EVALUATION FORM NO. 5

Model ID	Title: Generalized Streamflow Relations of the San Bernardino and Eastern San Gabriel Mountains, California. Author: Busby, Mark W. and Hirshima, George T., U.S. Geological Survey, Menlo Park, California Date of Work: 1972 Source: U.S. Geological Survey, Open File Report, Water Resources Division, Menlo Park, 75 p., 1972 Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Forest versus non-forest land, site potential, southern California Size of Area: 7.8 - 352 sq km (3 - 136 sq mi) Vegetation Zones: Brush and coniferous forest of the San Bernardino mountains of southern CA. Other: Flood frequency studies, southern California
Methodology	Type: Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ Summary: Flow characterisitcs were related to various sets of eight basin characteristics by statistical correlation method. The 26 stream characterisitcs represented high, low, and medium lows--flows used most in the design studies
Input	Variables Required & Time Scales: Drainage area, annual precipitation, channel length, channel slope, precipitation intensity, forest cover, elevation greater than 1524 (5000 feet) evapotranspiration (Pot ET) Calibration Requirements: None
Output	Variables Predicted & Time Scales: Twenty-six streamflow parameters including monthly flows, mean annual flow, 2-2, 50-year flood, 1-215-day, 2-year high, and 1-215-day, 50-year high.
Misc.	Previous Applications: Topographical parameters were used by Scott and Williams, USGS, Water Resources Investigation 47-73, 128 p., 1974. Strong Points: The number of streamflow parameters is comprehensive.

Weak Points: The errors in all the relations are quite large (ranging from 40 to 80 percent). The range of forest cover is too small to be of much diagnostic value. Stepwise regression techniques, which was used, probably does not give very reliable coefficients where such high correlations among the variables are involved.

MODEL EVALUATION FORM NO. 6

Model ID	**Title:** Methodology of Hydrologic Model-Building **Author:** Dawdy, David R. and Lichty, R.W., U.S. Geologic Survey, Menlo Park, California **Date of Work:** 1968 **Source:** International Association of Scientific Hydrology Pub. #81, pp. 347-367, 1968. **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Any effecting infiltration rate, soil moisture storage (evapotranspiration) in a known quantitative way **Size of Area:** Small units areas **Vegetation Zones:** Vegetation types which do not control surface runoff under different condition **Other:** Methods of objective fitting (calibration) error evaluation and sensitivity tests
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ **Summary:** A simulation approach to evaluations of surface runoff and three other components: soil moisture at onset; infiltration and rainfall excess for storm heightened period rainfall; and transformation of rainfall into stream at a point using linear storage and translation operations.
Input	**Variables Required & Time Scales:** Model operated with a total of eight parameters in an assumed time-area curve with rainfall discharge rates 5-10-15-30 or 60-minute intervals. **Calibration Requirements:** This is needed for the additional calibration.
Output	**Variables Predicted & Time Scales:** Complete storm hydrograph on stream for individual storms.
Misc.	**Previous Applications:** Test on Beetree Creek, North Carolina of a split sample fitting and testing basis (a Pl-1 program is available, through the U.S. Geological Survey, Washington, D.C.) Strong Points: A model has been subjected to sensitivity testing, selection of coefficients and subjected to a study of error functions. Weak Points: The model is a surface runoff model. No relation of water discharge to water quality is attempted or was intended.

MODEL EVALUATION FORM NO. 7

Model ID	**Title:** Usdahl 70 Model of Watershed Hydrology
	Author: Holton, H.N., Lopey, N.C.
	Date of Work: 1971
	Source: USDA, ARS, Tech. Bull. No. 1435, 84 p. 1971
	Evaluator: Henry W. Anderson
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___
	Activities: Activities for which evapotranspiration and Storage and routing coefficients of surface and subsurface are known
	Size of Area: Small watershed units
	Vegetation Zones: Any
	Other: Water yield
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___
	Summary: Rainfall rated to represent watershed areas is routed through the soils on the watershed for different capability classes and associated infiltration; evapotranspiration and overland flow are calculated and flow from the watershed in three stratified units, plus the channel is routed.
Input	**Variables Required & Time Scales:** Continuous rainfall, soil depths and storage characteristics, and routing coefficients for surface and subsurface water on the timescale of the output desired.
	Calibration Requirements: Calibration required for new units
Output	**Variables Predicted & Time Scales:** Annual water yield, flood peaks, and recession flows for individual storms
Misc.	**Previous Applications:** Used to predict the differences in water yield associated with planting of grass or deep-rooted vegetation as these affect infiltration and evapotranspiration both in Nebraska and Texas.
	Strong Points: Emphasizes separation in considerable detail what is happening on individual units of watersheds and routing is to channels and outflow.
	Weak Points: Flow peaks and recession flows and hence water quality associated with these are likely to be too sensitive to rainfall intensities and the storage coefficient used in routing surface and subsurface flows. No snow accumulation melt processes are accounted for.

MODEL EVALUATION FORM NO. 8

Model ID	**Title:** Simulation of the Hydrology of Ungaged Watersheds **Author:** Huggins, L.F., Burney, J.R. Kundu, P.S., and Monke, E.J. **Date of Work:** June 1973 **Source:** Purdue University, Water Resources Center, West Lafayette, Indiana Technical Report #38, 70 p., 1973 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Any activity for which the hydraulic and certain hydrologic elements of the hydrologic cycle are quantitatively known **Size of Area:** A few acres **Vegetation Zones:** Those for which the interception, soil moisture storage, and centain surface roughness characteristics are known **Other:** Unknown
Methodology	**Type:** Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ **Summary:** A surface runoff model in which mathematical characterization of the various physical processes occuring within each element of a grid of the watershed is used and numerical integration of the responses of each watershed element and discharge at the outlet is simulated.
Input	**Variables Required & Time Scales:** Size of watershed, time increment, surface roughness category, percent of ground cover, maximum potential interception, maximum surface roughhage heihgt, maximum surface detention depth and average depth and infiltration control depth together with watershed slope. **Calibration Requirements:** Calibration will be required
Output	**Variables Predicted & Time Scales:** Runoff by 2 ½-minute intervals or others of choice.
Misc.	**Previous Applications:** None **Strong Points:** A distributed analytical approach rather than a more common lumped system analysis. Quantitative expression of some of the vegetation elements has the effect of a hydraulics system. Weak Points: It is doubtful that laboratory roughness resembles natural watershed sufficiently to be transferable to actual outputs; cover density is not likely to be full expression of the hydrologic effectiveness of cover.

MODEL EVALUATION FORM NO. 9

Model ID	Title: Multicapacity basin accounting for predicting runoff from storm precipitation. Author: Kohler, M.A. and Richards, M.M. Weather Bureau, Wash., D.C. (Now NOAA) Date of Work: 1962 Source: J. Geophys. Res. 67(13) p. 5187-5197, 1962 Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Any for which evapotranspiration is known quantitatively Size of Area: Any for which no underflow Vegetation Zones: Any for which evapotranpiration is known Other: Probably in later ESSA models, see Nat. Wea. Serv. Forecast System
Methodology	Type: Analytic procedure ___ Simulation X Regression X Stochastic ___ Deterministic ___ Summary: A daily accounting of moisture deficit in a basin using different assumption of capacities. Evapotranspiration is assumed to be at a maximum until soil moisture deficit is experienced.
Input	Variables Required & Time Scales: Storm precipitation, air temperature, dewpoint, wind and solar radiation Calibration Requirements: Calibration is required.
Output	Variables Predicted & Time Scales: Evapotranspiration and storm streamflow.
Misc.	Previous Applications: Probably in subsequent Weather Bureau models Strong Points: The inclusion of elements of evapotranspiration and the checking of outputs by long-term watershed storage. Weak Points: No specific relation to non-point pollution sources or forest and range activities.

MODEL EVALUATION FORM NO. 10

Model ID	Title: Prediction of average annual and seasonal streamflow at physiographic units in the northeast. Author: Lull, Howard W. and Sopper, William E. Date of Work: 1967 Source: Int. Symp. Forest Hydrol., Pennsylvania State Univ., pp. 507-521, Pergammon Press, N.Y. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Those that might relate to changes in annual or seasonal flow. Size of Area: Whole watersheds less than 259 sq.km. (100 sq.mi.) Vegetation Zones: Eastern hardwood and coniferous forests Other:
Methodology	Type: Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ Summary: Analysis of streamflow data from 137 watersheds were related by regression analysis to 14 climatic, geographic, topographic, and land use variable.
Input	Variables Required & Time Scales: Precipitation temperature, elevation, percent forest cover, slope, percent of swamps, and latitude. Calibration Requirements: None
Output	Variables Predicted & Time Scales: Annual and seasonal streamflow.
Misc.	Previous Applications: Test representativeness of experimental watersheds. Strong Points: Some evaluation of spacial variation of streamflow is achieved and differences in the overall streamflow potential. Weak Points: No evaluation of forest activities on streamflow are obtained.

MODEL EVALUATION FORM NO. 11

Model ID	**Title:** GTWS: Georgia Tech Watershed Simulation Model **Author:** Lumb, Allan N., Currie, F. Leslie, Hassett, Timothy C., and Zorich, John. **Date of Work:** 1975 **Source:** School of Civil Engineering, Environ. Resources Center, Georgia Institute of Technology, ERC-0175, 153 pp, 7 appendices, January, 1975. **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Those for which quantitative estimated of evapotranspiration are available or differences between treatments are avaliable. **Size of Area:** 259 sq km (100 sq mi) or greater **Vegetation Zones:** Those for which evapotranspiration is known quantitatively **Other:** Student training
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ **Summary:** The Georgia Tech Watershed Simulation program is a deterministic model characterized by the terms empirical, physical-reasoned, intuitive, lumped and moderately expensive. The model originated with the Stanford and with the Kansas watershed models.
Input	**Variables Required & Time Scales:** Precipitation and pan evaporation adjusted for the time interval chosen or a given simulation. **Calibration Requirements:** Calibration is required
Output	**Variables Predicted & Time Scales:** Stream flow on a 15-minute basis, evapotranspiration, under flow, and soil moisture storage in the basin. Storage is divided into surface soil moisture, and ground water.
Misc.	**Previous Applications:** Studies of parameter optimization, requirements for rain gauge density and studies of parameter sensitivity. Strong Points: A user, George Dissmeyer, says that the variables are related to the physical properties of watershed. The effect of precipitation errors seem to have been well tested. Weak Points: All those associated with the explicit soil moisture accounting models

MODEL EVALUATION FORM NO. 12

Model ID	Title: Soil and Water Conservation Functions of Forest on Mountainous Lands, the research of the Forest Experiment Station.
	Author: Nakano, Hidenori, Japan
	Date of Work: 1971
	Source: Forest Influences Division, Government Forest Exp. Sta. 66p. 1971. Effects of changes in forest condition on water yield, peak flow, anddirect runoff of small watersheds in Japan. Proc. Int. Symp. Forest Hydrol, Penn State., pp 551-564, 1967.
	Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___
	Activities: Forest harvest
	Size of Area: Small watersheds
	Vegetation Zones: Coniferous forest of Japan
	Other: Unknown
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___
	Summary: Winter season runoff associated with interception was modeled by regression.
Input	Variables Required & Time Scales: Percent forest, relief ratio, mean slope
	Calibration Requirements: None (except for other variable low flows or water quality.)
Output	Variables Predicted & Time Scales: Streamflow flood peak, cubic meters/sec/m^2
Misc.	Previous Applications: Evaluation of changes in forest conditions.
	Strong Points: Some evaluation of changes in forests on streamflow.
	Weak Points: No direct means of evaluation of non-point pollution changes.

MODEL EVALUATION FORM NO. 13

Model ID	**Title:** Application of Streamflow Synthesis and Reservoir Regulation--"SSARR"--program to the lower Meking R. **Author:** Rockwood, David M., U.S. Corps of Engineers, Portland, Oregon. **Date of Work:** 1968 **Source:** International Assn. of Scientific Hydrology, Pub. No. 80, p. 329-344, 1968. **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Any activities known quantitatively to affect any component of the hydrologic cycle surface-subsurface, and base flow. **Size of Area:** Large basins. **Vegetation Zones:** Any from which the hydrologic cycle components have been evaluated. **Other:** Presumable would have application to water pollutant routing
Methodology	**Type:** Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ **Summary:** The "SSARR" program creates a mathematical hydrologic model of a river system through use of an electronic digital computer. Various hydrometeorological functions are combined to represent the entire process of streamflow simulation of the hydrologic cycle.
Input	**Variables Required & Time Scales:** Rainfall, snow melt, soil moisture, evapotranspiration and runoff excess indices, surface-subsurface flow, separation of cycle surface-subsurface, and base flow. **Calibration Requirements:** Calibration is required
Output	**Variables Predicted & Time Scales:** Continuous prediction of streamflow
Misc.	**Previous Applications:** Columbia River flood routing and other major watershed flood predictions **Strong Points:** The components of the hydrologic cycle can be changed as additional information is available on more detailed processes **Weak Points:** The present state of the model doesn't relate to non-point sources of physical pollutants either at their sources or in their delivery to use points.

MODEL EVALUATION FORM NO. 14-1

Model ID	Title: Design of a System for Predicting the Effects of Vegetation Manipulation on Water Yields in the Salt Verde Basin Author: Rogers, James J. Date of Work: 1973 Source: PhD dissertation, Univ. of Arizona, Tucson, 444 p. 1973. (On assignment, Oregon State Univ., School of Forestry, Corvallis, Oregon, April 1975) Evaluator: James J. Rogers
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: All activities affecting evapotranspiration, infiltration, and surface and ground water flow Size of Area: Small unit watersheds Vegetation Zones: General Other: General model of the hydrologic cycle evaluations
Methodology	Type: Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic X Summary: The model allows division of the watershed into response units, carries the water balance on each unit and routes the flow through the response unit and into the channel system.
Input	Variables Required & Time Scales: Rainfall by individual events or by daily amounts Calibration Requirements: Calibration is usually not required.
Output	Variables Predicted & Time Scales: Daily streamflow is predicted for individual watershed response units into the general system
Misc.	Previous Applications: See Brown, Harry E., et al. "Opportunities for increasing water yields and other multiple-use values on ponderosa pine and lands." USDA Forest Service Research Paper, RM-126, 1974. Strong Points: A rather complete picture of the hydrologic cycle, including 3-dimensional evaluation of the soil moisture storage. Weak Points: The model has only been applied on the Beaver Creek watersheds where unique forest characteristics of surface runoff and channel flow exist. Needs to be tested on other areas. A runoff model will not be water quality model.

MODEL EVALUATION FORM NO. 14-2

Model ID	**Title:** Ecosystem analysis of forest watersheds: a general water balance model. **Author:** James J. Rogers **Date of Work:** 1974-75, in development **Source:** Rogers, James J., R. H. Waring, W. Swank. 1975. Water relations and hydrologic cycles. In: Reichle, D.E. (ed.) International Biological Programme Synthesis Volumes. Woodlands: Their Structure and Function, Vols. 1 and 2. Cambridge University Press. Rogers, James J. 1975. Ecosystem analysis of forest watersheds: Documentation of a general water balance model. Manuscript in review. **Evaluator:** James J. Rogers
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial X **Activities:** All activities affecting terrestrial water balance processes. **Size of Area:** **Vegetation Zones:** **Other:**
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** Watershed is divided into response units. Hydrologic and plant water relation processes on each unit are modeled. Surface and subsurface flows are routed through response units to the channel systems.
Input	**Variables Required & Time Scales:** Daily climatic data (Precipitation, air temperature, dew point temperature, radiation, wind), soil, vegetation, physiographic characteristic. **Calibration Requirements:** None
Output	**Variables Predicted & Time Scales:** Complete data on water balance is available. Specific output determined by user. Basic output is daily flow from units, total flow, soil moisture, and snowpack description; and weekly summaries of water balance processes.

Misc.	Previous Applications: Tested on H. J. Andrews, Beaver Creek, Coweeta watersheds. Strong Points: A rather general complete process model for forest ecosystems. Data required is usually available or readily estimated. Program is modular in design and designed to allow coupling with erosion and nutrient component models. Weak Points: Requires further testing. Graphics display package is needed to aid interpretation of output. Such a package is not yet available but is in development.

MODEL EVALUATION FORM NO. 15

Model ID	Title: An application of the Utah State University watershed simulation model to the Entiat Experimental Watershed, Washington State Author: Shih, C.C., D.S. Bowles, and J.P. Riley Utah State University Date of Work: 1973 Source: Prepared for USDA, Forest Service, Pacific Northwest Forest & Range Exp. Sta., 48 p., June 1973. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Forest fire evaluation Size of Area: 2.6 - 13 sq.km. (1 - 5 sq.mi.) Vegetation Zones: East side coniferous, Washington State Other: Water budgeting, weather modification evaluation, watershed simulation (H.J. Andrews)
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ Summary: The (USU WSM) model is a lumped parameter type with a time increment of 1 day, based on evaluation of the elements of the hydrologic cycle and routing to streamflow and ground water zone storage.
Input	Variables Required & Time Scales: Rainfall and snow storage, temperature, monthly radiation index. Calibration Requirements: Required.
Output	Variables Predicted & Time Scales: Annual and daily streamflow and annual net perolation.
Misc.	Previous Applications: Weber River Basin, Utah, and H. J. Andrews Exp. Forest, Oregon. Strong Points: The groundwater storage was balanced quite well over an 8-year period. Weak Points: The lumped parameter model does not apply well to forestry's distributed problems.

MODEL EVALUATION FORM NO. 16

Model ID	Title: National Weather Service River Forecast System Forecast Procedures Author: Staff Hydrologic REsearch Laboratory (NOAA) Date of Work: 1972 Source: NOAA Tech. Memo. NWS HYDRO-14, Solar Springs, Md., Dec. 1972. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Presumably any that effect evapotranspiration is predictable from potential evaporation measured in Standard weather bureau pan Size of Area: Vegetation Zones: Mixed vegetation types countrywide Other: Flood forecasting
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ Summary: Stanford model type IV was modified chiefly to group contributions into fast medium and slow rather than surface runoff, interflow and ground water flow.
Input	Variables REquired & Time Scales: Elements of the hydrologic cycle, as indexed by the Stanford model, are on a six-hour input except for infiltration, zone retention, surface interflow detention, and lower zone retention, which are on an hourly basis; seepage and ground water are on a daily basis. Calibration Requirements: For individual or some watersheds before application
Output	Variables Predicted & Time Scales: Six-hour streamflow
Misc.	Previous Applications: One of the sequential modifications of Stanford model--widely used, widely modified. Strong Points: Deviation from infiltration theory may make it more realistic for forested watersheds. Weak Points: Soil relation to activities seems to be through evapotranspiration which is calculated on theoretical grounds, which are still of questionable applicability to forest land activities.

MODEL EVALUATION FORM NO. 17

Model ID	Title: Long-Duration Runoff Volumes Author: U.S. Army Engineering District Corps of Engineers Sacramento, California Date of Work: 1958 Source: Corps of Engineers, Sacramento, Calif. Technical Bulletin. No. 5, 20 p, 17 charts, July 1958 Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Any activities known to change extreme flow, averages, or variances. Size of Area: Large watersheds. Vegetation Zones: All zones integrated into average map locations. Other: Unknown
Methodology	Type: Analytic procedure___ Simulation___ Regression___ Stochastic X Deterministic___ Summary: Frequency of annual-runoff items were determined: degree of correlation of successive annual runoff volumes was established, and statistical methods applied to determine means and variances of runoff volumes. The streamflow records were used to draw isopleths of streamflow for the U.S. and with some greater detail for the West.
Input	Variables Required & Time Scales: Simple map lookup for the general streamflow for the area involved (presumably with adjustment for deviation of the particular area from the average in the map zone). Calibration Requirements: None
Output	Variables Predicted & Time Scales: Geometric mean annual runoff in thousands of acre feet per square mile, the ratio of the 90-day annual runoff to annual runoff and standard deviation of the volumes of annual runoff.
Misc.	Previous Applications: Technical Report No. 1, June 1955, "Streamflow Volume Duration Frequency Studies." Strong Points: Streamflow and its variability is normalized insofar as possible with the records then available. Weak Points: Application to particular areas of forest or range activities will require cardful evaluation of deviation of those areas from the average of "map" streamflow characteristics.

MODEL EVALUATION FORM NO. 18

Model ID	Title: Hydrologic effects of vegetation manipulation. Author: USFS, Region 1 Date of Work: 1970-75 Source: Forest Hydrology, Part II U.S. Forest Service Missoula, Montana Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Timber, harvest, roads, burning Size of Area: 1st to 4th order drainage Vegetation Zones: Coniferous zones Other: Snowmelt watersheds
Methodology	Type: Analytic procedure X Simulation X Regression___ Stochastic___ Deterministic___ Summary: Calculates water yield increases and recovery due to evapotranspiration redistribution and interception on the basis of the area in roads, clearcuts, and partial cuts. Limits of annual water yield increase are converted to percent of area in equivalent clearcut condition.
Input	Variables Required & Time Scales: Precipitation/elevation, harvest type/elevation/habitat type, road acres/elevation, stream channel stability. Calibration Requirements: None.
Output	Variables Predicted & Time Scales: A "black box" model that determines average annual water yield, channel impact period, percent of area in equivalent clearcut condition, and hydrologic recovery by evapotranspiration, redistribution, and interception.
Misc.	Previous Applications: Tested to 5 years data on Benton Creek (research) timber harvest data by University of Idaho and Intermountain Forest and Range Exp. Station. Strong Points: Simplicity of application, a systematic comparison between subdrainages. Converts percent of area cut over by vegetation type/elevation, etc., into units of water yield. Weak Points: Does not include individual processes which may be most sensitive to water quality changes. Needs an energy budget subroutine for hydrograph simulation (peak flows, desynchronization).

MODEL EVALUATION FORM NO. 19

Model ID	**Title:** Using CSL for Daily or Longer Period Rainfall-Runoff Modelling. **Author:** Todini, E. and Wallis, J.R. Centro Scientifico, IBM Italia, Pisa. **Date of Work:** 1974 **Source:** Workshop on Mathematical Models in Hydrology, Pisa, Italy, December 9-12, 1974, Centro Scientifico IBM Italia, Pisa. **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Time variation in stream flow or extrapolation of stream flow relations to major floods **Size of Area:** Large basins **Vegetation Zones:** Deserts to rain forests **Other:** Unknown or at least untested.
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ **Summary:** A constrained linear system (CLS), is developed using the systems approach to simulate continuous daily or longer period rainfall-runoff modelling. A two or more vector space function (back versus front watershed), precipitation input, with a variable threshhold of accounting for antecedent moisture is basic to the simulation.
Input	Variables Required & Time Scales: Precipitation on a daily or average two day basis. **Calibration Requirements:** Calibration is required at the individual watershed
Output	**Variables Predicted & Time Scales:** Daily stream flow
Misc.	**Previous Applications:** None **Strong Points:** Very simple to use and efficient when only time variation is of interest; a computer program under a time-sharing system CP-CSM is used. **Weak Points:** A distributed inputs are very broad under past use; no coefficients related to elements of hydrologic cycle or to activities which might affect that cycle are built into the model.

MODEL EVALUATION FORM NO. 20

Model ID	Title: A Water Balance Program (BURP) Author: Watershed Systems Development Unit (Forest Service) Date of Work: 1967 Source: Watershed Systems Development Unit, PSW Forest & Range Experiment Station, Berkeley, CA 94701 Evaluator: Henry W Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Any that have known qualitative affects on evapotranspiration Size of Area: Small homogeneous units of land Vegetation Zones: Any for which evapotranspiration rates are known. Other: Input to erosion models
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ Summary: Water balance used by this program is the simple accounting procedure for interception, precipitation, potential evapotranspiration, soil moisture storage, snow accumulation melt, and soil moisture excess or runoff. A choice of standard equations for the various elements may be made in the model.
Input	Variables Required & Time Scales: Precipitation, dew point, radiation, sunshine ratio, reflecting surface, wind velocity, pressure, water surface temperature with slope-aspect adjustment for radiation. All may be on a daily or monthly basis depending on the computational formulae used. Calibration Requirements: Calibration is required
Output	Variables Predicted & Time Scales: Interception and other elements of the hydrologic cycle including runoff as an excess, on a monthly or daily basis
Misc.	Previous Applications: Broad regional planning (framework studies, USDA-FS); local tests on national forests. Strong Points: A simple computer-based modelling system for initial water balance evaluation. Weak Points: The computational elements are not particularly developed for forest activities evaluation or forest-terrain interactions.

MODEL EVALUATION FORM NO. 21

Model ID	Title: Mathematical simulation of the snow melting process
	Author: Amorocho, J. and B. Espildora
	Date of Work: February 1966
	Source: Department of Water Science and Engineering University of California, Davis
	Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X
	Activities: N/A
	Size of Area: Central Sierra Nevada mountains
	Vegetation Zones: Lodgepole, red fir, and white fir
	Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___
	Summary: This is a lumped-parameter equivalent system model. It considers heat and mass transfer of the snow-air and snow-soil interfaces and within snowpack. Input data may limit use, especially if model is used outside of "test conditions." The model does not simulate water equivalent changes as compared with observed values. The author explains the difference "due to field measurement errors."
Input	Variables Required & Time Scales: Radiation, air temperature, dewpoint temperature, wet-bulb, wind velocity, precipitation, cloud type, and cover.
	Calibration Requirements: Should be tested for other areas.
Output	Variables Predicted & Time Scales: Snow accumulation and melt, inches of water
Misc.	Previous Applications: Experimental only--no field data was collected, used 1946-47 CSSL data only.
	Strong Points:
	Weak Points: Confined to a small forest opening, required detailed data.

MODEL EVALUATION FORM NO. 22

Model ID	Title: Streamflow modification through management of eastern forests Author: Douglass, J. E. and W. T. Swank Southeast Forest Experiment Station Asheville, North Carolina Date of Work: May 1972 Source: USDA, Forest Service Research Paper SE-94 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Timber harvesting/water yield Size of Area: Southern Appalachian forests Vegetation Zones: Southeastern hardwoods Other:
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: Used paired watersheds to check effects of timber cutting on water yield. Treatment was on hardwoods in North Carolina. Prediction equations: y = 1.39 + 0.13x, where y = first year streamflow increases after treatment (inches), and x = reduction in forest stand basal area (%). y = 1.57x, where y = duration of increased flow (years), and x + first year streamflow increase after treatment (inches).
Input	Variables Required & Time Scales: Calibration Requirements: None except check on areas other than southern Appalachian
Output	Variables Predicted & Time Scales: Water yield increase/ duration of increase over time (years)
Misc.	Previous Applications: Coweeta watersheds and checks with Fernow, Leading Ridge, and Hubbard Brook. Strong Points: Simple equation. Weak Points: Assumes "flat terrain" i.e., no contrast with aspect or slope.

MODEL EVALUATION FORM NO. 23

Model ID	Title: Effects of management practices on water quality and quantity: Coweeta Hydrologic Lab, N. Carolina Author: Douglass, J. E. and W. T. Swank Date of Work: 1975 Source: USDA, Forest Service, Southeast Forest Exp. Sta. Technical Report SE-13 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Timber management/conversion Size of Area: Southeast, small watersheds Vegetation zones: Southeast hardwoods and eastern white pine Other:
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___

Summary: Conversion of hardwoods to white pine reduces monthly and annual streamflow. Conversion of hardwood to grass produces ≤14.73cm (5.8 in.) of annual flow (increase). Some nutrient output occurs but are well within drinking water standards.

First year changes in yield are:

$$\Delta Q = 0.0024 \left(\frac{x_1}{x_2}\right)^{1.4462} \qquad r^2 = .89$$

where Q = 1st year increase in flow, inches

x_1 = percent basal area cut

x_2 = potential annual insolation in langleys

Derives it (above) for north and south slopes. Above relation is then applied to Douglass and Swank's equation (see review sheet) to estimate annual changes in flow after initial timber cut.

Input	Variables Required & Time Scales: Annual streamflow increase, percent basal area cut, solar radiation. Calibration Requirements: None if used in southern Appalachian

Output	**Variables Predicted & Time Scales:**
Misc.	**Previous Applications:** Experimental Coweeta
	Strong Points: Simple equations
	Weak Points: Used "whole" watersheds

MODEL EVALUATION FORM NO. 24

Model ID	Title: Documentation of PROSPER--a model of atmosphere-soil-plan water flow Author: Goldstein, R. A. J. B. Mankin, and R. J. Luxmoore Date of Work: February 1974 Source: EDFB-1BP-73-9, Oak Ridge National Lab. Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: N/A Size of Area: Small watersheds $\leq$97.5 ha (240 ac.) Vegetation Zones: Oak-hickory, Southeast, U.S. Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ Summary: This model was developed to also provide a coupling with a model of stand vegetation development and provide a detailed description of water fluxed in a hydrologic transport model. It follows the typical water balance approach to a vegetative stand with the soil divided into several layers. It is designed for accuracy on a weekly basis but can be used to predict on a daily basis.
Input	Variables Required & Time Scales: At "normal" weather stations, i.e., wind velocity and solar radiation. Vapor density, initial soil moisture content. Calibration Requirements: Need testing in other parts of U.S.
Output	Variables Predicted & Time Scales: Weekly water balance.
Misc.	Previous Applications: Oak Ridge, Tennessee Strong Points: Can be coupled with other programs into a total yield model. Weak Points: Specific detailed data not necessarily available and validated only in southeast.

MODEL EVALUATION FORM NO. 25

Model ID	Title: Computer simulation of snowmelt within a Colorado subalpine watershed Author: Leaf, C. F. and G. E. Brink Date of Work: February 1973 Source: USDA, Forest Service Rocky Mountain Forest & Range Exp. Sta. Researce Paper RM-99 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Timber harvesting Size of Area: Rocky Mountain area Vegetation Zones: Rocky Mountain conifer zone (subalpine) Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ Summary: This model simulates snowmelt in Colorado subalpine watersheds for combination of aspect, slope, elevation, and forest cover and density. Accumulation and melt water are simulated by energy balance functions on a daily basis.
Input	Variables Required & Time Scales: Daily temperature and precipitation and shortwave radiation, potential radiation, cover, and maximum snowpack water equivalent. Calibration Requirements: Needs testing for other areas with dry snow.
Output	Variables Predicted & Time Scales: Simulates daily snowpack accumulation and melt.
Misc.	Previous Applications: Tested from field data on a 270 ha (667 ac.) watershed. Strong Points: Simple model. Weak Points: Emperical in many functions.

MODEL EVALUATION FORM NO. 26

Model ID	Title: Interception by eastern white pine Author: Helvey, J. D. Coweeta Hydrology Lab Date of Work: 1967 Source: WRR v.3(3), 3rd quarter, 1967 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: N/A Size of Area: Southern Appalchians (North Carolina) Vegetation Zones: Eastern white pine Other:
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: Total seasonal interception loss (I) was predicted based on measurements of gross rainfall, throughfall, stemflow, and litter interception in eastern white pine stands 10, 35, and 60 years old in western North Carolina. (See reverse for equations.)
Input	Variables Required & Time Scales: Total annual precipitation, number of storms, stand age. Calibration Requirements: N/A
Output	Variables Predicted & Time Scales: Interception
Misc.	Previous Applications: Coweeta only Strong Points: East of use and available data. Weak Points: Does not consider basal area or some indication of canopy or leaf area, size of storm or intensity.

Methodology - Summary (cont.):

Prediction equations:

Eastern white pine

$$I_{10} = 0.05(N) + 0.08(\Sigma P)$$

$$I_{35} = 0.05(N) + 0.12(\Sigma P)$$

$$I_{60} = 0.06(N) + 0.18(\Sigma P)$$

where I_i = interception loss of the i^{th} aged stand (pine)

N = number of storms

ΣP = total seasonal precipitation

Interception losses increase with stand age and pine stands exceeded losses from mature hardwoods.

Mature mixed hardwoods

$$I = 0.04(N) + 0.08(\Sigma P);$$ (mature, growing season)

$$I = 0.02(N) + 0.06(\Sigma P);$$ (mature, dormant season)

		I losses	
Mixed hardwoods	mature	25.4cm (10 in.)	12% of P
White pine	10 yrs.	30.5cm (12 in.)	15% of P
White pine	35 yrs.	38.1cm (15 in.)	19% of P
White pine	60 yrs.	53.3cm (21 in.)	26% of P

MODEL EVALUATION FORM NO. 27

Model ID	Title: Hydrologic simulation model of Colorado subalpine forest Author: Leaf, C. F. and G. E. Brink Date of Work: May 1975 Source: USDA, Forest Service Rocky Mountain Forest & Range Exp. Station Research Paper RM-107 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Timber harvesting Size of Area: Rocky Mountain area Vegetation Zones: Rocky Mountain conifer zone, lodgepole pine, spruce, fir Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ Summary: This is a revision and expansion of Leaf's earlier snowmelt model. It is designed to simulate the total water balance on a continuous, year-round basis. The model incorporates contributions from individual hydrologic subunits to form a composite watershed functioning.
Input	Variables Required & Time Scales: Daily temperature and precipitation and shortwave radiation, potential radiation, cover, and density. Calibration Requirements: Needs testing for other areas with "dry" snow
Output	Variables Predicted & Time Scales: Simulation of water balance (snowpack water equivalent, evapotranspiration, soil moisture deficit, and runoff).
Misc.	Previous Applications: Tested in Rocky Mountain area 270 ha (667 ac.) watershed. Strong Points: Incorporates effects of wind redistribution. Weak Points: Application to small areas; requires detailed data, very emperical.

MODEL EVALUATION FORM NO. 28

Model ID	Title: Application of the Green and Corey method for computing hydraulic conductivity in hydrologic modeling Author: Luxmoore, R. J. Date of Work: April 1973 Source: Oak Ridge National Lab EDFB-IBP-73-4 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: N/A Size of Area: N/A Vegetation Zones: N/A Other:
Methodology	Type: Analytic procedure X Simulation ___ Regression ___ Stochastic ___ Deterministic X Summary: Utilizes a main program and three subroutines (SOIL, TABLOK, and UNTAB). The "main" program representative of any hydrologic model calls the subroutines: SOIL determines the hydraulic conductivity; TABLOK determines the particular hydraulic conductivity and pressure values at given soil water contents; UNTAB appears to check on the tabled values of conductivity (not really discussed in the article). The total program package can provide an effective bridge between available data and the input data requirement of a physically based soil-water model. Computer program and user's guide are available from Oak Ridge.
Input	Variables Required & Time Scales: Water content, pressure, total porosity saturated conductivity. Calibration Requirements: None
Output	Variables Predicted & Time Scales: Hydraulic conductivity.
Misc.	Previous Applications: Tested experimental data. Strong Points: Can be coupled with a runoff model. Weak Points: Data may be unavailable or difficult to collect.

MODEL EVALUATION FORM NO. 29

Model ID	Title: Interception loss in loblolly pine stands of the South Carolina Piedmont Author: Swank, W. T., N. B. Goebel, and J. D. Helvey Date of Work: 1972 Source: Jour. Soil and Water Conservation July-August 1972 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: N/A Size of Area: Southeast Piedmont Vegetation Zones: Loblolly pine Other: See evaluation on J. D. Helvey, 1967
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: Equations of interception loss were determined for loblolly stands based on 45-year mean precipitation and storm frequency (Clemson, S. Carolina). (see reverse for equations)
Input	Variables Required & Time Scales: Gross annual precipitation, number of storms Calibration Requirements: N/A
Output	Variables Predicted & Time Scales: Interception, inches.
Misc.	Previous Applications: Research plots Strong Points: Ease of use and data Weak Points: No information relating to stand condition and canopy, nor size of storm or intensity.

Methodology - Summary (cont.):

Regression equations:

$$I_5 = 0.04(N) + 0.08(P)$$

$$I_{10} = 0.02(N) + 0.19(P)$$

$$I_{20} = 0.02(N) + 0.15(P)$$

$$I_{30} = 0.02(N) + 0.15(P)$$

$$\text{Hardwood + Pine} = 0.03(N) + 0.13(P)$$

where I_i = annual interception loss for i^{th} year stands

N = number of storms

P = total annual precipitation

---

	annual	
5 yr. loblolly	12.7cm (5 in.) loss	14% of P
10 yr. loblolly	29.7cm (11.7 in.) loss	22% of P
20 yr. loblolly	24.3cm (9.6 in.) loss	18% of P
30 yr. loblolly	24.3cm (9.6 in.) loss	18% of P
Hardwood + pine(mature)	23.6cm (9.3 in.) loss	17% of P

MODEL EVALUATION FORM NO. 30

Model ID	Title: Simulation of evapotranspiration from mature and clearcut deciduous forest and young pine plantation Author: Swift, L. W. Jr., et al. Date of Work: December 1973 Source: EDFB Memo Report 73-79 Evaluator: Don Willen
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial X Activities: Vegetation type cutting or conversion Size of Area: Vegetation Zones: Eastern hardwoods and white pine Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ Summary: Discusses a model, PROSPER, which simulates evapotranspiration and annual streamflow from a mature oak-hickory forest in southern Appalachian Mountains. Simulated annual streamflow agreed within 1.5% with measured streamflow. Simulations were also made with clearcuts and "showed good agreement" with measured changes at Coweeta Hydrologic Lab. this model can incorporate the subroutines "ASPECT" and "SUNMAP". (See the evaluation for Swift and Luxmoore, 1973. Computational algorithm for solar radiation on mountain slopes.)
Input	Variables Required & Time Scales: Precipitation, air temperature, atmospheric moisture, solar radiation, wind speed, Albedo, leaf area, interception storage, resistance values for water movement through soils, plants, and atmosphere. Calibration Requirements: Would require calibration with other geographic areas and vegetative cover.
Output	Variables Predicted & Time Scales: Simulated streamflow.
Misc.	Previous Applications: Tested with Coweeta data. Strong Points: Applicable to eastern hardwoods and white pine. Can simulate water stress on vegetation. Weak Points: A continuously moist surface is assumed; vegetative cycles are represented by emperical coefficients. Some input data may not be available.

MODEL EVALUATION FORM NO. 31

Model ID	Title: Computational algorithm for solar radiation on mountain slopes Author: Swift, L. W., Jr. and R. J. Luxmoore Date of Work: 1973 Source: EDFB - Memo Report 73-10 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: N/A Size of Area: Broad Vegetation Zones: N/A Other: Potential energy on a surface; subroutines "ASPECT" and "SUNMAP" for the atmosphere-soil-plant-water flow model "PROSPER."
Methodology	Type: Analytic procedure X Simulation X Regression ___ Stochastic ___ Deterministic ___ Summary: This algorithm for calculating the solar irradiation of mountain slopes utilizes Frank and Lee's equations; eliminates use of solar declination and radius vector; provides estimates of solar radiation on the slope that includes actual effects of cloud cover and atmospherical transmissivity. Computer program and user's guide available.
Input	Variables Required & Time Scales: Actual data and potential; aspect; date (Julian), latitude, inclination Calibration Requirements: None
Output	Variables Predicted & Time Scales: Actual radiation, daily basis; potential radiation on slope; potential on map area.
Misc.	Previous Applications: Research tool since 1950 and revised 1970. Strong Points: Does not require solar ephemeras data; can easily be adapted to a total runoff model. Weak Points: Has bugs, being revised; need nearby actual solar data.

MODEL EVALUATION FORM NO. 32

Model ID	Title: Estimating water yield differences between hardwood and pine forests Author: Verry, E. S. Date of Work: March 1975 Source: Unpublished Research Paper North Central Experiment Station Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Type conversion Size of Area: Northeast and possibly northern states. Vegetation Zones: Red pine and aspen Other:
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: Presents regression equations for stemflow, throughfall, and net precipitation for red pine, aspen, hazel, and brochen fern for growing and "non-growing" seasons and related to basal area, stems per acre and percent crown cover. "Net snowfall" equations are given for aspen and red pine. All equations are applicable to storms 2 to 50 mm except the "dormant" season storms for aspen which are applicable from 2 to 25 mm. Snowpack equation are applicable for seasonal precipitation from 60 to 220 mm. Equations could then be used to incorporate into a water yield model to estimate yield differences between type conversions. Write-up available from North Central Experiment Station.
Input	Variables Required & Time Scales: Annual precipitation, annual runoff, area of treatment, and net percent change of cover. Calibration Requirements: None if used in northeast.
Output	Variables Predicted & Time Scales: Estimated percent change in water yield.
Misc.	Previous Applications: Derived only from research plots. Strong Points: Equations have simple input variables. Weak Points: Does not have wide applicability nor estimated effects on soil moisture. Needs more testing.

MODEL EVALUATION FORM NO. 33

Model ID	Title: Simulation of daily snow water equivalent and melt
	Author: Willen, D. W., C. A. Shumway, and J. E. Reid
	Date of Work: 1971
	Source: Proc. 39th West. Snow Conf., pp. 1-8.
	Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X
	Activities: Timber harvesting
	Size of Area: Central Sierra Nevada
	Vegetation Zones: Red and white fir, lodgepole pine
	Other:
Methodology	Type: Analytic procedure X Simulation X Regression ___ Stochastic ___ Deterministic ___
	Summary: Model is a simulation algorithm for predicting daily snow and water equivalent and delivered melt water on-site.
Input	Variables Required & Time Scales: Daily maximum and minimum temperature and precipitation and solar radiation, and canopy density.
	Calibration Requirements: Needs testing in other Pacific coast areas.
Output	Variables Predicted & Time Scales: Snow water equivalent and potential water delivery on-site
Misc.	Previous Applications: Tested with 2 years of CSSL data
	Strong Points: Correlates well with Sierra Nevada snow zone analytical
	Weak Points: Does not include routing to stream.

MODEL EVALUATION FORM NO. 34

Model ID	Title: Summer evapotranspiration trends as related to time after logging of forests in Sierra Nevada Author: Ziemer, R. R. Date of Work: 1964 Source: J. Geophys. Res. V69(4), Feb. 15, 1964 Evaluator: Don Willen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Timber harvesting Size of Area: Central Sierra Nevada (west side) Vegetation Zones: Red fir, whitefir 1,820 to 2,135m (6,000 to 7,000 ft.) Other:
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: After logging, soil moisture saving was decreased to 7.36cm (2.9 in.) in 5 years, 3.05cm (1.2 in.) in 10 years, 1.78cm (0.7 in.) in 12 years. After 16 years the moisture saved by cutting will be negligible. Equation: $y=6.891 - 5.728 \log t$, where y = moisture savings per season at maximum depletion in inches of moisture per 4 feet of soil, and t = age of the forest opening in years.
Input	Variables Required & Time Scales: Age of forest opening. Calibration Requirements: None, need to check for other areas.
Output	Variables Predicted & Time Scales: Moisture savings, in season at depletion for 4 foot soil depth.
Misc.	Previous Applications: Research plots only. Strong Points: Simple to apply. Weak Points: Not universally applicable for other vegetative zone and soils.

MODEL EVALUATION FORM NO. 35

Model ID	Title: Guidelines for computing quantified soil erosion hazard and on-site soil erosion Author: Anderson, David Date of Work: 1969 Source: USFS, Southwestern Region Albuquerque, New Mexico Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Surface disturbance Size of Area: Not specific Vegetation Zones: Southwest, arid, semi-arid, alpine, coniferous Other:
Methodology	Type: Analytic procedure X Simulation X Regression X Stochastic ___ Deterministic ___ Summary: Summary model is a factoral approach originally developed by Musgrave but modified to reflect steeper slopes and total ground cover.
Input	Variables Required & Time Scales: Erodibility coefficient, basic erosion rate, precipitation intensity-duration 2 yrs, 30 min. precipitation. Calibration Requirements:
Output	Variables Predicted & Time Scales: Erosion hazard in inches/year
Misc.	Previous Applications: Actual loss, development of coefficients for use outside of data base area. Strong Points: Applies a consistent analytical procedure to a wide range of land areas and relative impacts associated with various surface disturbance activities. Valuable for on-site management alternative selection. Weak Points: Does not evaluate snowmelt, does not give a time distribution or recovery. Difficult to relate to water quality.

MODEL EVALUATION FORM NO. 36

Model ID	Title: Soil-loss considerations in chaparral-to-grass conversions. Author: Boster, R. S. and L. R. Davis Date of Work: 1972 Source: National Symposium on Watersheds, in Trans. AWRA Proc., 1972. Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Surface disturbance activities Size of Area: Not specific Vegetation Zones: Best in agricultural lands Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression X Stochastic ___ Deterministic ___ Summary: This is a computerized version of the Anderson 1969 (modified Musgrave) soil loss estimation. It, however, permits varying rates of precipitation.
Input	Variables Required & Time Scales: Basic erosion rates, erodability, precipitation intensity, slope and cover characteristics. Calibration Requirements: Should be tested to local soil loss data to developed coefficients.
Output	Variables Predicted & Time Scales: Soil loss per unit area/unit storm intensity-duration.
Misc.	Previous Applications: Unknown. Strong Points: Applies a systematic, analytic procedure to determine relative erosion loss rates per unit area tested. Weak Points: Does not account for snowmelt runoff effects and may be limited for widespread application.

MODEL EVALUATION FORM NO. 37

Model ID	Title: Mathematical simulation of upland erosion using fundamental erosion mechanics Author: Foster, G. R. and L. D. Meyer USDA, ARS Misc. Pub. ARS-S-40 (in press) Date of Work: 1972 Source: Sediment Yield Workshop ARS Sedimentation Laboratory, Oxford, Mississippi November 28-30, 1972 (in process) Evaluator: George F. Dissmeyer
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Mathematical expression of erosion processes (rill and inter-rill erosion) Size of Area: Slope erosion--midwest Vegetation Zones: Agricultural lands Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic X Summary: Predicts erosion using erosion mechanics.
Input	Variables Required & Time Scales: Fluid and erosion mechanics variables, transport capacity, detachment, shear stress, etc., and vegetation Calibration Requirements:
Output	Variables Predicted & Time Scales: Erosion
Misc.	Previous Applications: Small 12m (35 ft.) plots Strong Points: Summarizes in mathematical form sheet and rill erosion processes. Weak Points: Limited to small plots, so far. Does not route sediment to point downstream.

MODEL EVALUATION FORM NO. 38

Model ID	Title: A closed form soil erosion equation for upland areas Author: Foster, G. R. and L. D. Meyer ARS, Oxford, Mississippi Date of Work: 1972 Source: Sedimentation (Einstein). H. W. Shen, Editor and Publisher Fort Collins, Colorado Evaluator: George E. Dissmeyer
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Surface disturbance activities. Size of Area: Plots Vegetation Zones: Other:
Methodology	Type: Analytic procedure X Simulation ___ Regression ___ Stochastic ___ Deterministic X Summary: Erosion prediction using equations and concepts from mechanics.
Input	Variables Required & Time Scales: Calibration Requirements:
Output	Variables Predicted & Time Scales: Erosion
Misc.	Previous Applications: Strong Points: Deals with physical processes involved in overland flow and detachment. Weak Points: Data not readily available and not related to parameter readily identified in field. Deals only with overland flow and sediment associated with this process.

MODEL EVALUATION FORM NO. 39-2

Model ID	Title: A model for predicting erosion and sediment yield from secondary forest road construction Author: Leaf, C. F. Rocky Mountain Forest & Range Exp. Sta. Date of Work: December 1974 Source: Evaluator: George E. Dissmeyer
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Road erosion Size of Area: Small watershed in Rockies Vegetation Zones: Subalpine with snowmelt Other:
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic X Summary: Under broad assumptions, accumulated erosion and sediment curves are predicted by use of equations of re-cover trends.
Input	Variables Required & Time Scales: Road design data, length and area of roads, estimate of "normal" geologic erosion, time-recover period, erosion indexes. Calibration Requirements:
Output	Variables Predicted & Time Scales: Sediment yield and erosion.
Misc.	Previous Applications: Just in Fools Creek. Strong Points: Recover trend prediction with approximations of sediment yield by year after road construction. Weak Points: Based on well designed and installed roads system--comparison with substandard roads lacking. Developed in and can be used in snowmelt zones only.

MODEL EVALUATION FORM NO. 39a

Model ID	Title: Erosion over time on severely disturbed granitic soils: a model Author: Megahan, W. F. Date of Work: September 1974 Source: USDA, Forest Service Research Paper INT-156, 1974, 14 p. Evaluator: David A. Falletti
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Road construction Size of Area: Variable Vegetation Zones: Any Other: Developed for Idaho Batholith
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: Model is exponential regression for surface erosion over time based upon experimental data on granitic materials from four different study sites. Useful for comparing erosion rates on disturbed vs. non-disturbed lands.
Input	Variables Required & Time Scales: Erosion rate, amount of material available to be eroded, index for rate of decline in erosion rate, elapsed time in days after disturbance. Calibration Requirements: Observed total erosion over time.
Output	Variables Predicted & Time Scales: Total erosion rate in tons/mi^2
Misc.	Previous Applications: Basic form of equation is used in Leaf and Brink, Land Use Planning MOdel (1975) Strong Points: Simple to use--gives comparative evaluations. Weak Points: Requires new regression coefficients for each site.

MODEL EVALUATION FORM NO. 40

Model ID	Title: Soil stability on high-elevation rangeland in the intermountain area Author: Meeuwig, Richard O. Date of Work: 1971 Source: USFS, Intermountain Forest & Range Exp. Sta., INT-94. Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Surface disturbance activities Size of Area: Small unit areas Vegetation Zones: Alpine, coniferous forests, rangelands, timber Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression X Stochastic ___ Deterministic ___ Summary: Relationships established between slope gradient, length, simulated rainfall, vegetative cover, and organic matter on soil detachment and loss. Equations developed which indicate erosion potential for seven different areas.
Input	Variables Required & Time Scales: Soil erodability factors, slope, cover, organic matter. Calibration Requirements:
Output	Variables Predicted & Time Scales: Erosion loss by various soil types and storm intensity per storm event.
Misc.	Previous Applications: Strong Points: These equations can be very valuable for validation of standard soil loss equations. Weak Points: Does not deal with snowmelt losses and does not include time distributed losses.

MODEL EVALUATION FORM NO. 41

Model ID

Title: Mathematical simulation of the process of soil erosion by water

Author: Meyer, L. D., and W. H. Wischmeier

Date of Work: 1969

Source: Trans. ASAE, Vol. 12- No. 6, 1969

Evaluator: George E. Dissmeyer

Intended application

Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial X

Activities: Erosion simulation

Size of Area: Slopes

Vegetation Zones:

Other:

Methodology

Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic X

Summary: Paper concentrates on primary erosion and transportation forces. Simplified model which simulates erosion by slope increments on various types of slopes. The model is for conceptual and developmental purposes only.

Input

Variables Required & Time Scales:

Calibration Requirements:

Output

Variables Predicted & Time Scales: Erosion.

Misc.

Previous Applications:

Strong Points: Analytic in approach.

Weak Points: Needed data is limited.

MODEL EVALUATION FORM NO. 42

Model ID	Title: The quantitative evaluation of factors in water erosion. A first approximation. Author: Musgrave, G. W. Date of Work: 1947 Source: Jour. of Soil and Water Conservation 2: 133-138. Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Surface disturbance activities. Size of Area: Not specific Vegetation Zones: Croplands--agricultural. Other:
Methodology	Type: Analytic procedure X Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: This surface soil erosion model estimates the soil loss associated with a 2 year, 30 minute storm intensity.
Input	Variables Required & Time Scales: Slope grade, length, soil erodibility, cooperative management factor. Calibration Requirements:
Output	Variables Predicted & Time Scales: Actual soil loss for a particular storm event relates to a 2 year, 30 minute rainfall. Relates more directly to forest activities.
Misc.	Previous Applications: Strong Points: Ease of application. Weak Points: Does not consider snow melt runoff or is not suited to extrapolation for slopes over 20-30 percent. Does not estimate sediment or water quality parameters. Needs to be linked with water yield models and channel erosion models, including snowmelt, and a sediment deliver ratio system to be able to quantify sediment production associated with resource activities. Needs to be validated with on-site erosion studies on moderate to steep slopes in the West. Does not consider soil loss recovery over time. This original work has been modified many times to improve the basic work (see other erosion evaluation sheets).

MODEL EVALUATION FORM NO. 43

Model ID	**Title:** Prediction of subsoil erodibility using chemical, mineralogical, and physical parameters **Author:** Roth, C. B. et. al. **Date of Work:** June 1974 **Source:** EPA, ORD, Cincinnati, Ohio 45268 **Evaluator:** Don Willen
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X **Activities:** N/A **Size of Area:** N/A **Vegetation Zones:** N/A
Methodology	**Type:** Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ **Summary:** A nomograph is presented which predicts sub-soil erodibility ("scalped soils") of high clay subsoils. The nomograph is correlated to the erodibility factor, "K," of the Universal Soil Loss Equation. It is usable only with high clay subsoils, with very slow permeability and blocky or massive structure containing amorphous iron and aluminum hydrous oxides. Also applicable to compacted fill soils. The study suggests a "soil management" factor which should replace the "cropping-management" factor in the Universal Soil Loss Equation when the latter is used to predict sub-soil erosion. Further work is suggested to incorporate initial soil moisture content, separate the crystalline and amorphous forms of aluminum and iron hydroxides and test on soils other than blocky or having low permeabilities. This would improve the application of this model to broad areas. Write up is available on procedure.
Input	**Variables Required & Time Scales:** Soil particle size distribution, amorphous hydrous oxides of iron, aluminum and silicon. **Calibration Requirements:** N/A
Output	**Variables Predicted & Time Scales:** Subsurface erodibility
Misc.	**Previous Applications:** Utilized agricultural soils of the midwest and tested with rainfall simulators. **Strong Points:** Predicts subsoil erodibility and could be used in estimating road and site preparatory areas. **Weak Points:** Requires detailed chemical analysis of soils (see paper).

MODEL EVALUATION FORM NO. 44

Model ID	Title: Estimating soil erosion losses from Utah watersheds Author: Tew, Ronald K. Date of Work: 1973 Source: USFS, Intermountain Region, Ogden, Utah. Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Surface disturbance activities. Size of Area: Not specific Vegetation Zones: Semi-arid to subalpine Other:
Methodology	Type: Analytic procedure X Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: The modified Musgrave approach was used and tempered with local.Soil detachment (ground cover variable), slope adjustment and erodability and rainfall factors were used to develop a set of nomographs to calculate erosion losses from surface disturbance activities.
Input	Variables Required & Time Scales: Soil evaluation (erodibility), slope, ground cover, crown cover, rainfall factor, erosion hazard. Calibration Requirements: Needs testing to determine appropriate coefficients.
Output	Variables Predicted & Time Scales: Soil loss in inches per year.
Misc.	Previous Applications: USFS, Region 4. Strong Points: Applies a consistent analytical approach to determine the relative soil loss associated with activities for various slope segments. Weak Points: Does not handle snowmelt runoff and is not a time function analyzer. Does not take recovery into account.

MODEL EVALUATION FORM NO. 45

Model ID	Title: Sediment yield prediction with universal equation using runoff energy factor Author: Williams, Jimmy R. ARS, Southern Region Temple, Texas Date of Work: November 1972 Source: Sed. Yield Workshop ARS, Sedimentation Laboratory, Oxford, Miss. November 28-30, 1972 (in press) Evaluator: George E. Dissmeyer
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Sediment yield production Size of Area: Small agricultural watersheds Vegetation Zones: Corn belt. Other:
Methodology	Type: Analytic procedure X Simulation ___ Regression ___ Stochastic ___ Deterministic X Summary: Universal equation is modified by replacing the "R" factor by a runoff factor $(95(Q \times q_p)^{.56})$, and used to predict sediment yield for large storms in tons.
Input	Variables Required & Time Scales: Weighted values for Universal equation + volume of discharge (ac.ft.) and peak in cfs. Calibration Requirements:
Output	Variables Predicted & Time Scales: Sediment yield tons per storm
Misc.	Previous Applications: Agricultural lands Strong Points: Attempt to relate sediment to storm runoff Weak Points: Storm runoff should be separated into a surface runoff component which is the volume of runoff responsible for erosion.

MODEL EVALUATION FORM NO. 46

Model ID

Title: New developments in estimating water erosion

Author: Wischmeier, W. H.
ARS
W. Lafayette, Indiana

Date of Work: 1974

Source: Land Use: Persuasion or Regulation
Proc. 29th annual meeting, SCSA, Syracuse, N.Y.
August 11-14, 1974

Evaluator: George E. Dissmeyer

Intended application

Type: Physical X Chemical___ Biological___ Aquatic___
Terrestrial X

Activities: Erosion production

Size of Area: Broadens Universal Equation to more national use.

Vegetation Zones:

Other:

Methodology

Type: Analytic procedure X Simulation___ Regression___
Stochastic___ Deterministic___

Summary: Procedures modified to predict more accurately erosion from slops of different configurations, varying soils, vegetation as you proceed from top to bottom of slope. Also has procedure to develop "R" factors for western states.

Input

Variables Required & Time Scales:

Calibration Requirements:

Output

Variables Predicted & Time Scales: Erosion

Misc.

Previous Applications: Agricultural lands

Strong Points: Systematic on-the-ground evaluation procedures.

Weak Points: Based on agricultural research and not tested on forest land with plot check to verify.

MODEL EVALUATION FORM NO. 47

Model ID	Title: Estimating the cover and management factor for undisturbed areas Author: Wischmeier, W. H. Purdue University Date of Work: 1972 Source: Sediment Yield Workshop ARS, Oxford, Mississippi 1972 Evaluator: George E. Dissmeyer
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: All forest disturbances and conditions Size of Area: USA Vegetation Zones: USA Other:
Methodology	Type: Analytic procedure X Simulation ___ Regression ___ Stochastic ___ Deterministic X Summary: Procedure for developing cover and conservation factors for universal soil loss equation and its use on forest lands.
Input	Variables Required & Time Scales: Evaluated in field. Calibration Requirements: None
Output	Variables Predicted & Time Scales: Cover and conservation factor for Universal Equation
Misc.	Previous Applications: Strong Points: Systematic approach to determine C & P factors. Weak Points: Not developed using research data--was derived by logic and use of energy relationships.

MODEL EVALUATION FORM NO. 48

Model ID	Title: Universal soil loss equation Author: Wischmeier and Smith Date of Work: 1960 Source: Seventh Int. Cong. Soil Sci. Madison, Wisconsin Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial X Activities: Surface disturbance activities Size of Area: Not specific Vegetation Zones: Developed for agricultural or crop lands Other:
Methodology	Type: Analytic procedure X Simulation___ Regression X Stochastic___ Deterministic___ Summary: The model is a surface erosion model which relates the inputs (listed below) to soil detachment and loss on-site on a storm intensity basis.
Input	Variables Required & Time Scales: Storm intensity, soil erodability, cropping management, slope length, slope gradient, and practices. Calibration Requirements:
Output	Variables Predicted & Time Scales: Erosion losses on a storm event basis.
Misc.	Previous Applications: Strong Points: The model has widespread use because of its ease of application. There has been little verification testing, however, when it's been used. Weak Points: Is calibrated and developed for croplands in the southeast and midwest U.S. Is not developed for slopes over 30 percent. Does not consider snowmelt. Need to be linked to a sediment delivery ratio and a water yield model in order to quantify or predict sediment production rates. Does not evaluate soil loss recovery time.

MODEL EVALUATION FORM NO. 49-1

Model ID	Title: ONEROS Author: WSDU, USFS, Berkeley, California Date of Work: 1972 Source: WSDU, USFS Evaluator: Dave Falletti
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Natural conditions and any surface disturbance. Size of Area: Any Vegetation Zones: Works best on rangelands, but has been used for forest lands. Other: Version ONEROS2 allows up to three different road types
Methodology	Type: Analytic procedure X Simulation X Regression X Stochastic ___ Deterministic ___ Summary: ONEROS model uses the modified Musgrave equation developed by Anderson (1969) to generate sheet erosion. Sheet erosion is combined with estimated gulley and road erosion and by use of estimated routing and trap coefficients. Total average annual soil loss is calculated.
Input	Variables Required & Time Scales: Basic erosion rate; erodability factor; 2 year, 30 min. storm slope of unit; total ground cover and road characteristics. Calibration Requirements: Should be calibrated against known average annual soil losses.
Output	Variables Predicted & Time Scales: Average annual soil loss by response unit and watershed.
Misc.	Previous Applications: Extensive use in western U.S. in Forest Service. Strong Points: Model easy to use, can be related to inidividual land units or whole watersheds. Provides a comparative analysis and has accounting procedures for roads. Weak Points: Does not analyze snowmelt runoff; all routing and trap parameters are estimates with no process for estimating. Basic Musgrave approach has weakness in steep timbered lands.

MODEL EVALUATION FORM NO. 50

Model ID	Title: EROSON, Model Author: Region 3 U.S. Forest Service Albuquerque, New Mexico Date of Work: 1973 Source: Watershed Systems Development Unit, Berkeley, Calif., from Anderson, 1969. Guidelines for computing quantified soil erosion hazard and on-site erosion.USFS. Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X Activities: Surface disturbance activities. Size of Area: Not specific Vegetation Zones: Adapted for wildland conditions, however, developed from Musgraves approach for SE & midwest U.S. Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression X Stochastic ___ Deterministic ___ Summary: Generates an array of on-site erosion rates estimated by erodibility of soil, precipitation intensity, slope and vegetative cover, using modified Musgrave approach on a storm basis.
Input	Variables Required & Time Scales: See modified Musgrave approach. Calibration Requirements: Should test to actual local soil loss data.
Output	Variables Predicted & Time Scales:
Misc.	Previous Applications: Planning and assistance in alternative selection. Strong Points: Is an aid in applying a systematic approach to approximate changes in soil loss rates to surface disturbance activities. Weak Points: Does not evaluate snowmelt events--only relates to rain storm events for short time periods. Recovery (reduction in soil loss time) is not evaluated.

MODEL EVALUATION FORM NO. 51

Model ID	Title: Mechanisms of erosion and sediment movement from gullies Author: Piest, R. F., J. M. Bradford, R. G. Spomer Date of Work: 1972 Source: Sediment Yield Workshop Oxford, Mississippi Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic X Terrestrial X Activities: All Size of Area: Small watersheds 30 to 60 ha.(74 to 150 ac.) Vegetation zones: Agricultural but could be used on wildlands. Other:
Methodology	Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ Summary: Gully erosion prediction are best indicated by runoff rates from storm events. The runoff is mostly affected by changes in vegetative levels. Sediment rating curves established to show magnitude of gulley erosion with increases in storm runoff.
Input	Variables Required & Time Scales: Sediment concentration, runoff, soil moisture, vegetative cover. Calibration Requirements: Need sediment rating curves.
Output	Variables Predicted & Time Scales: Sediment production from sheet, rill, and bulley erosion.
Misc.	Previous Applications: Agricultural lands, Iowa Strong Points: Assess channel erosion on the basis of a measureable parameter--streamflow, thus it can be linked with other on-site soil loss and water yield models to determine potential changes in water quality by considering the gully and channel contributions. The sediment rating curve approach is used. Weak Points: Data requirements are stringent initially. Does not handle armoring, deposition, or sediment storage in the various channel systems. Is not a "routing" model per se, only an integrative analysis including the lumping of channel erosion processes.

MODEL EVALUATION FORM NO. 52

Model ID	**Title:** Some methods for relating sediment production to watershed conditions **Author:** Rosa, J. M. and M. H. Tigerman U.S. Forest Service Ogden, Utah **Date of Work:** 1951 **Source:** Intermountain Forest and Range Experiment Station **Evaluator:** Dave Rosgen
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic X Terrestrial X **Activities:** Timber harvest, grazing, vegetation conversions **Size of Area:** All **Vegetation Zones:** Arid, alpine, dry to moist timbered sites in Idaho, Utah, and Colorado (Columbia & Colo. River Basins.) **Other:**
Methodology	**Type:** Analytic procedure X Simulation X Regression X Stochastic ___ Deterministic ___ **Summary:** Estimates of the effect of vegetation condition (good, fair, and poor) were correlated with the amount of sediment transported. A fourfold increase was noted in poor vs. good contion watersheds. A coefficient value (sediment rating curve) is derived based on watershed condition.
Input	**Variables Required & Time Scales:** Vegetative cover type and erosion map, stormflow, and runoff data, sediment concentrations to estimate mean annual base sediment produced. **Calibration Requirements:** Test to regression where $S = Kq^n$
Output	**Variables Predicted & Time Scales:** Sediment production rates.
Misc.	**Previous Applications:** **Strong Points:** Can adjust local sediment production coefficients when using the sediment rating curve approach as documented in later research work if degrees of freedom developed with data. **Weak Points:** Integrates total of all impacts, not on specific locations within the watershed or specific activity. Does not separate natural high rates vs. accelerated. No degrees of freedom established in data which would bias correlation coefficient.

MODEL EVALUATION FORM NO. 53

Model ID	**Title:** The hydraulic geometry of stream channels and source physiographic implications **Author:** Leopold, L. and T. Maddock, Jr. **Date of Work:** 1953 **Source:** U.S. Geological Survey Paper 252 **Evaluator:** Dave Rosgen
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Those that affect the change in water yield or direct sediment introduction to all stream channels. **Size of Area:** Not specific. **Vegetation Zones:** Not specific **Other:**
Methodology	**Type:** Analytic procedure X Simulation X Regression X Stochastic ___ Deterministic ___ **Summary:** Accelerated channel erosion is predicted using the sediment rating curve approach and an estimate of the background (existing) channel erosion and estimate of pre-treatment and post-treatment water yield (peak or average daily flow).
Input	**Variables Required & Time Scales:** Daily flow, existing sediment rating curve, and post treatment slope of the rating curve. **Calibration Requirements:** N/A
Output	**Variables Predicted & Time Scales:** Accelerated channel erosion in tons or acre feet/unit time/unit area.
Misc.	**Previous Applications:** Unknown except for development work by the authors. **Strong Points:** Separates the channel erosion component with increases in streamflow due to activities. **Weak Points:** Does not evaluate up-slope contribution (on-site) through erosion. Requires some sediment concentration data which may not be available.

MODEL EVALUATION FORM NO. 54

Model ID	**Title:** Use of erosion equations and sediment delivery ratios for predicting sediment yield **Author:** Renfro, Graham **Date of Work:** 1972 **Source:** USDA, Sedimentation Workshop Oxford, Mississippi **Evaluator:** Dave Rosgen
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X **Activities:** **Size of Area:** Not specific **Vegetation Zones:** Southeastern, USA **Other:**
Methodology	**Type:** Analytic procedure X Simulation X Regression X Stochastic ___ Deterministic ___ **Summary:** A resume of the SCS technique of applying the universal soil loss equation, Musgrave, and the use of sediment delivery ratios.
Input	**Variables Required & Time Scales:** See universal and Musgrave write-ups, uses drainage area and relief-length ratio for delivery ratios. **Calibration Requirements:** Should be tested on-site, need to have an estimate of baseline sediment production and on-site erosion loss and estimates.
Output	**Variables Predicted & Time Scales:** Erosion rates, sediment delivery ratios, and sediment production.
Misc.	**Previous Applications:** Agricultural lands. **Strong Points:** Applies a consistent systematic approach to changes in approximate quantities of soil loss and associated sediment production. **Weak Points:** Does not handle snowmelt runoff; does not handle channel erosion or transport.

MODEL EVALUATION FORM NO. 55

Model ID

Title: PSAND (sediment model)

Author: Strand, Robert I.

Date of Work: 1972

Source: Bureau of Reclamation
Denver, Colorado

Evaluator: Dave Rosgen

Intended application

Type: Physical X Chemical___ Biological___ Aquatic X
Terrestrial___

Activities: Channel erosion increases in discharges and resultant water quality due to channel erosion and sediment transport.

Size of Area:

Vegetation Zones: All generally large watersheds.

Other:

Methodology

Type: Analytic procedure___ Simulation___ Regression___
Stochastic___ Deterministic___

Summary: Program calculates total sediment load for an alluvial channel transporting sand. Sediment transport computed by the modified Einstein procedure and Einstein bedload function or velocity.

Input

Variables Required & Time Scales: Discharge, channel hydraulic characteristics, hydraulic gradient, water temperature, size distribution of the channel bed material.

Calibration Requirements: Concentration and size of suspended sediment.

Output

Variables Predicted & Time Scales: Sediment discharge by sand size classes and computes wash load.

Misc.

Previous Applications: Unknown.

Strong Points: The program handles the complicated Einstein bedload functions and selected modifications for a sand channel.

Weak Points: Only integrates total of all increases in a watershed and discharge input on a time series is difficult. Data requirements are difficult to obtain. Limited to only sand channels.

MODEL EVALUATION FORM NO. 56

Model ID	Title: Unit stream power for sediment transport in natural rivers Author: Yang, C. T. and J. B. Stall Date of Work: 1974 Source: University of Illinois Water Resources Center, Urbana, Illinois UILU-WRC-74-0088 Evaluator: Dave Rosgen
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic X Terrestrial ___ Activities: Channel erosion, activities affecting direct sediment introduction, roads, etc. Size of Area: Not specific. Vegetation Zones: N/A Other:
Methodology	Type: Analytic procedure ___ Simulation X Regression X Stochastic ___ Deterministic ___ Summary: Total sediment concentrations are calculated based on unit stream power as influenced by changes in particle size, water depth, and water temperature.
Input	Variables Required & Time Scales: Water discharge, velocity, energy slope, shear stress, particle size channel material, and sediment material. Calibration Requirements: Channel morphology data.
Output	Variables Predicted & Time Scales: Total sediment concentration on the basis of unit stream power.
Misc.	Previous Applications: Tested on 6 natural rivers and over 1,000 sets of data verify basic relationships used on predominantly sand channels. Strong Points: Looks at measurable energy relations to determine total sediment production. Weak Points: Need flow data to use this approach. Adapted (based on test data) to sand channels where wash loads are minimal.

MODEL EVALUATION FORM NO. 57

Model ID	**Title:** Scour and deposition in rivers and reservoirs **Author:** Thomas, William A. Hydraulic Engineering Center Davis, California **Date of Work:** January 1974 **Source:** U.S. Army Corps of Engineers Program 723-G2-L2470 **Evaluator:** Dave Rosgen
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Flow related. **Size of Area:** Not specific **Vegetation Zones:** Not specific **Other:**
Methodology	**Type:** Analytic procedure ___ Simulation X Regression X Stochastic ___ Deterministic ___ **Summary:** A simulation to analyze scour and deposition of sediment in streams or reservoirs by interaction of channel geometry, water-sediment mixture, channel material, and hydraulics of flow. Utilizes sediment rating curves by various reaches. Transport of sediment by conditions in Einstein's bedload function equations.
Input	**Variables Required & Time Scales:** Channel geometry, sediment rating curves, water surface elevation, material size composition of sediment and Manning's N values. **Calibration Requirements:** Need to have available Manning's N and sediment rating curves and runoff data (stage-discharge curve).
Output	**Variables Predicted & Time Scales:** Bedload material, sediment transport outflow (suspended) volume and gradation of sediment deposition, armor layering, resulting bed elevation.
Misc.	**Previous Applications:** None. **Strong Points:** Handles detailed data input of parameters and changing sediment rating curves and channel characteristics to show the affects on sediment depositions and transport. **Weak Points:** Does not relate to up-slope management or treatments. Does not consider channel erosion directly (bank sloughing). If coupled with a water yield distribution model (by unit area) it would be a good tool to relate to activities.

MODEL EVALUATION FORM NO. 58

Model ID	**Title:** A stochastic model for sediment yield for ephemeral streams **Author:** Woolhizer, W. H. and P. Tod Drovi **Date of Work:** 1971 **Source:** Proc. Int. Assoc. for Statistics in Physical Science Symposium of Hydrology. Tucson, Arizona **Evaluator:** Dave Rosgen
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial X **Activities:** Activities which affect streamflow rates and timing. **Size of Area:** Large **Vegetation Zones:** All **Other:**
Methodology	**Type:** Analytic procedure ___ Simulation ___ Regression ___ Stochastic X Deterministic ___ **Summary:** Utilizing short-term sediment production for long-term evaluation is related to the pure threshold model, the general threshold model, and the infiltration model. A regression equation between peak runoff rate and sediment yield is suggested.
Input	**Variables Required & Time Scales:** Precipitation amounts and duration,sediment concentration, streamflow infiltration. **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Sediment production as an output per storm event.
Misc.	**Previous Applications:** Not known. **Strong Points:** A stochastic modeling approach should eventually be the best model to describe the variance of sediment over time and space. Establishing a statistical base for mean production data. **Weak Points:** Is an empirical approximation which needs to be validated before application. Can be used on total watershed affects with difficulty, however, in assigning unit area contributions associated with various activities.

MODEL EVALUATION FORM NO. 59

Model ID	Title: General slope stability analysis
	Author: Bell, James M.
	Date of Work: 1968
	Source: Proc. ASCE, J. Soil Mechan. Found. Div. V. 94, No. SM6, pp. 1253, 1270.
	Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___
	Activities: Those that effect stress.
	Size of Area: Local
	Vegetation Zones: Unknown
	Other: Seismic effect evaluated.
Methodology	Type: Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic X
	Summary: "A statisticlly accurate limiting equilibrium procedure for numerical treatment of slope stability problems," which applies to both homogeneous and nonhomogeneous earth slopes, wide variety of loads, but requires a normal stress distribution assumption.
Input	Variables Required & Time Scales: Effective strength parameters, excess pore pressure or shear resistance.
	Calibration Requirements: (Probably for forest activities)
Output	Variables Predicted & Time Scales: Relative slope stability
Misc.	Previous Applications: (Unknown)
	Strong Points: Computer program yielding appropriate stresses for complex slopes.
	Weak Points: Input information may be difficult to assess in forest activity evaluation.

MODEL EVALUATION FORM NO. 60

Model ID	Title: Mass soil movement in the H. J. Andrews Experimental Forest Author: Dyrness, C. T. Date of Work: 1967 Source: U.S. Forest Serv. Res. Pap. PNW-42, 12 pp. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Road development, logging. Size of Area: Any Vegetation Zones: Douglas-fir Other: --
Methodology	Type: Analytic procedure___ Simulation___ Regression___ Stochastic X Deterministic___ Summary: Analysis of 47 mass movement occurrences resulting from severe storms during winter of 1964-65. Differences between geologic rock types, roaded areas, logged and unlogged and unroaded were tallied.
Input	Variables Required & Time Scales: Major event example. Calibration Requirements: Yes.
Output	Variables Predicted & Time Scales: Mass movement occurrence = f (roads, logging, geologic rock type)
Misc.	Previous Applications: (Unknown) Strong Points: Opportunity to appraise a rare event. Weak Points: Rare event is unique.

MODEL EVALUATION FORM NO. 61

Model ID	Title: Effect of forest clear cutting on the stability of natural slopes Author: Gray, Donald H. Date of Work: 1969 Source: Prog. Rpt., U. Michigan, ORA Proj. 01939, 67 p. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Logging Size of Area: Local Vegetation Zones: Coniferous forests Other:
Methodology	Type: Analytic procedure X Simulation ___ Regression ___ Stochastic ___ Deterministic ___ Summary: For a slope with constant angle of inclination and soil depth much less than slope height, the author borrowed an analysis technique of Ter-Stepanian (1963) to calculate the stability parameters.
Input	Variables Required & Time Scales: Time scale unknown. Calibration Requirements: Yes
Output	Variables Predicted & Time Scales: Height of rigid zone, factor of safety against complete failure, allowable height of piezometric level, and maximum depth planar creep.
Misc.	Previous Applications: Ter-Stepanian (1963) and Yen (1969) Strong Points: Forest parameters apparently included. Weak Points: Untested under forest activities.

MODEL EVALUATION FORM NO. 62

Model ID	Title: Roles of topography, soil and forest in the landslides of weathered granite areas Author: Khono, Y., S. Namba, K. Takiguchi, Y. Kitamura, T. Juroturi, K. Armitsu, K. Miyagawa, and C. Kobayashi Date of Work: 1968 Source: Rpt. of Coop. Res. for Disaster Preven. (Tokyo) No. 14, 77-112 (In Japanese, English summary) (See Sed. Bibliog. Foreign Lit. Surv.5,pp169-170, 1969. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Forest planting, road location, and design. Size of Area: Small Vegetation zones: Japan coniferous forests and farmlands. Other:
Methodology	Type: Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ Summary: The area of landslides were related to the area of young forests, length of "unfitted" roads, and farmland along the base of the hills.
Input	Variables Required & Time Scales: Time scale unknown, inputs as above. Calibration Requirements: None.
Output	Variables Predicted & Time Scales: Area of landslides (Ha/Km^2)
Misc.	Previous Applications: Unknown Strong Points: Is activity-oriented and forest land evaluated. Weak Points: Limited geology, soils, topography and land uses involved in evaluation.

MODEL EVALUATION FORM NO. 63

Model ID	Title: Landslides along the Columbia River Valley, Northeastern Washington Author: Jones, F. O., D. R. Embody, W. L. Peterson, and R. M. Hazlewood Date of Work: 1961 Source: U.S. Geol. Survey Prof. Pap. 367, 98 p. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: None Size of Area: Local Vegetation Zones: Unknown Other:
Methodology	Type: Analytic procedure X Simulation___ Regression___ Stochastic___ Deterministic___ Summary: The stability of natural slopes was investigated by comparing slopes which slide with others that had not. The analysis included material, ground water terrace height, original slope, and submergence. A formula was developed for predicting the stability of natural slopes.
Input	Variables Required & Time Scales: (Not known--original appraisal, 1965, unfavorable, not reappraised.) Calibration Requirements:
Output	Variables Predicted & Time Scales: Stability of natural slopes.
Misc.	Previous Applications: Unknown Strong Points: Compare both sliding and non-sliding areas. Weak Points: No fundamental measurements involved.

MODEL EVALUATION FORM NO. 64

Model ID	Title: Statistical studies on landslides near the boundare between Gitu and Fukui pretectures Author: Murano, Y.
	Date of Work: 1968
	Source: Rpt. Coop. Res. for Disaster Preven. (Tokyo), No. 15, 19-31 (In Japenese with English summary)
	Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___
	Activities: "Forest conditions"
	Size of Area: Watersheds
	Vegetation Zones: Japanese westside forests
	Other:
Methodology	Type: Analytic procedure___ Simulation___ Regression___ Stochastic X Deterministic___
	Summary: The relation of three parameters, precipitation, topography, forest condition and geology were studied--number of slides per unit area, mean area of landslides, and area of landslides.
Input	Variables Required & Time Scales: Geology, relief energy, 3-day precipitation and forest condition.
	Calibration Requirements: None
Output	Variables Predicted & Time Scales: Number of landslides per unit area, mean area of landslides, and area of landslides.
Misc.	Previous Applications: Unknown
	Strong Points: Both numbers and sizes of landslides were independently related to watershed attributes.
	Weak Points: The volume of material, hence total sediment production, was not obtained (apparently).

MODEL EVALUATION FORM NO. 65

Model ID	**Title:** Soil and water conservation function of forest on mountainous land **Author:** Nakano, Hidenori **Date of Work:** 1971 **Source:** Forest Influences Div.,Govt. Forest Exp. Sta. (Japan), 66 p. (in English) **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Forest harvest, reforestation **Size of Area:** Local **Vegetation Zones:** Coniferous forests **Other:** Slope stabilization
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** Experiments and conceptual physical relations together with simple power function models are combined to estimate the relation of forest establishment and timber harvest on hydrologic outputs including streamflow, surface erosion, landslides, and elements of the hydrologic cycle.
Input	**Variables Required & Time Scales:** Rainfall (maximum 1 hour), forest percent, forest species. **Calibration Requirements:** Yes
Output	**Variables Predicted & Time Scales:** Resistance to "Landslides" = f (trees, stumps, time); surface erosion = f (cutting, stump removal, location on slope); streamflow = f (forest area, relief ratio, slope).
Misc.	**Previous Applications:** (Unknown) **Strong Points:** Concepts are experimentally tested. Best index of slope (surface) stability and time changes. **Weak Points:** The climatic, soil-geologic, and topographic potentials are primitively indexed, activities are few.

MODEL EVALUATION FORM NO. 66

Model ID	Title: An estimate of the role of soil slips in erosion from the San Gabriel Mountains Author: Rice, Raymond M. Pacific Southwest Forest & Range Exp. Sta. Berkeley, California 94701 Date of Work: 1968 Source: Amer. Geophys. Union Trans. 49(4), p. 678, 1968, (Abstract) Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Brush to grass conversion Size of Area: Local Vegetation zones: Brushlands, Southern California Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ Summary: The data from two large storms in 1965 were used together with fire history and storm frequency to simulate expected distribution of soil-slip frequency under natural brush and brushland converted to grassland following fires.
Input	Variables Required & Time Scales: Storm frequency, fire frequency, vegetation recovery. Calibration Requirements: Yes
Output	Variables Predicted & Time Scales: Area and volume of soil slips, frequency.
Misc.	Previous Applications: (Unknown) Strong Points: Some attempt to put soil-slip results on a long-term time scale. Weak Points: Quanitative reactions to storms tend to be unique so more experienced data would be needed and wider sampling in site characteristics.

MODEL EVALUATION FORM NO. 67

Model ID	Title: Effects of high intensity storms on soil slippage on mountainous watersheds in southern California Author: Rice, R. M. and G. T. Foggins, III Date of Work: 1971 Source: Water Resources Res. 7(6): 1485-1496. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Fire prevention, type conversion (brush to grass) Size of Area: Local Vegetation Zones: Brush and grass, Southern California Other:
Methodology	Type: Analytic procedure ___ Simulation ___ Regression ___ Stochastic X Deterministic ___ Summary: The effects of conversion of brush areas to grass (following a forest fire) on soil slippage during the winter storms of 1969 were studied in the San Dimas Experimental Forest by linear discriminant analysis and comparison of converted versus non-converted areas.
Input	Variables Required & Time Scales: Proximity to stream, grass vs. brush, slope, single events compared. Calibration Requirements: None
Output	Variables Predicted & Time Scales: Area of soil slippage, volume of slippage, time scale not evaluated.
Misc.	Previous Applications: 1966 storm analysis, similar model. Strong Points: Meaningful (rare) event evaluated. Weak Points: Effect of long-term consequences difficult to assess.

MODEL EVALUATION FORM NO. 68

Model ID	**Title:** Flood frequencies and Sedimentation from Forested Watersheds **Author:** Anderson, Henry W. Forest Service, Berkeley, CA 94701 **Date of Work:** 1949 **Source:** Transactions American Geophysical 30 (4), pp 567-583, 1949 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Forest fire prevention, and rehabilitation of vegetation after forest fires **Size of Area:** 2.6-518 sq km (1-200 sq mi) **Vegetation Zones:** Sage grass, brushland, and high elevation conifers, southern Calif. **Other:** Evaluation of rainfall amounts and rainfall antecedent to storms on the streamflow and sediment producing frequencies.
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** A multi-watershed, multi-storm, multi-variable approach was used to develop a hydrologic base for evaluating flood control in southern CA. Rainfall and streamflow evaluations were used in the determination of sedimentation frequencies and average annual sedimentation variation with forest cover density, as affected by 13 cover types and three geologic types and the time recovery of vegetation following fire.
Input	**Variables Required & Time Scales:** Maximum 24-hour precipitation, precipitation in the 21 days prior to a storm, forest cover density, and area of mainstream channel. **Calibration Requirements:** NONE
Output	**Variables Predicted & Time Scales:** Maximum yearly streamflow and average annual sediment deposition normalized to long-term expected streamflow and rainfall frequencies.
Misc.	**Previous Applications:** USDA Flood prevention program, southern California, State evaluations of fire prevention southern and south coastal California, USGS evaluations of reservoir design, Stanford Research Insstitute evaluations of fire programs, southern California.

Strong Points: An effective simple index of vegetation management for fire prevention together with a precipitation index of time variation and a geologic and vegetation index of spacial variation are integrated into the model.

Weak Points: Geologic differences in sediment production are indexed only in terms of their affects on cover density; a different scaling coefficient has been found to be necessary for some of the coastal sediments.

MODEL EVALUATION FORM NO. 69

Model ID	**Title:** Physical Characteristics of Soils Related to Erosion. **Author:** Anderson, Henry W. **Date of Work:** 1951 **Source:** J. soil & Water Conservation 6(3) pp 129-133, 1951 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Forest fires and other treatments affecting watershed cover density **Size of Area:** 18.1-518 sq km (7-200 sq mi) **Vegetation Zones:** Coastal sage-grass, brushlands and high elevation coniferous forest of south coastal CA **Other:** USDA Flood Control Program, Santa Maria
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** Seven soil characteristics associated with geologic types in south coastal basins of Calif. together with average cover density on watersheds were tested for relationship to suspended sediment concentration from 13 watersheds. Equations relate average sediment concentration to watershed cover density and various soil indexes of erodability.
Input	Variables Required & Time Scales: Cover density on watershed and index calculated from geology **Calibration Requirements:** None
Output	**Variables Predicted & Time Scales:** Average suspended sediment concentration in parts per million
Misc.	**Previous Applications:** USDA Flood Prevention programs, U.S. Geological Survey, analysis of expectedreservoir deposition. **Strong Points:** Various indexes of erodability were tested for their quantitative production of sediment from watersheds; the familiar erosion ratio was shown to be technically unsound. Weak Points: Only a limited number of soil geologic types were sampled; cover density as an index of land uses suitable only for rather limited bit of Forest Service activities

MODEL EVALUATION FORM NO. 70

Model ID	**Title:** Suspended sediment discharge as related to stream flow topography, soil, and land use. **Author:** Anderson, Henry W. Forest SErvice, BErkeley, CA **Date of Work:** 1954 **Source:** Transactions American Geophysica Union 35 (2) pp 268-281, 1954 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Timber harvest, road construction and maintenance, agricultural use, channel-bank stabilization **Size of Area:** 2.59-28490 sq km (1-11,000 sq mi) **Vegetation Zones:** West coast coniferous forests, cultivated lands, and non-stop forests; **Other:** Evaluation of contribution of eroding channel banks to sedimentation; contribution of forest versus non-forest land to sedimentation.
Methodology	**Type:** Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ **Summary:** Responses of suspended sediment discharge to watershed variables were established from records of 1-3 years from 29 streams in western Oregon. The responses were used to establish a contribution to sediment discharge of individual parts of the watershed with different values of the variables. The surface-aggregation index of erodability was introduced; sediment frequency-concentration established.
Input	**Variables Required & Time Scales:** Streamflow characteristics, soil erodibility and soil texture, slope, roads, recent cutover, bare cultivation, length of eroding oanks. Calibration Requirements: None
Output	**Variables Predicted & Time Scales:** Average annual suspended sediment discharge, normalized to long-term flow frequency.
Misc.	**Previous Applications:** USDA Flood prevention, SVEN similation jodel, Snohomish watershed model, Wash. **Strong Points:** Average effect of most of the important variables are taken into account to allow application to individual units of land. Most inputs (streamflow) and outputs (sedimentation) are normalized to long-term frequency. Weak Points: No distinction is made between types of cutover or location and types of roads.

MODEL EVALUATION FORM NO. 71-2

Model ID

Title: Principal Components Analysis of Watershed Variables Affecting Suspended Sediment Discharge after a Major Flood

Author: Anderson, Henry W., U.S. Forest Service Berkeley, CA

Date of Work: 1970

Source: International Assn. of Scientific Hydrology Pub. #96, pp405-416, 1970. USDA Forest Service Research Note PSW-268, 4p., 1972

Evaluator: Henry W. Anderson

Intended application

Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___

Activities: Unimproved roads, type conversion (forest or brush to grass), vegetation watershed recovery.

Size of Area: 28-7252 sq km (11-2800 sq mi)

Vegetation Zones: Grasslands, brushlands, coniferous forests, northern California.

Other: Study of watershed recovery after a major flood, associated with before-flood land use.

Methodology

Type: Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___

Summary: Increases in sediment discharge from 31 watersheds after two major floods in northern California were studied by principle component analysis. Effects in individual watersheds of relative flood size, topographic differences, and extent of poor land use practices were found to be associated with increases in suspended sediment concentrations after the floods

Input

Variables Required & Time Scales: Drainage area, slope, relative flood size, elevation, channel lengths, and extent of poor logging, together with extent of steep grasslands, and relative amounts of three major geologic types were input. The time-scale was suggested by age of the photo versus time of each flood.

Calibration Requirements: None

Output

Variables Predicted & Time Scales: Annual suspended sediment discharge (MT/km^2), normalized to long-term flow duration. Increase in sediment in post flood period (1965-67) over the preflood period (1957-59)

Misc.

Previous Applications:
The basic techniques of normalization have been used in flood studies in Oregon and in suspended sediment studies in northern California.

Strong Points: Since major floods not only produce a large part of long-term sediment production but also may modify the future performance of watersheds for some period, values of this type contribute a necessary part of sedimentation studies in design of monitoring of sediment.

Weak Points: Evaluation of "distributed inputs" relies on a wide difference among each attribute among watersheds; many highly desirable combinations of attributes are not available with as few as 31 watersheds to be evaluated.

MODEL EVALUATION FORM NO. 72-2

Model ID	**Title:** Sediment deposition and reservoirs associated with rural roads, forest fires, and catchment attributes. **Author:** Anderson, Henry W., Forest SErvice, Berkeley, CA **Date of Work:** 1974 **Source:** International Assn. Scientific Hydrology Pub. #113, pp 87-95, 1974 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Forest fires, road standards and locations, Urbanization **Size of Area:** 1.3-3885 sq km (½-1500 sq mi) **Vegetation Zones:** northern California coniferous forests and brushlands. **Other:** Evaluation of rain and snow characteristics on climate stress, evaluation of geology
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** Measurements of reservoir deposition at 48 northern California reservoirs were studied by principle component analysis for four categories of variables: catchment, streamflow, snow, and land use. The regression coefficient obtained may be used to estimate the contribution of each variable to total sediment discharge and hence to estimate the effects of change in any variable on the expected change in sedimentation.
Input	**Variables Required & Time Scales:** Fire history, topography, geologic types, road characteristics, rain and snow characteristics based on elevation, and reservoir capacity. Calibration Requirements: None
Output	**Variables Predicted & Time Scales:** Average reservoir deposition normalized to long-term expectance and short-term evaluatin of the sediment potential based on streamflow
Misc.	**Previous Applications:** Erosion hazards for coastal area California Forest Practices Act, 1974 **Strong Points:** Deposition is total sediment, quantitatively measured, sedimentation is normalized to long-term expectancy; results were applicable to unit areas and management decisions. Weak Points: Timber harvest is not specifically evaluated (only in connection with road development), type conversion is not evaluated except for higher elevation brush-

lands, only three geologic types are specifically evaluated, and streamflow quantity is not evaluated (model has been extended to include streamflow landslide potential, geologic faults and reservoir density of sediments). Does not separately evaluate surface erosion or channel erosion.

MODEL EVALUATION FORM NO. 73

Model ID	**Title:** Influence of Some Watershed Variables on a Major Flood **Author:** Anderson, H.W. and Trobitz, H.K. U.S. Forest Service, Berkeley, CA **Date of Work:** 1949 **Source:** J. of Forestry, Vol. 47(5):347-356, 1949 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Forest fire prevention and rehabilitation, vegetation and recovery associated with flood and sediment reduction, barren area effects on flood and sedimentation, evaluation of effects of historic old fires. **Size of Area:** 2.6-518 sq km (1-200 sq mi) **Vegetation Zones:** Sage grass, brushlands, and high elevation coniferous forests of southern California. **Other:** Design capacity for debris basins and reservoirs.
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** The independent effects of some watershed variables including past fire history on peak discharges and sediment deposition during a major flood were isolated in quantitative terms by means of multiple regression analysis of data from many watersheds.
Input	**Variables Required & Time Scales:** 24-hour maximum precipitation of a storm falling on a watershed, average cover density computed from age of cover, geologic origin of the rocks and growth curves, extent of old fires watershed physiography. **Calibration Requirements:** None
Output	**Variables Predicted & Time Scales:** Peak discharge at reservoir deposition associated with the 1938 flood in southern California
Misc.	**Previous Applications:** None **Strong Points:** The multi-watershed, multivariable approach is probably the best way of evaluating unique major floods and their sedimentation effects which are the major causes of damage.

Weak Points: The antecedent conditions of any single storm are unique (droughts, watershed wetness, etc.) hence another storm might produce quite different results. The lack of a completely burned watershed immediately prior to the storm possibly limits interpretation of major storm effect on a completely burned watershed.

MODEL EVALUATION FORM NO. 74

Model ID	Title: Plant Cover, Runoff, and Sediment Yield relationships on mancos shale in Western Colorado Author: Branson, F.A. and Owen, J.R. U.S. Geol. Survey, Denver, Colo., 80225 Date of Work: 1970 Source: Water REsource REsearch, 6, (3), pp 787-790, 1970 Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Any that might be indexed by bare soil, versus non-bare soil Size of Area: 5-81 HA (12-200 Acre) Vegetation Zones: Desert shrub Other: Evaluation of topography in terms of the relief ratio
Methodology	Type: Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ Summary: Annual sediment yield is related to geomorphic vatiables, watershed cover and hydrologic measurement from 17 watersheds near Grand Junction, Colorado. The percentage of bare soil was shown to be a good expression of watershed cover that relates to hydrologic measurements on arid lands.
Input	Variables Required & Time Scales: Relief ratio (maximum difference in elevation divided by area), and percent of bare soil average during six years. Calibration Requirements: None
Output	Variables Predicted & Time Scales: Average annual sediment yield in acre feet per square mile averaged over 15 years of record.
Misc.	Previous Applications: Unknown Strong Points: Simple index of topography and an index of vegetation effects in arid climate may be a good approximation of sediment delivery ratios Weak Points: No relation to streamflow or other basis of frequency; no direct evidence that different means of eliminating bare soil would be very effective in eliminating sediment production.

MODEL EVALUATION FORM NO. 75

Model ID	**Title:** Evaluating Effects of Land-use Changes on Sediment Load.
	Author: Cooper, Alfred J., and Snyder, Willard M., TVA, Knoxville, Tenn.
	Date of Work: 1956
	Source: J. Hydrolics Div. Proc, ASCE Hy 1, paper 83, 1956
	Evaluator: Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___
	Activities: Activities effecting cover density in relation to streamflow and sediment load
	Size of Area: 259 sq km (100 sq mi)
	Vegetation Zones: Crops, pasture, and forest
	Other: Time trends of sediment loads in watersheds
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___
	Summary: 18 year record of sediment loads in two tributary streams of the Tennessee Valley were used to evaluate the effects time changes of cover density and land-use upon sediment load. The use of time-regression function was made to represent the change in changing cover and resulting sediment load.
Input	**Variables Required & Time Scales:** Storm, rainfall, duration, antecedent 10-day, temperature, peak discharge, and antecedent monthly precipitation.
	Calibration Requirements: Yes, to evaluate the constant in the change of cover density with time
Output	**Variables Predicted & Time Scales:** Storm and monthly sediment loads in tons per square mile.
Misc.	**Previous Applications:** Unknown
	Strong Points: Handling of short- and long-term shifts in time relationships is informative
	Weak Points: No explicit relationship of sediment production to land-use is given by the model, only time shifts.

MODEL EVALUATION FORM NO. 76

Model ID	Title: Estimating the impact of forest management on water quality Author: Dissmeyer, G. E. Date of Work: 1971 Source: Coop. Watershed Management Workshop U.S. Forest Serv., Memphis, Tenn., 14 p. Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Any for which relative erosion rates are known. Size of Area: Local Vegetation Zones: Any for which effect of activities on erosion rates are known. Other: Sediment deposition, sediment discharge.
Methodology	Type: Analytic procedure X Simulation ___ Regression ___ Stochastic ___ Deterministic ___ Summary: The procedure distributes measured sediment discharge or measured reservoir deposition among land uses and/or disturbances above the point of measurement.
Input	Variables Required & Time Scales: Measured sediment discharge or estimated erosion and delivery ratio. Calibration Requirements: None
Output	Variables Predicted & Time Scales: Sediment deposition, sediment discharge.
Misc.	Previous Applications: River Basin Planning Southeast, FASS Strong Points: May identify problem areas of sediment production. Weak Points: The proportioning of sediment discharge to individual sites and forest activities is highly subjective.

MODEL EVALUATION FORM NO. 77

Model ID	Title: Evaluating the impact of individual forest management practices on suspended sediment Author: Dissmeyer, George E. USFS, SA, Atlanta, Georgia Date of Work: October 1973 Source: Proceedings National Meeting of SCSA, Hot Springs, Arkansas, October 3, 1973 Evaluator: George E. Dissmeyer
Intended application	Type: Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ Activities: Erosion, suspended sediemtn Size of Area: Small to large watersheds Vegetation Zones: Any Other:
Methodology	Type: Analytic procedure X Simulation ___ Regression ___ Stochastic ___ Deterministic X Summary: The procedure is basically an allocation process when measured suspended or reservoir sediment (translated into suspended sediment) is distributed among forest land uses or disturbances.
Input	Variables Required & Time Scales: Erosion plot data, measured sediment, area and types of land uses or disturbances. Calibration Requirements:
Output	Variables Predicted & Time Scales: Several man weeks of field sampling are required to collect data. (However, in southeast all data has been put into data bank which reduces field sampling in strata sampled elsewhere.)
Misc.	Previous Applications: Several river basin studies in SE. Strong Points: Identifies the relative magnitude of forest land uses and disturbances as sediment contributors. Weak Points: Uses Universal or modified Musgrave soil loss prediction equation which has not been verified by research for application on forest land. Also, this procedure relies heavily on visual observations and judgment. Bias could easily enter into evaluation. Consistency and objectivity in appraisals are keys to meaningful results.

MODEL EVALUATION FORM NO. 78-2

Model ID	**Title:** Predicting Sediment Yield in the Western United States
	Author: Flaxman, E.M. Soil Conservation Service, Portland Oregon
	Date of Work: 1972
	Source: J. Hydrology Division, Proceedings, American Society of Civil Engineering, reprint 98 No. HY 12, pp 2073-2085, (Rev. March 1974)
	Evaluator: Henry W. Anderson
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___
	Activities: None
	Size of Area: Local (Unknown - minimum)
	Vegetation Zones: Broad (no specified limitations)
	Other: Sediment producing hazard associated with precipitation, temperature relations, watershed slope, soil characteristic and streamflow peakedness.
Methodology	**Type:** Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___
	Summary: Data from 27 watersheds in 10 western states was used to develop a relationship of sediment yield from small ponds and reservoirs to watershed characteristics, with the streamflow variable being determined by procedure in Section 4, Handbrook Hydrology, SCS, National Engineering Handbook
Input	**Variables Required & Time Scales:** Average ratio annual precipitation, watershed slope, soilparticles G.T. 1.0 mm, soil aggregation or dispersion, percent L.T. .002 mm, 50 percent chance peak discharge, csm.
	Calibration Requirements: None
Output	**Variables Predicted & Time Scales:** Average annual sediment yield for a period of record
Misc.	**Previous Applications:** None
	Strong Points: Only evaluation of soil alkalinity versus acidity
	Weak Points: Evaluation of vegetation is somewhat subjective and no activities are specifically included in the model

MODEL EVALUATION FORM NO. 79

Model ID	**Title:** Simulation of Water Yield from Devegetated Pieces
	Author: George Fleming
	Date of Work: 1971
	Source: Irrigation, drainage, ASCE, vol. 97 (IR2) Proc. Paper 8175, p 249-262, June 1971
	Evaluator: Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___
	Activities: Forest fire, typed conversion (brush to grass)
	Size of Area: Unit streamflow source areas.
	Vegetation Zones: Brush and grassland, south coastal California
	Other: sediment transport prediction
Methodology	**Type:** Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___
	Summary: Hydrocomp simulation was considered with specific reference to vegetation management on water quality changes. Two examples: The Sisquoc and the Santa Ynez Rivers in California.
Input	**Variables Required and Time Scales:** Evapotranspiration loss and other elements of the hydrological cycle included in the Stanford model, variety hydro comp simulation program, 1969 model
	Calibration Requirements: Calibration is required
Output	**Variables Predicted & Time Scales:** Evapotranspiration loss and other elements of the hydrological cycle included in the Stanford model, variety hydro comp simulation program, 1969 model
Misc.	**Previous Applications:** General model of the Stanford model has been widely modified for particular areas.
	Strong Points: Simulation of flood flows has particular application to sedimentation following fires and simulation of rapid transpiration by soil zones to water yield estimate.
	Weak Points: Common need for calibration in simulation modelling is doubly needed in the context of complex and drastic treatment such as fire and type conversion. An objective way of doing this for single watersheds is not obvious.

MODEL EVALUATION FORM NO. 80

Model ID	**Title:** Suspended Sediment Concentration as related to Watershed Variables in Central Arizona **Author:** Hansen, Edward A. **Date of Work:** 1966 **Source:** Rocky Mountain Forest & Range Experiment Station, Northern Arizona Univ., Flagstaff, Arizona. (Presented at Hydrolics Division Conference, ASCE, Madison, Wis. Aug '66 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Logging, any activity affecting ground cover. **Size of Area:** 2-1300 HA (5-3200 Ac) **Vegetation Zones:** Ponderosa pine and alligator juniper-ponderosa pine, central Arizona only **Other:** Relation of sediment concentration to streamflow where surface runoff is involved.
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** Two regression equations were developed from analysis of suspended sediment concentrations on 13 small watersheds in the Beaver Creek Watershed in central Arizona. One equation involves the litter index (hits/100) and the other the volume of the ponderosa pine (cubic feet/acre).
Input	**Variables Required & Time Scales:** Discharge at time of suspended sediment collection, average annual discharge, rise or falling stage, litter index, and volume of ponderosa pine. Calibration Requirements: None
Output	**Variables Predicted & Time Scales:** Sediment concentration, ppm, for individual streamflow discharge, cfs.
Misc.	**Previous Applications:** Unknown **Strong Points:** Sediment concentration related to streamflow allows evaluation of frequency if streamflow were available; the two indices of vegetation are an index of management alternatives even though they do not directly imply particular activities. Weak Points: Evaluation is made for a hydrologically unique area of the Beaver Creek watershed. Land-use in the evaluated area was light or uniform so no land use was evaluated and no topography or soil-geology was evaluated.

MODEL EVALUATION FORM NO. 81

Model ID	**Title:** Simulation of the Hydrologic transport of Radioactive aerosols **Author:** Huff, Dale D., and Kruger, Paul. Univ. of Wisconsin, Madison, Wisconsin **Date of Work:** 1974 **Source:** Radionuclides in the Environment, American Chemical Society Publications, p 487-505, 1970 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Any elements of the hydrologic cycle which may be quantitatively evaluated by the Standford Watershed Model. **Size of Area:** Greater than 23.3 sq km (9 sq mi) **Vegetation:** Any for which the interception storage is known **Other:** Sediment discharge. ("Sediment load and radial aerosols discharge are highly correlated.")
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ **Summary:** A numerical simulation of watershed moisture balance as computed by the Stanford Watershed Model is used to estimate resulting effects on radial aerosol transport. The hydrologic transport model (HTM-1) is based on the anticipated physical and chemical interactions.
Input	**Variables Required & Time Scales:** Aerosol deposition, hourly rainfall, and volume of the vegetal storage capacity (interception storage). **Calibration Requirements:** Calibration is required.
Output	**Variables Predicted & Time Scales:** Streamflow in CFS, strontium and cesium on an hourly basis.
Misc.	**Previous Applications:** Stanford Watershed Model has been widely tested and widely modified. **Strong Points:** The model includes a vegetation influence (interception), which may have diagnostic value. Also, sediment correlation with radioactive discharge may have monitoring possibilities. **Weak Points:** "One major difficulty in assessing the accuracy of any transport simulation method is inaccuracy in runoff estimations." This quotation would seem to apply even more strongly about the differential erosion and its effect on radioactive materials.

MODEL EVALUATION FORM NO. 82

Model ID	**Title:** Land use simulation model of the subalpine coniferous forest zone **Author:** Leaf, Charles F. and Brink, Glen E. **Date of Work:** 1975 **Source:** USDA, Forest Service Res. Paper RM-135, 15 p. **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Any for which evapotranspiration, soil moisture storage and time accretion is known. **Size of Area:** 259 ha. (640 ac.) **Vegetation Zones:** Subalpine forest **Other:**
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ **Summary:** Simulation by means of components of the hydrologic cycle of the long-term interactions between water and timber resources in old-growth subalpine forests subject to partial cutting and regeneration practices. Effects of logging and logging road construction on erosion and sediment yields are also considered.
Input	**Variables Required & Time Scales:** Computed evapotranspiration, forest cover type, density, reflectivity, and cutting pattern, erosion indices, disturbed area, on a 7-day basis. **Calibration Requirements:** Calibration is required.
Output	**Variables Predicted & Time Scales:** Streamflow and sediment discharge, streamflow on short term, sediment annual.
Misc.	**Previous Applications:** To simulation of South Tongue River Hydrology. **Strong Points:** The system permits summing the effects of changes in the elements of the hydrologic cycle from individual small areas and introduction of time trends into the simulation. **Weak Points:** The components of the system are arbitrary approximation for the particular zone and types, so difficult to use in areas or for activities differing from the development area.

<u>MODEL EVALUATION FORM NO. 83</u>

Model ID	**Title:** A Sediment Model on a Digital Computer **Author:** Negev, Moshe., Stanford University **Date of Work:** 1967 **Source:** Dept. of Civil Engr., Stanford Univ. Tech. Rpt. No. 76, 109 p. 7 figs., March 1967 **Evaluator:** Henry W. Anderson
Intended application	**Type:** Physical_X_ Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Any that are quantitatively known for splash erosion, rill and gully erosion, and channel processes **Size of Area:** Unknown **Vegetation Zones:** Anywhere the hydrologic cycle has been quantitatively defined **Other:** Washload, interload, bed material load and grain-size evaluation
Methodology	**Type:** Analytic procedure___ Simulation_X_ Regression___ Stochastic___ Deterministic___ **Summary:** A method is presented for the simulation of suspended sediment load records from rainfall and total flow data, and from the simulated overland flow produced by the Stanford Watershed model. Theoretical and supporting experimental evidence are used and the functions are obtained by trial & error.
Input	**Variables Required & Time Scales:** Hourly quantities or daily quantities of splash erosion, rill and gully erosion and hourly rainfall amounts for pervious and impervious areas. **Calibration Requirements:** All coefficients need to be calibrated or determined by trial & error.
Output	**Variables Predicted & Time Scales:** Rain-splash erosion, impervious area erosion, overland flow erosion, rill & gully erosion, total yearly load period, for individual years or periods.
Misc.	Previous Applications: Napa & San Antonio Rivers in Calif. **Strong Points:** A streamflow model is well known and its weakhess have been documented by widespread tests. **Weak Points:** The components of sedimentation are only presumed to be evaluated and the application to forest activities is unknown

MODEL EVALUATION FORM NO. 84

Model ID	Title: A User's Manual for the Fortran IV Version of the Wisconsin Hydrologic Transport Model Author: Patterson, M.R., et al. Oakridge National Lab., Oakridge, Tenn. 37830 Date of Work: 1974 Source: Oakridge National Laboratory Report, ORNL-NSF-EATC-7, EDFB-IBB-74-9 Contract #W-7405-eng.-26,272 p. 1974 Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical X Biological___ Aquatic___ Terrestrial___ Activities: Activities which quantitatively are known to effect overland flow, infiltration and runoff from surface versus base flow. Size: Small unit watersheds to large basins Vegetation Zones: Tested in Wisconsin vegetative watersheds including impervious areas Other: Used in the study of transport of trace contaminants.
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ Summary: The Wisconsin Hydrologic Transport Model (WHTM) enables the simulation of trace contaminant transport by elements of the hydrologic cycle, interception storage, overland flow, infiltration, and base flow. Some models include interaction with the soil and a sheet erosion and submodel for transport of trace contaminants on transported sediment.
Input	Variables Required & Time Scales: Complete meteorological inputs: temperature, rainfall, and evaporation and daily solar radiation with snowmelt parameters, soil exchange and soil flow parameters utilizing and being in the form of the Stanford watershed model. Later versions (see No. 103) incorporate PROSPER (see Nos. 24 and 30). Calibration Requirements: Calibration is required for all components
Output	Variables Predicted & Time Scales: Hourly streamflow by individual reaches year by year and associated trace contaminant transport are output
Misc.	Previous Applications: The parts have been widely used and widely adjusted with the present being an addition of snow to the Kentucky variation of the Stanford model Strong Points: Improvements in the routing of water and incorporated capability for transport of sediment trace contaminants are said for this model. Weak Points: This is a surface runoff and thus a surface erosion model; hence it would be difficult to calibrate for areas where other erosion processes are important

<u>MODEL EVALUATION FORM NO. 85</u>

Model ID	**Title:** Ecosystem modelling of a forested river basin
	Author: Ryan, James A., Morison, I.G., and Bethel, J.S., University of Washington, Seattle, Washington
	Date of Work: 1974
	Source: Water Resources Bulletin, A.W.R.A. 10(4): 703-709, 1974
	Evaluator: Henry W. Anderson
Intended application	**Type:** Physical X Chemical X Biological X Aquatic___ Terrestrial___
	Activities: Logging, eroding, streambank stabilization
	Size of Area: 16 HA - 4856 Sq Km (40 Ac - 187 sq mi)
	Vegetation zones: Primarily coniferous forest of the west side Cascade Mountains of western Washington
	Other: Game playing management for managers and regulation agency personnel to make management decisions and to respond to indications of lack of environmental control.
Methodology	**Type:** Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___
	Summary: Precipitation inputs are routed through a Thornthwaite water loss and a detention storage function for each 40-acre cell in the basin. Yield runoff in terms of area inches. Snow melt is from the Corps of Engineers degree day equation. Silt concentration is from the Anderson (1954) suspended sediment relationship, to mean discharge, clay content, percent of area in roads, percent of area recently harvested, and stream slope.
Input	**Variables Required & Time Scales:** Precipitation, temperature and input monthly to equal seasonal annual outputs
	Calibration Requirements: Calibration is required
Output	**Variables Predicted & Time Scales:** Mean flow discharge on monthly and annual basis, water quality including suspended sediment concentrations, temperature, dissolved oxygen, effects of fertilizer on nitrogen content, biocide and herbicide effects and residuals from product conversion processes.

Misc.	**Previous Applications:** Parts of the model have been used in other applications **Strong Points:** Model utilizes the best of several other model in a decision-making framework for forest activities **Weak Points:** The Thornthwaite evapotranspiration loss is the weakest link; monthly outputs may not satisfy hydrologic and water quality criteria for management

MODEL EVALUATION FORM NO. 86

Model ID	**Title:** Development of models for predicting sediment yield from small watersheds **Author:** Simons, D.B., Li, R.M., and Stevens, M.A. Colorado State University, Fort Collins, Colo. **Date of Work:** 1974 **Source:** Civil Engineering Dept, Colorado State University Progress Report CR 74-75, DBS-RML-MAS 24, 127 p. Dec 74 **Evaluator:** Dave Rosgen
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Any for which the relationship of erosion to vegetation ground cover are known quantitatively to affect erosion. **Size of Area:** Small unit watersheds **Vegetation Zones:** Ponderosa Pine, alligator juniper-ponderosa pine of central Arizona. Estimation of water yield (and sediment) on a single storm basis and also long term water yield estimation
Methodology	**Type:** Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic___ **Summary:** The mathematical model simulates the routing of water and sediment hydrographs for small watersheds for individual storms. The model includes water balance on a single storm basis, loose soil detachment by raindrop impact and by moving water, and water sediment routing features for both overland flow and channel systems.
Input	**Variables Required & Time Scales:** Site geometry, soils data, vegetation, channel bed current characteristics, flow resistance and storm characteristics, antecedent moisture characteristics including rainfall intensity, and mean evaporation rate. **Calibration Requirements:** Calibration is required
Output	**Variables Predicted & Time Scales:** Shape and peak flow of watershed hydrographs, water yield and sediment yield by storm and by yearly amounts.
Misc.	**Previous Applications:** Tested on watershed #1, Beaver Creek Experimental Forest **Strong Points:** Use of physical processes governing mechanics of water and sediment flow but including experimental results of soil and vegetation processes may make for less need for calibration than with some other models. Can directly represent activities affecting vegetation cover, also roads to some extent.

Weak Points: The model is a surface runoff model implying the basic erosion sources are from surface runoff. Assumes a "stable" or non-erodable stream channel and does not account for stream channel materials as contributed to total sediment production. Utility of the model could be greatly enhanced if it were linked with a sediment rating curve for each reach.

MODEL EVALUATION FORM NO. 87-2

Model ID	Title: Suspended Sediment concentrations in a Michigan Stream as related to Watershed Characteristics Author: Striffler, W. David Lake States Forest Exp. Station, Forest Service (presently Colorado State Univ., Fort Collins) Date of Work: 1965 Source: USDA, ARS. Misc. Pub. 970:144-150, 1965 Evaluator: Henry W. Anderson
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Forest planting - pasture versus cultivation, channel bank erosion control, stream discharge modification Size of Area: 5-347 sq km (2-134 sq mi) Vegetation Zones: Northern forest land, wildland- pasture land and cultivated land Other: Sediment discharge as well as sediment concentration improving extreme aquatic habitat.
Methodology	Type: Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ Summary: The relation of suspended sediment concentration in the streamflow, land use, soil geology, and the eroding channel banks and time of concentration measurement was determined by means of multiple regression analysis. Total sediment discharge rate was also evaluated
Input	Variables Required & Time Scales: The stream discharge rate, csm, eroding channel banks, soil type, geology class, & vegetation-type, on a daily basis for input. Calibration Requirements: None
Output	Variables Predicted & Time Scales: Average sediment concentration in parts per million, sediment delivery rate in pounds as per square mile per day
Misc.	Previous Applications: Unknown Strong Points: Most of the classification type variables were studied and coefficients were obtained which were related to forest and pasture management Weak Points: With only 20 watersheds it would be difficult to evaluate all of the 21 variables considered for their independent effects, using multiple regression analysis

MODEL EVALUATION FORM NO. 88-2

Model ID	**Title:** Upper Bear Creek Experimental Project, a Continuous, daily streamflow model **Author:** Tennessee Valley Authority, Hydrologic Research and Analysis Staff, Knoxville, Tennessee **Date of Work:** 1972 **Source:** TVS Research Paper #8, 99 p., 1972. Contact Robert P. Betson, 331 Evans Building, Knoxville, Tennessee 37902 **Evaluator:** Henry, W. Anderson
Intended application	**Type:** **Physical** X **Chemical**___ **Biological**___ **Aquatic**___ **Terrestrial**___ **Activities:** Forest harvest, burning, and herbicide treatment effect on streamflow, Eastern U.S. Suspended sediment related to streamflow by simulation Size of Area: Small watersheds **Vegetation Zones:** Eastern forests **Other:** Simulation of nutrient outflow , notably potassium
Methodology	**Type:** **Analytic procedure**___ **Simulation** X **Regression**___ **Stochastic**___ **Deterministic**___ **Summary:** Model is basically a device for completely allocating moisture. Incoming precipitation is allocated in a cascading fashion among a series of compartments. Output from the system consists of evapotranspiration losses and streamflow on a daily basis from
Input	hourly precipitation and calculated monthly, evapotranspiration, and a recession "constant." **Calibration Requirements:** Calibration is required
Output	**Variables Predicted & Time Scales:** Daily streamflow, sediment discharge and total potassium loads, all on a daily basis
Misc.	**Previous Applications:** Effect of timber cutting, burning, and replanting of a small watershed on the William Bankhead National Forest on total streamflow Strong Points: Most elements of the hydrological cycle are included in the simulation model of streamflow; any parameter directly related to streamflow may be estimated Weak Points: five primary parameters to be optimized would be difficult to estimate well without a great deal of experience, hence may be unique to particular watersheds

MODEL EVALUATION FORM NO. 89

Model ID	**Title:** Formulas Developed for Estimating Sediment Yield in southern California **Author:** U.S. Dept. of Agriculture Forest SErvice, Berkeley, CA. 94701 **Date of Work:** 1953 **Source:** Report of Survey -- Santa Clara-Ventura Rivers and Calleguas Creek Watersheds, CA. 34p 5 appendices (hydrology appendix by H.W. Anderson) **Evaluator:** Henry W. Anderson
Intended application	**Type:** **Physical** X **Chemical**___ **Biological**___ **Aquatic**___ **Terrestrial**___ **Activities:** Forest fire and other factors effecting cover densidy on watersheds **Size of Area:** 259-5180 HA (1-200 sq mi) **Vegetation Zones:** Coastal sage-grass, brushlands, and high elevation southern California conifers. **Other:** Design capacity of reservoirs and effect of reservoir deporition on water supply
Methodology	**Type:** **Analytic procedure**___ **Simulation**___ **Regression** X **Stochastic**___ **Deterministic**___ **Summary:** Formula derived by Anderson (1949) for San Gabriel and San Bernardino Mountains was extended to the south Coastal Mountains by relation to measured sediment deposition in the Gibralter Reservoir.Relative erodability calculated from geologic type and soil samples and relative discharge for particular years was included in the new equation
Input	**Variables Required & Time Scales:** Watershed soil characteristics relative discharge to the mean annual flow, maximum yearly peak discharge, cover density and the watershed in the area of main channel of the watershed. Calibration Requirements: None
Output	**Variables Predicted & Time Scales:** Periodic and average annual sediment deposition in reservoirs.
Misc.	**Previous Applications:** USDA flood prevention programs, Santa Maria River Basin, Santa Clara-Ventura, & Calleguas Creek Watersheds. USGS Water Supply Paper 1798-E, 1968 Strong Points: Inclusion of soil erodability index based on geology minimizes the need for calibration on new conditions; infiltration differences among treatments were associated with rainfall excesses and the cover density to index a variety of treatment effects. Weak Points: Water quality indexes are not directly output, only reservoir deposition

MODEL EVALUATION FORM NO. 90-1

Model ID

Title: An application of multivariate analysis to sediment network design

Author: Wallis, James R., Anderson, Henry W.
Forest SErvice, Berkeley, CA

Date of Work: 1965

Source: International Association Scientific Hydrology Publication No 67, P 57-378, 1965

Evaluator: Henry W. Anderson

Intended application

Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___

Activities: Forest fire prevention, road construction, timber harvest, type conversion (forest or brush to grass).

Size of Area: 259Ha-7770 sq km (1-3000 sq mi)

Vegetation Zones: Coniferous forest, brush lands and grasslands, northern California

Other: Streamflow and rain/snow characterictics of precipitation in evaluation of climatic stress effect on sedimentation

Methodology

Type: Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___

Summary: Analysis of suspended sediment measurements from 23 northern Calif watersheds used to determine the relationship of suspended sediment discharge to watershed variables

Input

Variables Required & Time Scales: Rain area frequency from titude and elevation, distribution, forest fires, unimproved roads, logging class, area of steep grasslands, and mean annual streamflow

Calibration Requirements: None

Output

Variables Predicted & Time Scales: Average annual suspended sediment discharge per unit area, normalized to long-term frequency of streamflow expectancy

Misc.

Previous Applications: Few alternatives in evaluating possible impacts of proposed harvesting & road construction

Strong Points: Regression on principle components can be an effective technique; important variables to management decisions, particularly good versus poor logging techniques, are evaluated. Hazards of steep grassland conversion are evaluated. Streamflow potential for sediment discharge is evaluated.

Weak Points: Road classification is oversimplified for management decision purposes, logging (timber harvest) classification is oversimplified, the differences in geologic potential for sedimentation are unevaluated and specific topographic hazards are not considered. Surface erosion and channel source sediment are not separately identified.

MODEL EVALUATION FORM NO. 91

Model ID	**Title:** Hymo: Problem-Oriented Computer Language for Hydrologic Modelling **Author:** J.R. Williams, and R.W. Hann, Jr. **Date of Work:** 1972 **Source:** Water Resources Research, 8(1):79-86, 1972; also USDA, ARS Misc. Pub. ARS-S-40 (in press). Holsum User's Manual, J.S. Dept. of Agri., ARS, Riesel-Texas **Evaluator:** Henry W. Anderson
Intended application	**Type:** **Physical** X **Chemical**___ **Biological**___ **Aquatic**___ **Terrestrial**___ **Activities:** those related to the universal soil loss equation coefficients for erosion **Size of Area:** Small unit watersheds **Vegetation Zones:** Those for which the universal soil loss equation coefficients are applicable **Other:** Meets both runoff for individual storms and peak flows associated with erosion control practices
Methodology	**Type:** **Analytic procedure**___ **Simulation** X **Regression**___ **Stochastic**___ **Deterministic**___ **Summary:** A problem-oriented computer language for modelling surface runoff and sediment yields from watersheds.
Input	Variables Required & Time Scales: Basics of the inputs are as with the universal soil loss equation, except that calculated peak discharge and volume flow are substituted for the rainfall parameter for individual storms. **Calibration Requirements:** Calibration necessary
Output	**Variables Predicted & Time Scales:** Peak flows and storm runoff from individual storm and associate sediment yield in tons
Misc.	Strong Points: Applied together with channel slope to develop delivery ratios (Williams, J.R., and Berndt, H.D. Sediment yield computed with universal equation, J. Hydrolic Div., ASCE 98 (HY12), Paper 9426, 2087-2098, 1972). Channel hydralics considered with site characteristics, so may be applied to small unit areas and delivery from those units of streamflow and sediment. Weak Points: Applications questionable where surface runoff is not a principle source of sediment production, and where available material may limit the individual storm production of sediment associated with given discharge.

MODEL EVALUATION FORM NO. 92-2

Model ID	**Title:** Preliminary procedures for quantifying sediment production **Author:** Rosgen, Dave USFS Sandpoint, Idaho **Date of Work:** 1975 **Source:** Kaniksu National Forest Northern Idaho **Evaluator:** Dave Rosgen
Intended application	**Type:** Physical X Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** Timber harvest, roads, grazing, vegetation conversions **Size of Area:** 1st to 5th order streams. **Vegetation Zones:** Northern coniferous and subalpine.
Methodology	**Type:** Analytic procedure X Simulation___ Regression X Stochastic___ Deterministic X **Summary:** By use of sediment rating curves developed from measurement or channel stability ratings, increases in flow due to vegetative changes (ECA model) are reflected in increases in sediment/unit discharge + on-site contributions through the use of the WRRS (Watershed Response Rating System).
Input	**Variables Required & Time Scales:** Watershed response rating, stream channel stability, estimate of pre- and post-treatment water yield (mean monthly). **Calibration Requirements:** Test to local sediment rating curves by channel stability to obtain slope ÷ intercept + calibration for water yield model.
Output	**Variables Predicted & Time Scales:** Sediment production increases unit time/unit flow (coupled with water yield analysis and on-site and channel stability).
Misc.	**Previous Applications:** Northern Idaho, western Montana **Strong Points:** Combines watershed (measurable) variables and an easy channel stability evaluation coupled with the ECA[1] model or other appropriate water yield model to rapidly estimate changes in sediment/unit time/unit flow change. Separates channel erosion from direct on-site contributions. **Weak Points:** The on-site erosion model and sediment delivery ratios need further testing. Should be tied into a process model. If mean annual rates are determined, the flow used should be normalized to long term expectancy.

[1] ECA = Equivalent Clearcut Area (R-1 cutting guide, etc.).

MODEL EVALUATION FORM NO. 94

Model ID	**Title:** A first generation non-point source mineral water-quality model
	Author: Roger P. Betson & William M. McMaster; TVA, Knoxville, Tenn.
	Date of Work: 1974
	Source: Proc. 47th Annual Conference of the Water Pollution Control Federation, Denver, Colorado
	Evaluator: Wayne Swank
Intended application	**Type:** Physical___ Chemical X Biological___ Aquatic___ Terrestrial___
	Activities: Natural-area or undisturbed conditions
	Size of Area: Tennessee Valley
	Vegetation Zones: Mixed deciduous forests
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___
	Summary: Two coefficients in a constituent versus flow power function are predicted based upon the portion of drainage area in forest and in each of four rock types. Equations developed from 66 non-polluted basins
Input	**Variables Required & Time Scales:** Extent of forest cover and bedrock geology; instantaneous values
	Calibration Requirements: None required, but additional data can be used to improve coefficients
Output	**Variables Predicted & Time Scales:** Fifteen standard mineral constituents
Misc.	**Previous Applications:** Examples of applications given for strip mingin, point source pollution, & urbanization
	Strong Points: Has utility in simulating stream constituents for natural areas where no prior samples exist to evaluate major pollution sources
	Weak Points: Error terms are ± 50% and the model will not be particularly useful in evaluating typical forest management practices. As noted above, impact of large major pollution sources (more than 100% change) could be evaluated.

MODEL EVALUATION FORM NO. 95

Model ID	**Title:** Report-Methods for identifying and evaluating the nature and extent of non-point sources of pollutants
	Author: S.Y. Chiu Midwest Research Institute
	Date of Work: October, 1973
	Source: Midwest Research Institute 425 Volker Boulevard Kansas City, Missouri 64110
	Evaluator: John Currier
Intended application	**Type:** Physical___ Chemical___ Biological___ Aquatic___ Terrestrial___ N/A
	Activities: N/A
	Size of Area: N/A
	Vegetation Zones: N/A
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___ N/A
	Summary: Predictive methods for other pollutants After a through evaluation of literature and date, this study has concluded that methods are still not available for predicting effects of silvicultural activities on water quality in terms of parameters such as organics, pesticide, nutrients, and bacteria. Most of the pertinent data are results of case studies which depict order of magnitude changes of certain water quality parameters associated with a specific disturbance or treatment in a given local with its unique natural and operationsl conditions. It is dangerous to generalize results of such case studies unless research is conducted to further elucidate the processes responsible for the observed changes
Misc.	**Previous Applications:**
	Strong Points:
	Weak Points:

MODEL EVALUATION FORM NO. 96

Model ID	**Title:** Evaluation & Simulation of Chemical Quality Data for five Montana Sampling Stations **Author:** Leonard R. Frost Jr. Geological Survey, Helena, Mont. 59601 **Date of Work:** 1974 Open File Report **Source:** Montana U.S. Geological Survey P.O. Box 1696 Helena, Montana 59601 **Evaluator:** John Currier
Intended application	**Type:** Physical X Chemical X Biological___ Aquatic___ Terrestrial___ **Activities:** Not Defined **Size of Area:** Not Defined **Vegetation Zones:** Not Defined **Other:**
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** Developed regression equations based upon long term records of specific conductance, stream discharge, and concentration of specific chemicals. The regression equations take the form: $C_i = a_i + b_i K_{SC}$ where C_i = concentration of the major inorganic solutes; a_i and b_i are regression parameters; and $k_{SC} - kQ^n$ where Q = discharge and k & n are regression parameters Provides a method of describing an existing data set of water chemistry but has no predictive value for forest management activities.
Output	**Variables Predicted & Time Scales:**
Misc.	**Previous Applications:** **Strong Points:** **Weak Points:**

MODEL EVALUATION FORM NO. 97

Model ID	**Title:** Dissolved solids--discharge relationships: 1. Mixing models
	Author: Francis R. Hall, Univ. of New Hampshire, Durham, N.H.
	Date of Work: 1970
	Source: Water Resources Research 6(3)
	Evaluator: Wayne Swank
Intended application	**Type:** Physical___ Chemical_X_ Biological___ Aquatic___ Terrestrial___
	Activities: Not Defined
	Size of Area: Not Defined
	Vegetation Zones: Not Defined
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic_X_
	Summary: A series of simple mixing models based on mass balance calculations are presented for the relationships between dissolved solids and discharge in streams.
Input	**Variables Required & Time Scales:** Known concentrations of dissolved solids and stream discharge
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Dissolved solids
Misc.	**Previous Applications:** Not Defined
	Strong Points: Wide range of models available to fit particular stream conditions
	Weak Points: Has little predictive value; must have stream chemistry data

MODEL EVALUATION FORM NO. 98

Model ID	**Title:** Hydrocomp simulation program (HSP)
	Author: Hydrocomp, Inc., 1502 Page Mill Road, Palo Alto, CA 94304
	Date of Work: 1973
	Source: Donigian, A. and W. H. Waggy Simulation--A tool for water resource management, Water Resource Bulletin, Vol. 10, No. 2, 229-244, April 1974.
	Evaluator: David A. Falletti
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___
	Activities: Not an activity-oriented model
	Size of Area: Any--best on large watersheds
	Vegetation Zones: Any
	Other: Simulation programming model
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___
	Summary: HSP is propritory model of Hydrocomp, Inc. Used as the core flow model for PTR (Evaluation #99) and HSP-QUALITY (Evaluation #99a). Flow model uses three main routines: Library (data base management module for meteorological data), Lands (hydrologic module for movement of, on and through soil), and Channels (routine algorithms). Model uses simulation programming to fit coefficients required by model.
Input	**Variables Required & Time Scales:** Hourly precipitation, daily pan evaporation for snowmelt daily; maximum/minimum temperature, solar radiation, and wind movement.
	Calibration Requirements: Known flow records needed to fit coefficients.
Output	**Variables Prediced & Time Scales:** Storm or daily hydrograph
Misc.	**Previous Applications:** Many industrial/municipal users.
	Strong Points: Can replicate hydrograph with good accuracy.
	Weak Points: Black box approach and requires known record for calibration.

MODEL EVALUATION FORM NO. 99

Model ID	Title: Pesticide transport and runoff model for agricultural lands (PTR) Author: Hydrocomp, Inc., 1502 Page Mill Road, Palo Alto, CA 94304 Date of Work: 1973 Source: U.S. Environmental Protection Agency Technology Series, EPA-660/2-74-013, Dec. 1973. Evaluator: David A. Falletti
Intended application	Type: Physical X Chemical X Biological ___ Aquatic ___ Terrestrial ___ Activities: Agricultural Size of Area: Any Vegetation Zones: Croplands Other: Uses HSP model to generate hydrograph (see Evaluation #98)
Methodology	Type: Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___ Summary: Model assumes four pesticide storage zones within soil profile: surface zone, upper zone, lower zone, and ground water zone. The PTR model estimates the loss of pesticides from the land surface by simulating the mechanisims of surface runoff (uses HSP model), sediment loss, pesticide absorption-desorption, and pesticide volitization and degradation.
Input	Variables Required & Time Scales: Those needed for HSP, coefficients for soil storage, interflow and groundwater coefficients, pesticide characteristics; type, absorption-desorption, diffusion, solubility, and decay rate coefficients. Calibration Requirements: Must have known hydrograph, sediment loss, and pesticide balance.
Output	Variables Predicted & Time Scales: Monthly water balance, sediment loss and pesticide balance.
Misc.	Previous Applications: Industrial users Strong Points: Complete pesticide balance. Weak Points: Requires calibration and data that is not readily available for wildlands.

MODEL EVALUATION FORM NO. 99a

Model ID	**Title:** HSP-QUALITY
	Author: Hydrocomp Inc., 1502 Page Mill Road Palo Alto, California 94304
	Date of Work: 1973
	Source: Donigian, A. and W. H. Waggy Simulation--A tool for water resource management, Water Resource Bulletin, Vol. 10, No. 2 229-244, April 1974.
	Evaluator: David A. Falletti
Intended application	**Type:** Physical X Chemical ___ Biological ___ Aquatic ___ Terrestrial ___
	Activities: Not activity oriented model
	Size of Area: Any
	Vegetation Zones: Any
	Other: Uses HSP model to generate flow volumes (see Evaluation #98)
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___
	Summary: HSP-QUALITY uses flows generated by lands routine of HSP. To each flow a set of water quality characteristics is assigned. Characteristics are based on simulation programming o, pollutant accumulation and wash off. Water quality parameters that can be simulated are: Water temperature; Dissolved oxygen; BOD; Nitrate; Nitrite; Ammonia; Organic N; Total coliforms; Fecal coliforms; Ortho phosphate; Organic phospherous; Chlorophyll algae; Zooplankton; Benthic algae; TCS; Conservative constituents; Fecal streplococci
Input	**Variables Required & Time Scales:**
	Calibration Requirements: Known concentrations and flows for parameters being predicted.
Output	**Variables Predicted & Time Scales:** Hourly concentrations of parameters selected.
Misc.	**Previous Applications:** Industrial and municipal users.
	Strong Points: Comprehensive in-stream process model
	Weak Points: Applicability to wildland situation unknown. Data requirements appear to be prohibitive for most wildland uses. (Ability to use as a loading model not determined.)

MODEL EVALUATION FORM NO. 100

Model ID	Title: A working model for the variation in stream water chemistry at the Hubbard Brook Experimental Forest, New Hamshire Author: Johnson, N.M. & Likens, G.E. et al. Dartmouth College and Cornell Univ., respectively Date of Work: 1969 Source: Water Resources Research 5(6): 1353-1363 Evaluator: Wayne Swank
Intended application	Type: Physical___ Chemical_X_ Biological___ Aquatic___ Terrestrial___ Activities: Wildland Size of Area: Small watersheds (less than 50 ha) Vegetation Zones: Mixed deciduous forests Other:
Methodology	Type: Analytic procedure___ Simulation___ Regression_X_ Stochastic___ Deterministic___ Summary: A model for predicting stream water chemistry is described and is based on the premise that stream water is a mixture of soil water and rain water
Input	Variables Required & Time Scales: model parameters (coefficients) for each ion; average annual values Calibration Requirements: Extensive data set for the specific area of interest
Output	Variables Predicted & Time Scales: Standard stream chemistry (cations & anions) concentrations; instantaneous values
Misc.	Previous Applications: For five watersheds in the White Mountains of New Hampshire Strong Points: Provides a framework for describing stream chemistry of wildlands if the data base already exists Weak Points: Has little value for predicting changes in stream chemistry due to forest manipulation; also, extensive data are required to establish coefficients for the model.

MODEL EVALUATION FORM NO. 101

Model ID	**Title:** Working Model for the Variation in Stream Water Chemistry at the Hubbard Brook Experimental Forest, N.H.
	Author: Johnson, Likens, Bormann, Fisher, Pierce (Noye Johnson - Dartmouth College)
	Date of Work: 1969
	Source: U.S.F.S. Hubbard Brook Experimental Forest Durham, N.H. 03824
	Evaluator: John Currier
Intended application	**Type:** Physical___ Chemical X Biological X Aquatic___ Terrestrial___
	Activities: Natural Forests
	Size of Area:
	Vegetation Zones: Northern Hardwoods
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___
	Summary: Dr. Noye Johnson was contracted by phone and stated that the model was "applicable only to Hubbard Brook watershed and its applicability to other natural watersheds in area is questionable." Model falls apart when applied to disturbed (cut) watershed. Current model has limited use by F.S.
Input	**Variables Required & Time Scales:**
	Na, SiO_2, Mg, SO_4, Cl, Al, NO_3, K
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Standard stream chemistry (cations & anions) concentrations: instantaneous values
Misc.	**Previous Applications:** For five watersheds in the White Mountains for New Hampshire
	Strong Points: Provides a framework for describing stream chemistry of wildlands if the data base already exists.
	Weak Points: Has little value for predicting changes in stream chemistry due to forest manipulation; also, extensive data are required to establish coefficients for the model.

MODEL EVALUATION FORM NO. 102

Model ID	**Title:** Statistical methodology for predicting the Pollutants in a river **Author:** Nour, A. & Razek, A.; Mississippi State Univ., State College **Date of Work:** 1972 **Source:** Water Resrouces Bulletin 8(1); 15-23 **Evaluator:** Wayne Swank
Intended application	**Type:** Physical___ Chemical _X_ Biological___ Aquatic___ Terrestrial___ **Activities:** Varied **Size of Area:** River Basin **Vegetation Zones:** **Other:**
Methodology	**Type:** Analytic procedure___ Simulation___ Regression _X_ Stochastic___ Deterministic___ **Summary:** A stepwise multiple regression is used to regress pollutants in both time and space on their physical water characteristics. Models are constructed by dividing a natural stream into independent reaches based on physical criteria.
Input	**Variables Required & Time Scales:** Water quality data **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:**
Misc.	**Previous Applications:** Derived for a river system in Mississippi and Louisiana **Strong Points:** Provides a routing technique for known water quality data. **Weak Points:** Does not provide predictive capability as a result of landscape manipulation

MODEL EVALUATION FORM NO. 103

Model ID	**Title:** Development and application of the unified transport model **Author:** Patterson, M.R. et al., Oak Ridge National Laboratory **Date of Work:** 1974 **Source:** In N. Fulkerson, W.D. Shults, & R.I. Van Hook, eds <u>Ecology and Analysis of Trace Contaminants</u> -- Progress Report Oct. 1973-Sept. 1974, Oak Ridge Nat. Lab. **Evaluator:** Wayne Swank
Intended application	**Type:** Physical X Chemical X Biological X Aquatic X Terrestrial X **Activities:** Landscape modifications **Size of Area:** Variable **Vegetation Zones:** **Other:**
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** The unified transport model (UTM) is an assemblage of submodels that describes the movement of chemical constituents in air, land, and water primarily based on physical characteristics of these constituents rather than biological functions
Input	**Variables Required & Time Scales:** **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:**
Misc.	**Previous Applications:** Used to describe trace element movement in watershed systems **Strong Points:** / **Weak Points:** Insufficient information available. Appears to be physically based and needs biological functions incorporated to be of value for wildland applications.

MODEL EVALUATION FORM NO. 104

Model ID	**Title:** A study of the chemical quality of streamflow in Arkansas
	Author: Steele, T.D.; Geological Survey, Washington, D.C.
	Date of Work: 1971
	Source: Geological Survey Open-File Report, Oct. 1971 8p.
	Evaluator: Wayne Swank
Intended application	**Type:** Physical___ Chemical X Biological___ Aquatic___ Terrestrial___
	Activities:
	Size of Area: River basins
	Vegetation Zones:
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___
	Summary: Concentrations and loads of inorganic solutes are predicted from measures of specific conductance and stream discharge; monthly means
Input	**Variables Required & Time Scales:**
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Concentrations and loads of major inorganic solutes; monthly
Misc.	**Previous Applications:**
	Strong Points: Derived from extensive set of historical chemical quality records
	Weak Points: No predictive value for forest manipulations; is not exclusive for wildland conditions.

MODEL EVALUATION FORM NO. 105

Model ID

Title: Regional Analysis of Streamflow Chemical Quality in Texas

Author: Steele, T.D. and Jennings, M.E.

Date of Work: 1972

Source: Water Resources REsearch 8(2): 460-477

Evaluator: Wayne Swank

Intended application

Type: Physical___ Chemical X Biological___ Aquatic___ Terrestrial___

Activities:

Size of Area: Drainage Basin

Vegetation Zones:

Other:

Methodology

Type: Analytic procedure___ Simulation___ Regression X Stochastic___ Deterministic___

Summary: Based on historical records of water quality, regression models were developed for predicting chemical parameters of rivers using stream discharge or basin precipitation as independent variables.

Input

Variables Required & Time Scales: Stream discharge, precipitation; annual

Calibration Requirements:

Output

Variables Predicted & Time Scales: Typical standard water chemistry parameters; annual mean

Misc.

Previous Applications:

Strong Points: Provides very general guidelines for regionalizing some water quality characteristics of rivers for planning purposes

Weak Points: Little predictive value for wildland conditions.

MODEL EVALUATION FORM NO. 106

Model ID	**Title:** Simulation of Major Inorganic Chemical Concentration and Loads in Streamflow **Author:** Timothy Steele, U.S.G.S., Wash. D.C. **Date of Work:** August 1973 **Source:** NTIS, U.S. Department ofCommerce, 5285 Port Royal Road, Springfield, Virginia 22151, 29 pp. **Evaluator:** John Currier
Intended application	**Type:** Physical___ Chemical_X_ Biological___ Aquatic___ Terrestrial___ **Activities:** Not Indicated **Size of Area:** Not Indicated **Vegetation Zones:** Not Indicated **Other:**
Methodology	**Type:** Analytic procedure___ Simulation___ Regression_X_ Stochastic___ Deterministic___ **Summary:** Developed regression equations based upon long term record of specific conductance, stream discharge, and concentration of specific chemicals. The regression equations take the form: $C_i = a_i + b_i K_{sc}$ where C_i = concentration of the major inorganic colutes; a_i & b_i are regression parameters; and k_{sc} = specific conductance. Also developed a regression $K_{sc} = kQ^n$ where Q - discharge and k & n are regression parameters. Provides a method of simulating water chemistry from existinc chemical measurements but does not contain prediction capabilities.
Output	**Variables Predicted & Time Scales:**
Misc.	**Previous Applications:** **Strong Points:** **Weak Points:** Due to extensive data requirements, this method does not appear to meet Forest Service needs.

MODEL EVALUATION FORM NO.107

Model ID	**Title:** Water Quality Variations Due to the Geologic-Soil Complex and Environmental Modifications of Forested Lands **Author:** G.M. Aubertin Northeastern Forest Exp.Sta. Timber & Watershed Lab. Parson, W.Va 26287 **Date of Work:** On going **Source:** U.S.F.S. Northeastern Forest Experiment Station Timber & Watershed Laboratory Parsons, W. Va. 26287 **Evaluator:** John Currier
Intended application	**Type:** **Physical** X **Chemical** X **Biological**___ **Aquatic**___ **Terrestrial**___ **Activities:** Base (Natural) uality, Silviculturial, Roak Construction **Size of Area:** 1214 ha (30000 ac) **Vegetation Zones:** Hardwoods **Other:**
Methodology	**Type:** **Analytic procedure**___ **Simulation**___ **Regression** X **Stochastic**___ **Deterministic**___ **Summary:** Base data being collected, model still in conceptual stage. Objective of model is to determine the natural influences of the geologic-soil complex on water quality and to determine what changes in stream water quality can be attributed to man-made environmental modifications. Selected drainages will be intensively studied in terms of the stream's chemical properties as related to the geologic formations drained and/or environmental modifications within the drainage. Sampling will be by automatic samplers and grab sampling. Analysis will be according to accepted procedures.
Input	**Variables Required & Time Scales:** Independent: Geologic formation, geologic-soil complexes, environmental modifications, vegetation, and precipitation. Dependent: Streamflow, turbidity, suspended sediments, pH, specific conductance and chemical composition.
Output	**Variables Predicted & Time Scales:** Sediment, Conductivity pH, Chemical constituents
Misc.	**Previous Applications:** **Strong Points:** **Weak Points:** Model not developed yet--cannot evaluate.

MODEL EVALUATION FORM NO. 108

Model ID	**Title:** Organic Water Quality and Suspended Sediments from Small Forested Watersheds **Author:** Brown & Skau University of Nevada Reno, Nevada 89506 **Date of Work:** 1970 to present **Source:** East Side of Sierra's **Evaluator:** John Currier
Intended application	**Type:** Physical X Chemical X Biological ___ Aquatic ___ Terrestrial ___ **Activities:** Silvicultural, Recreation, etc. **Size of Area:** 26-130 sq km (1-50 sq mi) **Vegetation Zones:** **Other:**
Methodology	**Type:** Analytic procedure ___ Simulation ___ Regression X Stochastic ___ Deterministic ___ **Summary:** Study to determine the effects that natural watershed characteristics have on suspended sediments and organic water quality for forested watersheds of the east side Sierra Nevada. DEtermine the effects that logging, grazing, recreational and related developments have on suspended sediments and organic water quality. Develop and refine predictive techniques for these water quality parameters. **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:**
Misc.	**Previous Applications:** **Strong Points:** **Weak Points:** Cannot evaluate model--study still in progress.

MODEL EVALUATION FORM NO. 109

Model ID	**Title:** Models of nutrient circulation in forested watershed ecosystems at Coweeta **Author:** Coweeta Hydrol. Lab., USFS, Franklin, N.C. Institute of Ecology Univ. of Ga., Athens, Ga. **Date of Work:** 1968 to present **Source:** Coweeta Files, Franklin, N.C. **Evaluator:** Wayne Swank
Intended application	**Type:** Physical X Chemical X Biological X Aquatic X Terrestrial X **Activities:** Different management strategies **Size of Area:** First through third order streams **Vegetation Zones:** Mixed deciduous and white pine forests **Other:**
Methodology	**Type:** Analytic procedure X Simulation X Regression ___ Stochastic ___ Deterministic ___ **Summary:** Systems analysis is applied to the biotic and abiotic processes affecting the flux of ions through terrestrial and aquatic components of forested ecosystems.
Input	**Variables Required & Time Scales:** **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Standard water chemistry criteria; monthly means
Misc.	**Previous Applications:** In progress **Strong Points:** Takes into account physical and biological processes that affect stream chemistry and, thus, has capability of predicting changes in water chemistry due to forest management activities. Weak Points: The input data required will limit applications to management unless the model can be collapsed into more attainable units.

MODEL EVALUATION FORM NO. 110

Model ID	**Title:** Predicting the Effects of Land Management Alternatives on the Quality of Water from Forested Watersheds.
	Author: Randy Ferrin, White Mountain National Forest, US Forest Service, Conway, New Hampshire 03818
	Date of Work: February 1975
	Source White Mountain National Forest, U.S. Forest Service, Conway, New Hampshire 03818
	Evaluator: John Currier
Intended application	**Type:** Physical X Chemical X Biological X Aquatic ___ Terrestrial ___
	Activities: Grazing, timber, roads, recreation and mining
	Size of Area: variable
	Vegetation Zones: variable
	Other:
Methodology	**Type:** Analytic procedure ___ Simulation ___ Regression ___ Stochastic ___ Deterministic X
	Summary: "This prediction method should be used to gain only a rough estimate of the environmental effects of land-use, and the values predicted should only be taken at face value and not as the value." (author) Values based upon % area of watershed allocated to various forest management practices. Maximum effects of a land-use on water quality at any one time (such as after a summer storm). Final value given in units of an Environmental Quality Index (5.0 is maximum value indicating little or no impact, 0.0 is lowest value indicating a significant impact).
Misc.	**Previous Applications:** White Mountain National Forest
	Strong Points: Functional presently--can be used by field personnel.
	Weak Points: Ranks management activities by impact on water regimen--not quantitative.

MODEL EVALUATION FORM NO. 111

Model ID	**Title:** Lubrecht Ecosystem Project
	Author: L.K. Forcier et al.; Univ. of Montana, Missoula, Montana
	Date of Work: 1971 to present
	Source: Lubrecht Ecosystem Project, 2nd Progress Report; Mr. Hedley Bond, the University of Utah
	Evaluator: Wayne Swank
Intended application	**Type:** Physical___ Chemical_X_ Biological___ Aquatic___ Terrestrial___
	Activities: Various forest management practices
	Size of Area: Northern Rocky Mountain Region
	Vegetation Zones: Coniferous forests
	Other:
Methodology	**Type:** Analytic procedure___ Simulation_X_ Regression_X_ Stochastic___ Deterministic___
	Summary: Based on measurements, development of a nutrient-discharge model using physical characteristics of watersheds; i.e., soil water volume, weathering input, cation exchange, groundwater flow.
Input	**Variables Required & Time Scales:** In development stage
	Calibration Requirements: In development stage
Output	**Variables Predicted & Time Scales:** Not specified, but consists of typical stream chemistry, instantaneous
Misc.	**Previous Applications:** None
	Strong Points: / **Weak Points:** In development stage; insufficient information available for evaluation

MODEL EVALUATION FORM NO. 112

Model ID	**Title:** Western Coniferous Forest Biome
	Author: Gessel, S.P.; R.H. Waring Univ. of Wash.; Oregon State Univ. in cooperation with USFS
	Date of Work: 1970 to present
	Source: 1974 Proposal: Western Coniferous Forest Biome; Obtainable from above authors
	Evaluator: Wayne Swank
Intended application	**Type:** Physical X Chemical X Biological X Aquatic X Terrestrial X
	Activities: Various forest management activities
	Size of Area: Small watersheds and drainage basins
	Vegetation Zones: Coniferous forests of western U.S.
	Other:
Methodology	**Type:** Analytic procedure X Simulation X Regression ___ Stochastic ___ Deterministic ___
	Summary: This project is developing a series of integrated models of physical and biological processes for terrestrial and aquatic components of watershed ecosystems.
Input	**Variables Required & Time Scales:**
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Standard water chemistry characteristics
Misc.	**Previous Applications:** In progress
	Strong Points: The models are constructed from an understanding of the processes and can be used to predict changes in water chemistry due to forest manipulations.
	Weak Points: Data required to use the model may be unavailable in many cases

MODEL EVALUATION FORM NO. 113

Model ID	**Title:** Hydrologic Nutrient Cycle Interation for Natural and Man Disturbed Watershed
	Author: Jim Gosz University of Mexico
	Date of Work: On going
	Source:
	Evaluator: John Currier
Intended application	**Type:** Physical___ Chemical_X_ Biological_X_ Aquatic___ Terrestrial___
	Activities: Silvicultural, recreation development, etc.
	Size of Area: 3 ha- 415 ha
	Vegetation Zones: Pine, Aspen, Spruce, Fir
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression_X_ Stochastic___ Deterministic___
	Summary: Model is still in formulative stage
Input	**Variables Required & Time Scales:**
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** NO_3, NH_4, Ca, Mg,Na,K, Organic Matter, Tannin-Legnin, biological
Misc.	**Previous Applications:**
	Strong Points: } Cannot be evaluated at this time.
	Weak Points: }

MODEL EVALUATION FORM NO. 114

Model ID	Title: Regional water quality model--Intermountain Region of the Rocky Mountains Author: Haupt, Harold Intermountain F&RES Moscow, Idaho Date of Work: On-going Source: 10 forested watersheds (undisturbed) in Region 1. Evaluator: John Currier
Intended application	Type: Physical X Chemical X Biological___ Aquatic___ Terrestrial___ Activities: Natural/baseline water quality Size of Area: 404-6,070 ha (1000-15000 ac) Vegetation Zones: Other:
Methodology	Type: Analytic procedure___ Simulation X Regression X Stochastic___ Deterministic___ Summary: Model is completed. The evaluation will start 1975.
Input	Variables Required & Time Scales: Calibration Requirements:
Output	Variables Predicted & Time Scales: Flow, temperature, suspended solids, conductivity, pH, bicarbonate, sulfate, chloride, sodium, potassium.
Misc.	Previous Applications: Strong Points: Cannot evaluate at this time Weak Points:

MODEL EVALUATION FORM NO. 115

Model ID	**Title:** Not indicated **Author:** James Hornbeck, Northeast Forest Experiment Station, U.S. Forest Service, Durham, New Hampshire 03824 **Date of Work:** F.Y. 76 **Source:** U.S. Forest Service, Durham, New Hampshire 03824 **Evaluator:** John Currier
Intended application	**Type:** Physical X Chemical X Biological___ Aquatic___ Terrestrial___ **Activities:** **Size of Area:** **Vegetation Zones:** Not defined at present **Other:**
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** Northeastern Forest Experiment Station Work Unit 1601 located at the Forestry Sciences Laboratory in Durham, New Hampshire, is in the initial stages of developing a parametric model for nutrient concentrations in forest streams. The model will eventually be incorporated into an operational model of the hydrologic cycle developed earlier at the Hubbard Brook Experimental Forest. Data from suction lysimeters and streamwater chemistry studies at Hubbard Brook will be used in developing and testing the model.
Misc.	**Previous Applications:** **Strong Points:** Cannot evaluate at present **Weak Points:**

MODEL EVALUATION FORM NO. 117

Model ID	**Title:** Simulation of Water Quality in Streams and Canals
	Author: Masch, Fred D. & Associates; Austin, Texas & Texas Water Development Board
	Date of Work: 1971
	Source: Texas Water Development Board Report 128, Austin, May 1971, 13 p.
	Evaluator: Wayne Swank
Intended application	**Type:** Physical___ Chemical___ Biological___ Aquatic___ Terrestrial___
	Activities:
	Size of Area: River Basin
	Vegetation Zones:
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___
	Summary: Qual - I is a mathematical modeling system designed to simulate water A set of interrelated quality routing models are used to predict water characteristics.
Input	**Variables Required & Time Scales:**
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Temperature, BOD, DO, minerals
Misc.	**Previous Applications:** Applied to a segment of a river basin.
	Strong Points: Has applications for multiple headwater sources, waste loadings, and branching streams.
	Weak Points: Primarily a routing technique and not predictive for wildlands since biological and physical processes on landscape are not considered

MODEL EVALUATION FORM NO. 118

Model ID	Title: Watershed simulation model for selected ion concentrations
	Author: Keller, Hans M. and G. E. Brink
	Date of Work: 1975
	Source: USFS Rocky Mountain Forest & Range Exp. Sta. Fort Collins, Colorado 80521
	Evaluator: David A. Falletti
Intended application	Type: Physical X Chemical___ Biological___ Aquatic___ Terrestrial___
	Activities: Timber harvest
	Size of Area: Small watershed basins
	Vegetation Zones: Rocky Mountains - subalpine
	Other: Uses flow model developed by Leaf and Brink (see Evaluation No. 82)
Methodology	Type: Analytic procedure___ Simulation X Regression X Stochastic___ Deterministic___
	Summary: Model simulates selected ion concentrations in streams under undisturbed conditions in sub-alpine zone of central Colorado.
Input	Variables Required & Time Scales: Those required by the Leaf and Brink Flow Model Plus; coefficients for ion transfer, initial ion concentrations in baseflow, root zone, and melt or rain input.
	Calibration Requirements: Undetermined.
Output	Variables Predicted & Time Scales: Major cations (Ca^{++}, Mg^{++}, K^{+}, and Na^{+}) and NO_3 in Kg/ha, yr.
Misc.	Previous Applications: Fraser Experimental Forest
	Strong Points: Loading model
	Weak Points: Applicability to other areas undetermined.

MODEL EVALUATION FORM NO.119

Model ID	**Title:** Snohomish Basins
	Author: Jim Ryan Univ. of Wash. Seattle, Wash.
	Date of Work: 1972 - on going
	Source: Snohomish Basin, Washington
	Evaluator: John Currier
Intended application	**Type:** Physical X Chemical X Biological ___ Aquatic X Terrestrial ___
	Activities: Most Forest Practices - Harvest
	Size of Area: 4047 Ha (10000 Ac)
	Vegetation Zones: Conifers - Douglas Fir / Hemlock
	Other:
Methodology	**Type:** Analytic procedure ___ Simulation X Regression X Stochastic ___ Deterministic ___
	Summary: Not verified in other Watersheds.; soils (H_2O holding capacity, depth and erodability) Type vegetation & crown closure, precipitation, and air temperature, topography required as input
Input	**Variables Required & Time Scales:**
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** NO_3 - (fertilizers) O_2 Suspended Solids and Temperature
Misc.	**Previous Applications:** Snohomish Basin, Washington
	Strong Points: Data requirements can readily be met.
	Weak Points: Not tested in other areas or under disturbed conditions.

MODEL EVALUATION FORM NO. 120

Model ID	**Title:** User's Handbook for Assessment of Water Pollution from Non-point Sources **Author:** Shen-Yann Chiu Midwest Research Institute 425 Volker Blvd., Kansas City, Missouri 64110 **Date of Work:** Report presently being reviewed by EPA **Source:** Midwest Research Institute 425 Volker Boulevard Kansas City, Missouri 64110 **Evaluator:** John Currier
Intended application	**Type:** Physical___ Chemical X Biological___ Aquatic___ Terrestrial___ **Activities:** Not listed **Size of Area:** Not listed **Vegetation Zones:** Not listed **Other:**
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** They have just finished a report for EPA "Directed Toward Development of Loading Functions" for Non-point Sources. No further detail available at this time.
Input	**Variables Required & Time Scales:** **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** lb/acre/day daily average in year. Maximum in continued 60 days . Minimum 30 days
Misc.	**Previous Applications:** **Strong Points:** **Weak Points:** Not yet available for evaluation

MODEL EVALUATION FORM NO. 121

Model ID	**Title:** Not Formulated
	Author: Kent W. Thornton, U.S. Army Corps Engineer, Waterways Experiment Station, Vicksburg, Mississippi 39180
	Date of Work: F.Y. 1976
	Source: U.S. Army Corps Engineers, Waterways Experiment Station, Vicksburg, Mississippi 39180
	Evaluator: John Currier
Intended application	**Type:** Physical X Chemical X Biological ___ Aquatic ___ Terrestrial ___
	Activities: Not Defined
	Size of Area: Not Defined
	Vegetation Zones: Not Defined
	Other:
Methodology	**Type:** Analytic procedure ___ Simulation ___ Regression ___ Stochastic X Deterministic ___
	Summary: They plan to develop in F.Y. 76 a stochastic watershed model compatible with the Chen and Arlob (Water Resources Engineers) model that will incorporate some features of non-point source models. The major thrust will be reservoir pollution from surrounding areas
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:**
Misc.	**Previous Applications:**
	Strong Points:
	Weak Points:

Not defined at this time.

Cannot evaluate-- not developed as yet

MODEL EVALUATION FORM NO 122

Model ID	**Title:** Not listed **Author:** C.A. Troendle Timber & Watershed Lab. USFS, Parsons, W. Va. 26287 **Date of Work:** On .going **Source:** Appalachian Region Timber & Watershed Laboratory U.S.F.S. , Parsons, W. Va. 26287 **Evaluator:** John Currier
Intended application	**Type:** **Physical** X **Chemical** X **Biological**___ **Aquatic**___ **Terrestrial**___ **Activities:** Forest Management Activities **Size of Area:** Not Defined **Vegetation Zones:** Not Defined **Other:**
Methodology	**Type:** **Analytic procedure**___ **Simulation**___ **Regression**___ **Stochastic**___ **Deterministic**___ **Summary:** The Model is in the formative stages. A conceptual model has been developed, but further modification and testing will be required before it will be applicable for simulating the impact of non-point source pollutants.
Input	**Variables Required & Time Scales:** **Calibration Requirements:** Not defined
Output	**Variables Predicted & Time Scales:**
Misc.	**Previous Applications:** **Strong Points:** **Weak Points:** Cannot evaluate at this time--model not completed or tested

MODEL EVALUATION FORM NO. 123

Model ID	**Title:** Predicting Temperatures of small streams
	Author: Brown, George W.
	Date of Work: 1969
	Source: Water Resources Res. 5: 68-75
	Evaluator: Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial_X_
	Activities:
	Size of Area: Small watersheds of an Experimental Forest
	Vegetation Zones: Douglas fir-vine maple-salmonberry
Methodology	**Type:** Analytic procedure_X_ Simulation___ Regression_X_ Stochastic___ Deterministic___
	Summary: Hourly temperature of small streams can be accurately predicted using an energy balance. Micrometeorological measurements are required to assess the environment of the small stream accurately. The temperature-prediction technique was tested on three streams in Oregon. On unshaded stretches, net all-wave radiation is the predominant energy source during the day; evatoration and convection account for less than 10% of the total energy exchange. Conduction of heat into the stream bottom is an important energy balance component on shallow streams having a bedrock bottom. Up to 25% of the energy absorbed by such a stream may be transferred into the bed. Hourly temperature changes of 0-16F were predicted to within 1 degree more than 90% of the time. This technique permits foresters to control water temperature through manipulation of stream-side vegetation.
Input	**Variables Required & Time Scales:** Solar angle, meteorologic variables of the energy balance, stream size, streamflow, and characteristics of stream bottom.
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Stream temperature
Misc.	**Previous Applications:** Applied to clearcutting on coast range forests - See Evaluation #124.
	Strong Points: Relates directly to forest management activities.
	Weak Points: Not tested in other areas.

MODEL EVALUATION FORM NO. 124

Model ID	**Title:** Predicting the Effect of Clearcutting on Stream Temperature **Author:** Brown, George W. **Date of Work:** 1970 **Source:** J. Soil and Water Conserv. 25: 10-14 **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological X Aquatic X Terrestrial X **Activities:** **Size of Area:** **Vegetation Zones:** Douglas-fir **Other:**
Methodology	**Type:** Analytic procedure X Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** The temperature change that occurs between two points on a stream is directly proportional to the surface area of the stream and the heat load applied between these points. It is inversely proportional to the flow. Good estimates of the heat load can be made with solar radiation data if the stream is uniformly exposed to sunlight. Foresters can use this technique to predict the effect of clear-cutting on stream temperature.
Input	**Variables Required & Time Scales:** Solar angle, stream discharge, surface area **Calibration Requirements:** None
Output	**Variables Predicted & Time Scales:** Stream temperature, time-scale not known
Misc.	**Previous Applications:** Tested on two streams bounded by clearcuts **Strong Points:** Activity related with aquatic-terrestrial interface **Weak Points:** testing restricted to west slope of Cascades

MODEL EVALUATION FORM NO.125

Model ID	**Title:** An Improved Temperature Prediction Model for Small Streams **Author:** Brown, George W. **Date of Work:** 1972 **Source:** WRRI-16. Water Resources Research Inst., Oregon State Univ. **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological___ Aquatic___ Terrestrial___ **Activities:** **Size of Area:** 352 meters (1000 ft) of stream exposed **Vegetation Zones:** **Other:**
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** A model for predicting the maximum change in temperature from completely exposing a reach of stream to solar radiation was developed during earlier research. This model, which assumes that net solar radiation is the sole source of energy to the stream, worked well on most streams. In a few cases it worked very poorly. These streams contained either a large proportion of pools or bed rock in the stream bottom. It was found that only the flowing portion of the pools should be included in the heat exchange process and that the bed rock stream bottoms can conduct about 20% of the incident solar radiation away from the stream. Reducing estimates of stream surface area and net heat load according to pool configuration and bed condition provided good estimates of temperature change using the original model.
Input	**Variables Required & Time Scales:** Same as original model - See Evaluation #123. **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Stream temperature, no time scale
Misc.	**Previous Applications:** **Strong Points:** See Evaluation #123. **Weak Points:** See Evaluation #123.

MODEL EVALUATION FORM NO. 126

Model ID	**Title:** Water Quality Models for Total Coliform
	Author: Canale, R.P., Patterson, R.L., Gannon, J.J., & Powers, W.F.
	Date of Work: 1973
	Source: J. Water Poll. control Fed. 45: 325-336
	Evaluator: Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological X Aquatic X Terrestrial___
	Activities: Land uses that affect turbidity
	Size of Area:
	Vegetation Zones:
	Other: Model included because it is one of the few available for predicting coliform densities
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic X
	Summary: Gives coliform densities in Grand Traverse Bay, Michigan, as a function of time, turbidity, temperature, and various calculated loadings.
Input	**Variables Required & Time Scales:** Annual calculated total coliform death rate coefficient, temperature, new flow, turbidity.
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Survival of coliform and seasonal changes in coliform.
Misc.	**Previous Applications:**
	Strong Points: Good data on natural coliform trends, factors affecting coliform densities, and survival.
	Weak Points: Not suited to wildland situation.

MODEL EVALUATION FORM NO. 127

Model ID	**Title:** Model of coliform bacteris in Grand Traverse Bay **Author:** Canale, Raymond P. **Date of Work:** 1973 **Source:** J. Water Poll. control Fed. 45: 2358-2371,1971 **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological X Aquatic X Terrestrial___ **Activities:** Point inputs **Size of Area:** Not given **Vegetation Zones:** None **Other:** Model included because it is one of the few available dealing with predictions of coliform density
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic X **Summary:** Describes natural coliform death rate cycles, effects of various actual loadings, and effects of one directional flow and complete mixing on coliform densities
Input	**Variables Required & Time Scales:** Weekly average coliform density, average resident time of a fluid element in a section, section volume, time variable, & coliform loading caused by all sources **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Coliform population densities
Misc.	**Previous Applications:** **Strong Points:** Good reference on factors affecting coliform levels **Weak Points:** Not applicable to wildlands

MODEL EVALUATION FORM NO.128

Model ID	**Title:** Unsteady state, three-dimensional model of thermal pollution in rivers. **Author:** Cleary, R.W., Thomas J. McAvoy, and Short W.L. **Date of Work:** 1972 **Source:** Water - 1972, AICHE Symposium Series No. 129, Vol. 69: 422-431 **Evaluator:** Arthur Tiedemann
Intended application	**Type:** **Physical**___ **Chemical**___ **Biological** X **Aquatic** X **Terrestrial**___ **Activities:** Point discharge of heated wastes **Size of Area:** Not given **Vegetation Zones:** Not given **Other:**
Methodology	**Type:** **Analytic procedure** X **Simulation**___ **Regression**___ **Stochastic**___ **Deterministic**___ **Summary:** A three-dimensional, deterministic, unsteady state model of temperature in bounded rivers (finite in width and depth), subject to no-flux boundary conditions at three banks, a third type boundary condition (radiation, evaporation, and convection) at the river surface, and continuous point sourcegeneration by Dirac delta functions is solved analytically by an integral transform method. Temperature results using this exact double infinite series solution, together with the concept of an effective vertical diffusivity, to induce a virtual-buoyancy phenomenon showed the model to be capable of simulating the three-dimensional temperature distribution in rivers.
Input	**Variables Required & Time Scales:** Heat capacity, longitudinal eddy diffusivity, lateral eddy diffusivity, vertical eddy diffusivity, continuous point source strength, average river depth, surface heat exchange coefficient, energy loss by evaporation, energy gain or loss by convection, net longwave radiation, river temperature, time, equilibrium temperature

Calibration Requirements:

Output

Variables Predicted & Time Scales: Vertical diffusivity, longitudinal dimunition of temperature, linearized radiation and evaporation of the river surface.

Misc.

Previous Applications:

Strong Points: May be modified to predict effect of warm stream entering cool stream.

Weak Points: Of limited usefulness for predicting effects of management activities on thermal non-point pollution

MODEL EVALUATION FORM NO. 129

Model ID	**Title:** Relationship between Stream Water Temperature and Ambient Air Temperature **Author:** Cluis, Daniel A. **Date of Work:** 1972 **Source:** Nordic Hydrology 3: 65-71, 1972 **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological_X_ Aquatic__X Terrestrial___ **Activities:** None **Size of Area:** River basin **Vegetation Zones:** Not listed **Other:**
Methodology	**Type:** Analytic procedure_X_ Simulation___ Regression_X_ Stochastic___ Deterministic___ **Summary:** Air temperature found to be the most useful factor for this prediction model. Relates daily cyclic pattern of a well mixed stream to cyclic patterns in air temperature.
Input	**Variables Required & Time Scales:** Air temperature, stream temperature **Calibration Requirements:** Develop relationship between air temperature and stream temperature
Output	**Variables Predicted & Time Scales:** Stream temperature, 170 days
Misc.	**Previous Applications:** **Strong Points:** Utilizes a parameter that is easy to quantify. **Weak Points:** Not applicable to forest management activities

MODEL EVALUATION FORM NO. 130

Model ID	**Title:** Estimating Effects of Clear-cutting on Summer Water Temperatures of Small Streams **Author:** DeWalle, D.R. and Kappel, W.M. **Date of Work:** -- **Source:** Manuscript, School of Forest Resources, Penn. State Univ., University Park, Pa. (no date) **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial_X_ **Activities:** Forest cover removal -- clearcutting **Size of Area:** **Vegetation Zones:** Riparian **Other:**
Methodology	**Type:** Analytic procedure_X_ Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** Provides a new approach to the analysis of water temperature data bases on theory for completely mixed streams for predicting effects of complete shade removal on the diurnal range of stream temperature
Input	**Variables Required & Time Scales:** Water temperature, time, density of water, specific heat of water, depth of water **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Rate of temperature change of a completely mixed stream
Misc.	**Previous Applications:** **Strong Points:** Gives rule of thumb for estimating effects of clearcutting on water temperature **Weak Points:** Model needs to be revised for other latitudes

MODEL EVALUATION FORM NO. 131

Model ID

Title: Effect of Partial Vegetation and Topographic Shade on Radiant Energy Exchange of streams--with applications to thermal loading problems.

Author: DeWalle, David R.

Date of Work: 1974

Source: Res. Pub. No. 82, Pennsylvania State Univ., University Park, Pa.

Evaluator: Arthur Tiedemann

Intended application

Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial X

Activities: Forest harvest

Size of Area:

Vegetation Zones: Riparian

Other:

Methodology

Type: Analytic procedure X Simulation___ Regression___ Stochastic___ Deterministic___

Summary: a model was developed and tested for estimation of the effects of partial vegetative and topographic shade on radiation exchange of streams. Theoretical shade effects on direct solar, diffuse solar, reflected solar, transmitted solar radiation, and both terrestrial and atmospheric longwave radiation were analyzed. Theoretical and measured downward allwave radiation flux densities compared favorably for a stream partially shaded by vegetation during the summer days. Theory and measurements were used to estimate daily and diurnal shade effects on radiation exchange of streams. Maximum shade-induced reductions in daily absorbed solar plus downward longwave radiation occurred for N-S stream azimuths, clear daysand large shade altitudes. Reductions were negligible on streams large enough to be sinks for waste heat, but could be significant on small streams especially if diurnal variations in radiation exchange were considered. Shade e fects on heat disipation from thermally loaded streams were inferred from heat balance data.

Input

Variables Required & Time Scales: Solar altitude, solar declination, latitude hour angle, flux density of radiant heat received and lost, view factor density of water, specific heat of water, stream depth, stream velocity, water temperature, latent heat of vaporization.

	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Radiant energy impinging on a stream
Misc.	**Previous Applications:**
	Strong Points: Should provide good estimates of changes in stream temperature with given change in shading.
	Weak Points: Requires measurement of large number of parameters to test effectiveness of model for prediction.

MODEL EVALUATION FORM NO. 132

Model ID	**Title:** Bow Creek Watershed--Stream Temperature Effects of a Harvest Proposal. **Author:** Frazier, M. **Date of Work:** 1974 **Source:** Administrative Release, Zigzag Ranger District, Mt. Hood NF, 11p. **Evaluator:** Arthur Tiedemann
Intended application	**Type:** **Physical**___ **Chemical**___ **Biological** X **Aquatic** X **Terrestrial** X **Activities:** Forest harvest **Size of Area:** 24-194 ha (60-480 acres) **Vegetation Zones:** Not given **Other:**
Methodology	**Type:** **Analytic procedure** X **Simulation**___ **Regression**___ **Stochastic**___ **Deterministic**___ **Summary:** Provides a method of predicting total effect of exposing several small tributary streams on temperature of a main stream when effect of exposure on each stream is known
Input	**Variables Required & Time Scales:** Discharge of tributary creek, discharge of main stream, change in temperature during summer following harvest **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Stream temperature and effect of tributary entering a main stream
Misc.	**Previous Applications:** **Strong Points:** Predicts effects of small drainages on larger drainages when temperature of smaller drainage is affected by forest harvest. Enables projection of stream temperature with recovery of streamside vegetation. Weak Points: Need information on the effect of stream exposure on water temperature

MODEL EVALUATION FORM NO133

Model ID	Title: The Dissipation of Excess Heat from Water Systems
	Author: Jobson, Harvey M.
	Date of Work: 1973
	Source: J. of the Power Div., ASCE, 99(PO1): 89-103, 1973
	Evaluator: Arthur Tiedemann
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___
	Activities: None specified
	Size of Area: None specified
	Vegetation Zones: None specified
	Other:
Methodology	Type: Analytic procedure X Simulation___ Regression___ Stochastic___ Deterministic___

Summary: As a result of the analysis contained herin the following conclusions are drawn.

1. The definition of the excess temperature as the difference between the actual water temperature and the natural water temperature (the natural temperature is the temperature which would have occurred provided no unnatural heat source were present in the system) is convenient and useful.
2. The transfer of excess thermal energy from the water surface is proportional to the excess temperature for small values of excess temperature. Excess temperature up to approximately 15 degrees Celsius may be considered small for engineering purposes.
3. Eq. 28 can be used to determine the distribution of excess temperature in space and time.
4. The surface transfer coefficient for excess heat is primarily dependent upon the natural water temperature and the wind speed and is almost independent of air temperature and humidity.
5. For a given heat input and olume of receiving water the temperature rise, which is regulated by water quality standards will be larger in winter than in summer.

Input	**Variables Required & Time Scales:** Natural temperature, excess temperature, net incoming radiation, air temperature, atmospheric pressure, specific heat of water, humidity, wind velocity over stream, surface area of water, latent heat of vaporization, water density **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Heat dissipation
Misc.	**Previous Applications:** **Strong Points:** **Weak Points:** Requires large number of parameters to operate model.

MODEL EVALUATION FORM NO. 134

Model ID	**Title:** Stream temperatures in an alpine area
	Author: Johnson, F.A.
	Date of Work: 1971
	Source: J. Hydrology 14: 322-336
	Evaluator: Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological X Aquatic X Terrestrial___
	Activities: None
	Size of Area: 25-210 ha
	Vegetation Zones: Alpine
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___
	Summary: The phase angles and amplitudes of sine curves fitted to the annual cycle of stream temperatures are used as quantitative indices of the thermal characteristics of catchments and their associated stream waters. Higher altitudes result in lower temperatures but for streams with similar altitudinal ranges those with warmer aspects have higher temperatures but decreasing seasonal variations.
Input	**Variables Required & Time Scales:** Stream temperature, number of days since Nov. 1, Phase coefficient of sine curve in degrees, mean annual temperature, and mean catchment elevation
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Annual sine curves for temperature of small streams (25-210 ha). Lyear.
Misc.	**Previous Applications:**
	Strong Points: Good relationship between elevation, and mean annual temperature and sine curve parameters of stream temperature.
	Weak Points: Predictive for stream temperature, but not activity related

MODEL EVALUATION FORM NO. 135

Model ID	**Title:** Warming of small impoundments through natural heat exchange **Author:** Liu, Kannson T.H., and Howard D. Copp **Date of Work:** 1971 **Source:** Report No. 3A, Study C, Washington Water Res. Center Pullamn, WA. **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological X Aquatic___ Terrestrial___ **Activities:** Impoundments **Size of Area:** 1.21 Ha (3 acres) **Vegetation Zones:** None listed
Methodology	**Type:** Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic X **Summary:** The analytical prediction of temperature distribution in stratified water bodies as functions of depth and time has been based on the first law of thermodynamics and its linearized mathematical model. It superimposes the temperature distribution due to surface heating, bottom boundary heating and the initial pool temperature which has been assumed vertically uniform at the beginning of the warming season
Input	**Variables Required & Time Scales:** Pond surface area, initial pond volume, year, month, day that computation begins, inflow discharge with temperature TI, outflow discharge with temperature T2, atmospheric pressure, saturation vapor pressure at air temperature, saturation vapor pressure at water temperature, initial mean temperature in pond, insolation, cloud base altitude, fraction of cloud cover, air temperature, wind speed, relative humidity **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Water temperature of ponds
Misc.	**Previous Applications:** Examples given **Strong Points:** Basic approach for predicting temperature of a lake. **Weak Points:** Not related to management activities except through effect of a warm stream entering a lake

MODEL EVALUATION FORM NO. 136

Model ID	**Title:** Water Quality Simulation and Application
	Author: Lombardo, Pio S., and Ott, Ronald E.
	Date of Work: 1974
	Source: Water Resources Bull. 10(1): 1-9
	Evaluator: Arthur Tiedemann
Intended application	**Type:** Physical X Chemical X Biological X Aquatic X Terrestrial ___
	Activities: None listed
	Size of Area: 14.9 km (9.29 mi)
	Vegetation Zones:
	Other:
Methodology	**Type:** Analytic procedure ___ Simulation X Regression ___ Stochastic ___ Deterministic ___
	Summary: Describes a model for the relationship among coliforms, water temperature, dissolved oxygen, biological oxygen demand, total dissolved solids, nutrients, phytoplankton, and zooplankton
Input	**Variables Required & Time Scales:** Coliform population, water temperature, time, heat transfer between water and atmosphere, surface area, mass of water body, heat capacity of water, dissolved oxygen concentration, saturation, D.O. concentrations, reaeration coefficient , algal photosynthetic production, temperature, light, nitrate concentration, phosphate concentration.
Output	**Variables Predicted & Time Scales:** Coliforms, water temperature, dissolved oxygen, biological oxygen demand, total dissolved solids, phytoplankton, nutrient loading, zooplankton
Misc.	**Previous Applications:**
	Strong Points:
	Weak Points: Not related to management activities; principally stresses in-stream processes

MODEL EVALUATION FORM NO. 137

Model ID	**Title:** Mathematical description of biological and physical processes in heated streams. **Author:** Ahlert, Robert C. **Date of Work:** 1971 **Source:** AICHE Symposium Series 68(124): 191-201 **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological X Aquatic X Terrestrial___ **Activities:** Heated effluent, municipal wastes **Size of Area:** Not given **Vegetation Zones:** Not given **Other:**
Methodology	**Type:** Analytic procedure X Simulation___ Regression X Stochastic___ Deterministic___ **Summary:** The greatest problem in the development of general models for stream environments is the construction of submodels for biological processes and distributed physical processes. Various techniques used in the submodeling of both biological and physical processes are described here, and the impact that they have on the overall model for the thermal mixing zone is illustrated by examples involving perturbations of the submodel.
Input	**Variables Required & Time Scales:** Stream depth, width to depth ratio, heated effluent fraction, initial carbonaceous demand, initial oxygen concentration **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Temperature, biological oxygen demand, natural reaeration
Misc.	**Previous Applications:** **Strong Points:** **Weak Points:** Deals with effects of heated wastes on stream microorganisms. Not activity oriented

MODEL EVALUATION FORM NO. 138

Model ID	**Title:** Comparative Analysis of Modeling techniques for Coliform Organisms in Streams **Author:** Mahloch, Jerome L. **Date of Work:** 1974 **Source:** Applied Microbiology 27(2); 340-345 **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological X Aquatic x Terrestrial___ **Activities:** Point sources of pollutants **Size of Area:** River basin size not given **Vegetation Zones:** None listed
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic X Deterministic X **Summary:** The use of models for predicting changes in water parameters is currently considered an integral part of river basin management. The application of modeling techniques to coliform organisms is in its infancy due to the complexities involved and the lack of definitive information on coliform populations in natural environments. The purpose of this study was to make a comparative analysis of the available models for coliform organisms in order to improve on the state of the art of this subject. The available coliform models may be classified into deterministic or statistical types. In this study, six different models, three of each type, were selected for analysis and were applied to coliform data available on the Leaf River. Results of comparing the models indicated that a deterministic model was best suited for fecal coliform. Ultimate selection of a model for coliform organisms is dependent not only on the accuracy of the model but on ease of implementation. Current technology would probably dictate the use of a deterministic model because of the lack of a complete data base on which to base statistical models.
Input	**Variables Required & Time Scales:** Initial coliform concentration, time of travel, temperature, stream chemistry parameters, flow **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Coliform concentrations and survival under varying stream conditions

Misc.	**Previous Applications:**	
	Strong Points:	Good review of models to predict survival
	Weak Points:	Does not account for addition of sediments containing coliforms. Related principally to effect of stream environment on survival of coliforms, not sources.

MODEL EVALUATION FORM NO. 139

Model ID	**Title:** Baseline Values and Short-term Fluctuations of Enteric Bacteria in Oligotrophic Streams of Western North Carolina
	Author: McSwain, Michael R., and Swank, Wayne T.
	Date of Work:
	Source: Manuscript in press at Southeastern Forest Exp. Sta., Asheville, N.C.
	Evaluator: Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological___ Aquatic___ Terrestrial___
	Activities: Recreational activities
	Size of Area: 2,270 ha (5,609 ac)
	Vegetation Zones:
	Other:
Methodology	**Type:** Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic___

Summary: Seasonal, diurnal, and streamflow fluctuations in populations of total coliform, fecal coliform, and streptococci were determined for oligotrophic streams in western North Carolina. The effects of changes in stream parameters such as pH, temperature, nutrient content and streamflow on microbial populations were evaluated. Water temperature appeared to be a course regulator of seasonal dynamics of total and fecal coliform bacterial populations. An inverse relationship existed between daily streamflow and total coliform diel cycles. Total coliform diel cycles were evident throughout the year with the highest counts in the afternoon and lowest counts at night. All tested populations peaked during stormflow but fecal streptococci numbers were more stable than total coliform or fecal coliform. The fecal coliform/fecal streptococci ratio (FC/FS) was less responsive to storms than the toral coliform count. Stormflow data support recent work suggesting that the multiplication of coliform, but not enterococci bacteria, takes place in the bottom sediments of low nutrient content streams. A 3-day study in streams adjacent to a fully occupied campground revealed significant increases in total and fecal coliform. Camper activities, primarily stirring of stream bottom sediments by wading and related activities, appeared to be causitive factors.

Input	**Variables Required & Time Scales:** Changes in stream parameters such as pH, temperature, nutrient content, and streamflow
	Calibration Requirements:
Output	**Variables Predicted & Time Scales:** Total coliform, fecal coliform, and fecal streptococci
Misc.	**Previous Applications:**
	Strong Points:
	Weak Points:

MODEL EVALUATION FORM NO. 140

Model ID	**Title:** Thermal Loading of Water Bodies Under Water Quality Criteria Constraints **Author:** Nahavandi, Amir N., Maslo, Ronald M. and Layendecker, Richard A. **Date of Work:** 1974 **Source:** Proc. 1974 Summer Computer Simulation Conf., p. 635-641 **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___ **Activities:** Thermal discharge into Lakes **Size of Area:** Not given **Vegetation Zones:** Not given **Other:**
Methodology	**Type:** Analytic procedure_X_ Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** The water temperature quality criteria for natural bodies consists of: 1) a maximum allowable temperature, 2) a maximum allowable temperature rise, and 3) a maximum rate of temperature rise. To assess the extent of thermal pollution in natural water bodies and to determine the degree to which the above criteria are satisfied, it is necessary to predict the water temperature time history when the water body is subjected to a thermal load. To compute the temperature time history, a heat balance is applied to the water body. The rate of change of energy in the impoundment is equated to the sum of the thermal load plus the net air-water heat transfer. The heat balance differential equation is integrated numerically intime on a digital computer. The temperature/time histories are calculated and used to determine the projected power plant capacity for lakes to meet the water temperature quality criteria.
Input	**Variables Required & Time Scales:** Impoundment volume, impoundment surface, site latitude, power plant efficiency, ratio of condenser to total plant losses, effective index of refraction for water, effective index of refraction for air, quantity defined in equation (e), solar radiation intensity normal to incident ray reaching earth's outer atmosphere, turbidity factor, cloud cover

factor in tenths, Stephan Boltzman constant, absorptivity or emissivity coefficient for water, constant coefficient for evaporation heat loss, barometric pressure, water density, water specific heat, seasonal declination of sun, time of sunrise, time of sunset, minimum diurnal air temperature defined in equation (21), amplitute of diurnal fluctuations of air temperature defined in equation (21), amplitude of diurnal fluctuations of wind speed defined in equation (22), relative humidity, and power plant load.

Calibration Requirements:

Output

Variables Predicted & Time Scales: Solar radiation absorbed by water, temperature-time histories, and projected power plant capacity requiring only readily

Misc.

Previous Applications:
Tested against actual temperature changes for each season.

Strong Points:
Good for establishing baseline water temperature predictions.

Weak Points: Requires characterization of large number of variables to operate model. Some of the variables are difficult to quantify.

MODEL EVALUATION FORM NO. 141

Model ID	**Title:** Stream Temperature Study, North Fork, Snoqualmie River, Washington **Author:** Nece, Ronald E. **Date of Work:** 1968 **Source:** Tech. Report 23, State of Wash., Water Research Center, Pullman, Wa., 49 p. **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___ **Activities:** None listed **Size of Area:** Not given **Vegetation Zones:** Douglas-fir and riparian **Other:**
Methodology	**Type:** Analytic procedure_X_ Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** The upper basin of the North Fork of the Snoqualmie River was used for a study of stream temperatures in the headwater regions of a typical Pacific Northwest mountain river. Water temperature, stream flow, and climatological data are given for the heating season of calendar year 1967. A simplified procedure is suggested for predicting water temperature at a given station on such a stream. The suggested procedure uses a typical heat energy-budget approach; a number of terms usually considered in heat budget calcualtions are omitted, while provision is made for consideration of groundwater temperatures. The accuracy of the suggested simple scheme remains to be verified because stream travel times required in the calculations have yet to be obtained on the river study. Measuremnts of air temperatures and of solar radiation in the test basin indicate that these variables may indeed be satisfactorily predicted on the basis of conventional data obtained at the federal weather station in the same general region.
Input	**Variables Required & Time Scales:** Effective solar radiation, net long wave back radiation, water temperature, time, area, total water mass, velocity, mass rate and temperature of a tributary inflow,

total surface heat transfer rate, specific heat, ground water inflow, temperature of groundwater.

Calibration Requirements: (Over #2)

Output

Variables Predicted & Time Scales: River temperature at a given station on a stream

Misc.

Previous Applications:

Strong Points: Accounts for ground water inflow to stream

Weak Points: Not related to management activity

MODEL EVALUATION FORM NO. 142

Model ID	Title: Simplified Mathematical Model of Temperature Changes in Rivers. Author: Novothny, Vladimir, and Krenkel, Peter A. Date of Work: 1973 Source: J. Water Poll. Control Fed. 45(2): 239-248 Evaluator: Arthur Tiedemann
Intended application	Type: Physical___ Chemical___ Biological X Aquatic___ Terrestrial___ Activities: Not identified. Mainly related to point pollution Size of Area: Laboratory Vegetation Zones: None Other:
Methodology	Type: Analytic procedure X Simulation___ Regression X Stochastic___ Deterministic___ Summary:
Input	Variables Required & Time Scales: Velocity vector, fluid density, pressure, kinematic viscosity, gravitational acceleration, time, air temperature, total short-wave radiation, cloud cover, humidity, albedo, heat capacity, coefficient of expansion, temperature difference, radiation, thermal diffusivity coefficients, water surface temperature, surface layer heat exchange coefficient. Calibration Requirements:
Output	Variables Predicted & Time Scales: Water temperature
Misc.	Previous Applications: Strong Points: Good general model for turbulent mixing of two streams Weak Points: Requires large number of variables to operate model. Some are expensive and difficult to measure.

MODEL EVALUATION FORM NO. 143

Model ID	**Title:** Clear-cutting and its effect on the water temperature of a small stream in northern Virginia **Author:** Pluhowski, E.J. **Date of Work:** 1972 **Source:** U.S. Geol. Surv. Prof. Paper 800-C, pp.c-257 to C-262 **Evaluator:** Arthur Tiedemann
Intended application	**Type:** Physical___ Chemical___ Biological X Aquatic X Terrestrial X **Activities:** Forest harvest **Size of Area:** 335 meters (1,100 ft) **Vegetation Zones:** Riparian **Other:**
Methodology	**Type:** Analytic procedure X Simulation___ Regression___ Stochastic___ Deterministic___ **Summary:** Tree and shrub removal from an 1,100-foot reach at the lower end of Colvin Run near Reston., Va., has altered stream-temperature patterns. Owing to increased solar radiation, especially in summer, maximum water temperature at the lower end of the reach is frequently 1° to 3.5°C (Celsius) higher than that observed at the upper end. An energy budget, prepared for the period 1415-1500 hours, July 15, 1969, quantifies the principal energy sources controlling stream temperature in the reach
Input	**Variables Required & Time Scales:** Solar radiation, sky cover, wind velocity, relative humidity, air and water temperature, streambed temperature profiles, streamflow, net radiation **Calibration Requirements:**
Output	**Variables Predicted & Time Scales:** Temperature change as affected by alteration of energy budget through forest cover removal
Misc.	**Previous Applications:** Tested on 335 meters (1,100 ft) reach of channel **Strong Points:** Good comparison between observed and predicted values **Weak Points:**

MODEL EVALUATION FORM NO. 144

Model ID

Title: Mathematical Generalization of Stream Temperature in Central New England

Author: Tasker, Gary D., and Alan W. Burns

Date of Work: 1974

Source: Water Resources Bull. 10:1133-1142

Evaluator: Arthur Tiedemann

Intended application

Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___

Activities: None

Size of Area: Three states

Vegetation Zones:

Methodology

Type: Analytic procedure X Simulation___ Regression X Stochastic___ Deterministic___

Summary: The empirical relationship of an annual harmonic function for stream temperature measurements in central New England can be improved by considering a harmonic period of less than 365 days instead of 365 or 366 days. Generalized equations, developed using periodic temperature data from 27 streamflow stations, allow prediction of stream temperature at any site given (1) the mean basin altitude (F) in meters above mean sea level, and (2) station latitude (LAT), in degrees. Stream temperature t, in degrees Delsius ^{0}C, day number d, in days starting with January 1, is estimated as:

$$t(d) = \begin{cases} M[1 + \cos(\frac{2\pi}{\tau}(d-209))], & \text{when} |d\ 209| < \tau \\ 0^{0}C, & \text{when} |d-209| > \tau/2 \end{cases}$$

in which, M = 31.48 - 0.0025 (E) - 0.4635 (LAT) with standard error of estimate of $0.62^{0}C$, and =1228.88 - 21.01 (LAT) with standard error of estimate of 14.1 days.

Input

Variables Required & Time Scales:
Mean basin latitude, meters above sea level, and station latitude

Calibration Requirements:

Output

Variables Predicted & Time Scales:
Temperature

Misc.

Previous Applications:

Strong Points:

Weak Points:
Model deals principally with temperature predictions based on inputs from item 8 above. Usefulness for predicting effects of management activities on stream temperature are limited

MODEL EVALUATION FORM NO. 145

Model ID	Title: A Study of the Heat Loss of the St. Lawrence River between Kingston and Cornwall. Author: Witherspoon, D.F., and R.Y. Poulin Date of Work: 1970 Source: Proc. 13th Conf. Great Lakes Research, pp 990-996 Evaluator: Arthur Tiedemann
Intended application	Type: Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___ Activities: Size of Area: 164 km (102 mi) Vegetation Zones: not given Other:
Methodology	Type: Analytic procedure_X_ Simulation___ Regression_X_ Stochastic___ Deterministic___ Summary: Using an empirical relationship of the air and water temperature difference and the heat loss from the water surface, a model for the calculation of water surface temperature which considers river flow is developed for the St. Lawrence River between Kingston and Cornwall. Remote sensing airborne radiation thermometer data are used as the initial state condition of the river. Using observed air temperature data, the cooling of the river and its temperature are estimated, The calculated temperatures check with ground measurements within 1F (0.6C), 9 days after the initial state measurement. A relationship of the heat loss to the velocity is given for the five reaches that have similar hydraylic characteristics between Kingston and Cornwall. (Key words: ice, airwater interaction, open channel flow, St. Lawrence River.)
Input	Variables Required & Time Scales: Cross sectional river area, mean flow velocity, mean daily air and water temperatures, cooling coefficient, 9 days Calibration Requirements: Develop relationship between water temperature at several points and test against the given empirical relationship

Output	Variables Predicted & Time Scales: Water temperature drop at various points along a river
Misc.	Previous Applications: Model tested by measuring temperature drop along river with an airborne radiation thermometer Strong points: Might be used to predict water temperature changes in streams heated by forest cover manipulation activities Weak Points: Authors point out that model needs refinement when better data become available

MODEL EVALUATION FORM NO. 146

Model ID	Title: Practical Considerations for Assessing the Waste Assimilative Capacity of Illinois Streams. Author: Butts, T. A., V. Kothandaraman, and R. L. Evans Date of Work: 1973 Source: Ill. State Water Survey Circular 110 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___ Activities: Downstream effects Size of Area: Reach of Stream Vegetation Zones: General Other:
Methodology	Type: Analytic procedure X Simulation___ Regression___ Stochastic___ Deterministic X Summary: Outlines a conceptual and pragmatic procedure. Both are well documented and outlines step by step with examples for practical use with field data. Methodolcgy has sound basis. One method is useful for predicting effects of planned waste discharge. The other is for evaluating effects of current discharge.
Input	Variables Required & Time Scales: The 7-day 10 year low flow and associated high temperature, upstream DO concentration, waste DO, coefficients from filed data (procedures are given), channel, reach, and watershed characteristics Calibration Requirements: For estimation of coefficient in equations
Output	Variables Predicted & Time Scales: DO concentrations and sag along stream course
Misc.	Previous Applications: Seems to be used by State of Illinois Strong Points: Well documented for practical use. A short computer program for parameter estimation is provided but not essential. Programmable calculator could be used. Weak Points: Primarily applied for point discharges

MODEL EVALUATION FORM NO. 147

Model ID	Title: DOSAG3, Practical Application of Water Quality Models Author: Duke, James H. jr. Date of Work: 1974 Source: 1974 Summer Computer Simulation Conference, pp, 606-617 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___ Activities: Point and non-point source (general), down-stream effects Size of Area: Basins - streams, rivers Vegetation Zones: General Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic X Summary: Extension of DOSAGI. Steady State. Could not fully evaluate without complete report
Input	Variables Required & Time Scales: River channel topography, spatial and temporal hydrology and quality data, and meteorologic data. For details see report. Calibration Requirements: Not given
Output	Variables Predicted & Time Scales: Phosphorous, coliforms, ammonia, nitrite, nitrate, carbonaceous BOD, chlorophyll A, DO and three conservative constituents. Hourly
Misc.	Previous Applications: Applied on Chattahoochee - Flint River Basin Strong Points: no comment Weak Points: no comment

MODEL EVALUATION FORM NO. 148

Model ID	Title: QUAL-II, Practical Application of Water Quality Models Author: Duke, James H. Jr. Date of Work: 1974 Source: Proc. 1974 Summer Computer Simulation Conference, pp, 606-617 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological _X_ Aquatic _X_ Terrestrial___ Activities: Point and non-point source (general), downstream effects Size of Area: Basins - streams and rivers Vegetation zones: General Other:
Methodology	Type: Analytic procedure___ Simulation _X_ Regression___ Stochastic___ Deterministic _X_ Summary: Extension of QUAL-I. Unsteady state. Could not fully evaluate without complete report. See No. 117 for discussion of QUAL-I.
Input	Variables Required & Time Scales: River channel topography, spatial and temporal hydrology and quality data, and meterologic data. Calibration Requirements: Not given
Output	Variables Predicted & Time Scales: Phorphorous, coliforms, ammonia, nitrite, nitrate, temperature, carbonaceous BOD, chlorophyll A, DO and three conservative constituents. Hourly
Misc.	Previous Applications: Applied on Chattahoochee - Flint River Basin Strong Points: See 161--QUAL-I Weak Points: See 161--QUAL-I

MODEL EVALUATION FORM NO. 149

Model ID	Title: Practical Application of Water Quality Models. Author: Duke, James H. Jr. Date of Work: 1974 Source: Proc. 1974 Summer Computer Simulation Conference, pp. 606-617 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___ Activities: Point and non-point source (general), downstream effects. Size of Area: Basins - Reservoir Vegetation Zones: General Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic X Summary: Extension of Deep REservoir Model. Unsteady state. Could not evaluate without complete report
Input	Variables Required & Time Scales: Reservoir topography, spatial and temporal hydrology and quality data, and meteorologic data. Calibration Requirements: Given in above
Output	Variables Predicted & Time Scales: Phosphorous, coliforms, ammonia, nitrite, nitrate, temperature, carbonaceous BOD, chlorophyll A., DO and three conservative constituents. (Probably daily)
Misc.	Previous Applications: Applied on Chattahoochee - Flint River Basin Strong Points: Weak Points:

MODEL EVALUATION FORM NO. 150

Model ID	Title: Time Varying Mathematical Model for Water Quality
	Author: Goodman, Alvin s. and Tucker, Richard J.
	Date of Work: 1971
	Source: Water Research 5:227-241
	Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___
	Activities: General downstream effects
	Size of Area: Downstream
	Vegetation Zones: Massachusetts and similar areas
	Other:
Methodology	Type: Analytic procedure_X_ Simulation_X_ Regression___ Stochastic___ Deterministic_X_
	Summary: Time varying model. Routes through linked reaches unsteady state. Described in detail in FWPCA report cited in original paper.
Input	Variables Required & Time Scales: Water temperature, sunlight, stream flow, river parameters and physical characteristics, discharge quality of waste.
	Calibration Requirements:
Output	Variables Predicted & Time Scales: BOD, DO, Coliforms, chlorides, 4 hours
Misc.	Previous Applications: Merrimack River, Mass.
	Strong Points: Method used typical data available form field surveys, records, to develop equations.
	Weak Points: Requires development for each region in which it will be applied

MODEL EVALUATION FORM NO. 151

Model ID	Title: Computer Model of Connecticut River Pollution
	Author: Hoover, Thomas E. and Arnoldi, Robert A.
	Date of Work: 1970
	Source: J. Water Poll. Cont. Fed.42(2) Part 2: r67-r75
	Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___
	Activities: General - downstream
	Size of Area: linked stream system effects
	Vegetation Zones: General
	Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic X
	Summary: Linked reaches are simulated
Input	Variables Required & Time Scales: Temperature, depth, volume, velocity, tributary flows, waste characteristics and parameters, initial quality for each reach
	Calibration Requirements: One parameter for each reach
Output	Variables Predicted & Time Scales: BOD, DO, fine time interval, possibly 1-hour or less.
Misc.	Previous Applications: Connecticut River
	Strong Points: Good model, well presented
	Weak Points: Availability of program is unknown

MODEL EVALUATION FORM NO. 152

Model ID	Title: Prediction of Dissolved Oxygen Levels in the South Saskatchewan River in winter. Author: Landine, Robert C. Date of Work: 1971 Source: Int. Symp. on Water Pollution Control in Cold Climates. EPA, Water Pollution Control Res. Series 16100 EXH 11/71 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___ Activities: Waste loadings, reaeration at dams, under ice cover conditions Size of Area: Downstream - linked reaches Vegetation Zones: Subarctic Other:
Methodology	Type: Analytic procedure___ Simulation_X_ Regression___ Stochastic___ Deterministic_X_ Summary: Linked reaches, neglects photosynthesis, modeled each reach and solved by simulation
Input	Variables Required & Time Scales: Flow plus others, not clear, constant value Calibration Requirements: None, all parameters estimated from literature
Output	Variables Predicted & Time Scales: DO, steady state
Misc.	Previous Applications: South Saskatoon River Strong Points: For special ice covered conditions when others are not usable. Weak Points: Each reach modeled separately. Requires specialist to do this. Model given is specific to South Saskatoon but method used is adaptable

MODEL EVALUATION FORM NO. 153

Model ID	Title: Digital Simulation of the Effect of Thermal Discharge on Stream Water Quality. Author: Lin, S.H., Fan, L.T. and Hwang, C.L. Date of Work: 1973 Source: Water Res. Bull. 9(4): 689-702 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___ Activities: Downstream thermal effects on DO from point discharge Size of Area: Downstream - linked reaches Vegetation Zones: General Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic X Summary: Modified Streeter - Phelps with energy balance
Input	Variables Required & Time Scales: Streams characteristics, temperature of stream and flow, climatic data (many can be approximated Calibration Requirements: Unknown, but probable
Output	Variables Predicted & Time Scales: BOD, DO, Temperature -- fine time interval
Misc.	Previous Applications: Unknown Strong Points: Possible use for warm water flowing into cool. Basically a simple model Weak Points: Requires math programmer if program not available

MODEL EVALUATION FORM NO. 154

Model ID	Title: A Waste Assimilative Capacity Model for a Shallow, Turbulent Stream. Author: Novotny, Vladimir and Krenkel, Peter A. Date of Work: 1975 Source: Water Research 9:233-241 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___ Activities: Model for determining waste assimilative capacity of small streams. Use for downstream effects. Size of Area: Small streams (small, not defined) Vegetation Zones: Other:
Methodology	Type: Analytic procedure___ Simulation_X_ Regression___ Stochastic___ Deterministic_X_ Summary: Modification of DOSAG-1 developed by Texas Water Quality Board. Steady state.
Input	Variables Required & Time Scales: Temperature, deoxygenation coefficient, flow rate, waste water loads, depth and reaeration coefficient Calibration Requirements: Not mentioned
Output	Variables Predicted & Time Scales: Carbonaceous and nitrogenous BOD and DO, hourly
Misc.	Previous Applications: Tested and verified on two data sets Strong Points: Includes turbulence in shallow streams Weak Points: Requires determination of deoxygenation and degree of treatment

MODEL EVALUATION FORM NO. 155

Model ID	Title: A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows
	Author: Orsborn, John F., Brian W. Mar, James W. Crosby III, and James Crutchfield.
	Date of Work: 1973
	Source: State of Wash. Water Res. Center, Report No. 13 Vol. 1.
	Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___
	Activities: Use in development of low flow criteria to satisfy water quality regulations for streams
	Size of Area: Stream System
	Vegetation Zones: Wide range (developed for state of Washington)
	Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic X
	Summary: Not described in part 1 of report. Methodology is in part 2, which was not examined. Is probably a set of linked reaches similar to the Massachusetts model
Input	Variables Required & Time Scales: a. Complex model: net solar radiation, air temperature, vapor pressure, wind speed, mean width, mean depth, average velocity, flow rate, water temperature, saturation constants, uptake rate coefficients photoplankton, benthic algae, nutrient, concentrations, total phosphorus and carbon, waste water discharge, concentrations of quality parameters in discharge. b. Simplest model: worst conditions of solar radiation, air temperature, vapor pressure, wind speed, flow rate, waste water discharge and concentrations of waste quality parameters in wastewater discharge.
	Calibration Requirements: Not mentioned in Part 1.

Output	Variables Predicted & Time Scales: Depends on model used. There are 3 usable models ranging from very simple to complex The most complex predicts spatial and temporal variations of BOD, temperature, phytoplankton, carbon dioxide, DO, phosphate, nitrate, pH, benthic algae, coliforms and conservative pollutants. Time scale not given in the part of report examined. The simplest given BOD and DO under worst conditions.
Misc.	Previous Applications: Not mentioned in Part 1. Strong Points: Provide a range of models to choose from. Part I is rather well written Weak Points: No comment without seeing part 2

MODEL EVALUATION FORM NO. 156

Model ID	Title: Simulation of Water Quality in Tarawera River. Author: Rutherford, J. Christopher and Michael J. O"Sullivan. Date of Work: 1974 Source: J. Environ. Eng. Div. ASCE, April 1974:369-390 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological___ Aquatic___ Terrestrial___ Activities: Prediction of DO, and rates of bacteria and protozoa growth in river sediment. Useful for rivers where large accumulations of biomass with associated aerobic metabolism causes high rates of deoxygenation Size of Area: Downstream reach of river Vegetation Zones: All Other:
Methodology	Type: Analytic procedure___ Simulation_X_ Regression___ Stochastic___ Deterministic_X_ Summary: Solves set of differential equations by an implicit method which is described. Program availability not mentioned
Input	Variables Required & Time Scales: Dimensions of sediment layers, initial concentration of biomass, effluent quality and quantity, flow not well defined Calibration Requirements: Initial concentration of bacteria determined by calibration
Output	Variables Predicted & Time Scales: DO, rate of growth bacteria and protozoa in sediment. Assume a small but variable time step of one day or less
Misc.	Previous Applications: Tarawera River, New Zealand Strong Points: Technique usable for conditions where more standard techniques would fail Weak Points: Would require mathematical programming to set up technique if the program could not be obtained from authors

MODEL EVALUATION FORM NO. 157

Model ID	Title: Simulation of Dissolved Oxygen Profile
	Author: Sornberger, G. Clinton and Krishnaswamiengar Keshavan.
	Date of Work: 1973
	Source: J. Environ. Eng. Div., ASCE, August, 1973, pp. 479-488
	Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___
	Activities: Thermal polution source, downstream effects.
	Size of Area: Reach
	Vegetation Zones: General
	Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic X Deterministic___
	Summary: Extension of Thayer and Krutchoff (1967) model to case with thermal effects. Assumes reaeration and deoxygenation behave as a birth-death process
Input	Variables Required & Time Scales: Parameters of probability distributions, initial temperature, other parameters.
	Calibration Requirements: Probably needed
Output	Variables Predicted & Time Scales: DO, BOD, time scale variable from less than a day to a day depending on rate of changes of DO.
Misc.	Previous Applications: Unknown
	Strong Points: Can get both mean and variance of DO
	Weak Points: Need to determine probability distributions Difficult if data is limiting

MODEL EVALUATION FORM NO. 158

Model ID	Title: Stochastic Model for BOD and DO in Streams
	Author: Thayer, Richard P. and Richard G. Krutchkoff.
	Date of Work: 1967
	Source: J. Sanitary Eng. Div. ASCE 90(SA3): 59-72
	Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___
	Activities: Waste loading, downstream effects.
	Size of Area: Reach
	Vegetation Zones: General
	Other:
Methodology	Type: Analytic procedure___ Simulation_X_ Regression___ Stochastic_X_ Deterministic___
	Summary:
Input	Variables Required & Time Scales: Not sure
	Calibration Requirements: Determination of parameters
Output	Variables Predicted & Time Scales: BOD,DO, small time interval
Misc.	Previous Applications: Sacramento River
	Strong Points: Mean, variance of BOD and DO are determined
	Weak Points: Requires knowledge of probability distribution which may be difficult to determine

MODEL EVALUATION FORM NO. 159

Model ID	Title: Mathematical Model for Dissolved Oxygen
	Author: Thomann, Robert V.
	Date of Work: 1963
	Source: J. Sanitary Eng. Div. ASCE 89(SA5): 1-30
	Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___
	Activities: Waste discharge - downstream effects
	Size of Area: Linked reaches
	Vegetation Zones: General
	Other:
Methodology	Type: Analytic procedure X Simulation X Regression___ Stochastic___ Deterministic X
	Summary: General model of DO response in finite number of linked reaches (streams, lakes, estuaries), linear system
Input	Variables Required & Time Scales: BOD inputs - when known
	Calibration Requirements: Considerable for determining transfer functions
Output	Variables Predicted & Time Scales: DO, short time interval
Misc.	Previous Applications: Delaware Estuary, others
	Strong Points: If data is available, should be able to produce results quickly
	Weak Points: Heavily dependent on BOD and DO data. Ignore basic processes

MODEL EVALUATION FORM NO. 160

Model ID	Title: A Statistically Based Mathematical Water Quality Model for a Non-estuaring River System. Author: Tirabassi, Michael A. Date of Work: 1972 Source: Water Resources Bull. 7(6):1221-1237 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___ Activities: Depends on data sample, downstream effects Size of Area: Downstream Vegetation Zones: General Other:
Methodology	Type: Analytic procedure___ Simulation X Regression X Stochastic___ Deterministic___ Summary: Regressions are developed for each reach and reaches are linked to simulate behavior of whole
Input	Variables Required & Time Scales: Those for the regression equations Calibration Requirements: Must develop the regressions
Output	Variables Predicted & Time Scales: Those for which data are available. Example has 18 parameters
Misc.	Previous Applications: Passaic River for 18 parameters Strong Points: Uses available data. If it is available model can be developed quickly Weak Points: Requires data for each case

MODEL EVALUATION FORM NO. 161

Model ID	Title: QUAL-I Simulation of Water Quality in Streams and Canals. Program Documentation and Users Manual Author: Masch, Fred D. & Associates, Austin, Texas, and Texas Water Development Board Date of Work: Sep. 1970 Source: Texas Water Development Board Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___ Activities: Point and non-point source (general) for downstream effects Size of Area: Basins Vegetation Zones: General Other:
Methodology	Type: Analytic procedure___ Simulation_X_ Regression___ Stochastic___ Deterministic_X_ Summary: Linked systems of streams with multiple inputs and diversions. Unsteady state.
Input	Variables Required & Time Scales: River channel topography, spatial and temporal hydrology and quality data, and meteorologic data. For details see report. Calibration Requirements: See report for details.
Output	Variables Predicted & Time Scales: Temperature, BOD, DO, and three conservative constituents. Hourly.
Misc.	Previous Applications: Operational Strong Points: Well documented Weak Points: Required sophisticated user

MODEL EVALUATION FORM NO. 162

Model ID	Title: Modeling of Land Runoff Effects on Dissolved Oxygen Author: Wallace, D.A. and R.R. Dague Date of Work: 1973 Source: J. Water Poll. Control Fed. 45(8): 1795-1809 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___ Activities: General - downstream effects Size of Area: Basin or large watershed Vegetation Zones: General Other:
Methodology	Type: Analytic procedure___ Simulation X Regression___ Stochastic___ Deterministic X Summary: Uses Streeter-Phelps equation. Divides river into reaches based on junction with tributaries, impoundments, waste discharge points. Details are given in PhD thesis of Wallace, U. of Iowa, 1971
Input	Variables Required & Time Scales: Reach characteristics: discharges for each tributary, time scale not given but runs on a storm basis Calibration Requirements: BOD of tributary discharge may be estimated from DO data if it is unknown
Output	Variables Predicted & Time Scales: DO - time scale unknown. May be used to estimate BOD of runoff from land if DO data in river are available. This is done by calibration trial and error.
Misc.	Previous Applications: Describes several applications to the Iowa River Basin for flood conditions Strong Points: Possible utility in predicting downstream effects of management activities if one can predict BOD of discharge from tributaries affected by activities Weak Points: Assumptions restrict it to flood discharges primarily

MODEL EVALUATION FORM NO. 163

Model ID	Title: Generalized Equations for Critical Oxygen Deficit.
	Author: Yao, K.M.
	Date of Work: 1970
	Source: Water and Sewage Works 117(12):426-429
	Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological X Aquatic X Terrestrial___
	Activities: Determining location and magnitude of critical oxygen deficit in a downstream reach
	Size of Area: Reach of river
	Vegetation Zones: All
	Other:
Methodology	Type: Analytic procedure___ Simulation___ Regression___ Stochastic___ Deterministic X
	Summary: Based on Camp equation
Input	Variables Required & Time Scales: Mean velocity, BOD and oxygen deficit at upstream end of reach, rate of addition of BOD from bottom deposits, rate of oxygen production by photosynthesis, length of reach, oxygen saturation concentration, and three parameters. Rates are per day.
	Calibration Requirements: The three parameters probably need to be determined by some sort of calibration
Output	Variables Predicted & Time Scales: Location and magnitude of critical oxygen deficit, also DO, BOD & oxygen deficit at downstream end
Misc.	Previous Applications: General method probably widely used by consulting firms in practice
	Strong Points: Simple to use, program listed in text of report is short or can be done by hand with calcutor
	Weak Points: Parameter estimation needed

MODEL EVALUATION FORM NO. 164

Model ID	Title: Generalized Simulation Models for Massachusetts Streams. Author: Yeh, Hsin H., Michael J. Skelly, and John P. Lawler Date of Work: 1973 Source: Journal of the Boston Society of Civil Engineers, 60(3):108-132 Evaluator: James J. Rogers
Intended application	Type: Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___ Activities: 1) Uniform lateral inflow of groundwater, surface runoff, waste flows along a reach 2) Dams, point waste discharges, tributary inflow, diversion of flow Size of Area: Streams and rivers, no apparent limit since they are segmented into reaches Vegetation Zones: No apparent restriction Other: Model accomodates rapids areas, ponds,& reservoirs.
Methodology	Type: Analytic procedure___ Simulation_X_ Regression___ Stochastic___ Deterministic_X_ Summary: Models a generalized reach and links reaches to model a stream or river system. Reach may be a rapids areas, pond, reservoir or section of stream. Receives tributary inflows or point discharges at upper end, non-point uniformly along the reach, and may have diversions at lower end.
Input	Variables Required & Time Scales: For each reach: length, drainage area, mean depth, travel time, river flow (cfs), temperature, oxidation rate coefficient, waste discharge (BOD, 5-day BOD), photosynthetic oxygen, algal respiration, dam, rapids, bottom deposits (percent covered and oxygen uptake rate) on a daily basis Calibration Requirements: Could not determine if this was needed. May be needed where data is lacking on such inputs as travel time.
Output	Variables Predicted & Time Scales: BOD, DO. Also indicates if can be used to determine fate of other pollutants. Predicts profiles for a given set of conditions.
Misc.	Previous Applications: On major streams & rivers by Commonwealth of Massachusetts Strong Points: General equations are clearly presented. Weak Points: None readily apparent. Availability of program is unknown.

MODEL EVALUATION FORM NO. 165

Model ID	**Title:** Dissolved Oxygen Variations in Stratified Lakes
	Author: Bella, D.A.
	Date of Work: 1970
	Source: J. Sanitary Eng. Div. Proc. A.S.C.E. 96(SA5): 1129-1146
	Evaluator: James J. Rogers
Intended application	**Type:** Physical___ Chemical___ Biological_X_ Aquatic_X_ Terrestrial___
	Activities: Oxygen profiles as affected by various processes
	Size of Area: Stratified lake
	Vegetation Zones: All
	Other:
Methodology	**Type:** Analytic procedure___ Simulation_X_ Regression___ Stochastic___ Deterministic_X_
	Summary: Model describes effects of reaeration, photosynthetic oxygenation, vertical mixing, oxygen uptake on DO
Input	**Variables Required & Time Scales:** Dispersion coefficient, respiration rates, temperature profiles, photosynthesis, atmospheric reaeration
	Calibration Requirements: May require estimation of respiration
Output	**Variables Predicted & Time Scales:** DO variations with time (day) and depth.
Misc.	**Previous Applications:** Lake Sammamish, WA
	Strong Points: Model can be used to determine uptake rates if DO profiles are available
	Weak Points: One dimensional, vertical, assumes complete horizontal mixing, does not consider benthal demand or inflow from ground or streams. Required good data on biological processes and estimation of coefficients.

MODEL EVALUATION FORM NO.166

Model ID	**Title:** Oxygen Depletion Model for Cayuga Lake
	Author: Newbold, J.D. and J.A. Liggett
	Date of Work: 1974
	Source: J. of Environmental Eng. Div., Proc. A.S.C.E. 100(EE1): 41-59
	Evaluator: James J. Rogers
Intended application	**Type:** **Physical**___ **Chemical**___ **Biological** X **Aquatic** X **Terrestrial**___
	Activities: Determine possible causes of oxygen depletion
	Size of Area: Large deep lake
	Vegetation Zones: General
	Other:
Methodology	**Type:** **Analytic procedure**___ **Simulation** X **Regression**___ **Stochastic**___ **Deterministic** X
	Summary: An ecosystem type model including bacterial respiration, oxygen diffusion, zooplankton production, respiration, grazing, phytoplankton, benthic deposition and respiration. Processes modeled in both euphotic and aphotic zones.
Input	**Variables Required & Time Scales:** Lake hydrographic data, temperature, data on productivity, zooplankton, photoplankton, oxygen.
	Calibration Requirements: Coefficient values were estimated from literature. Some calibration was required for fine tuning.
Output	**Variables Predicted & Time Scales:** Primarily vertical oxygen profiles
Misc.	**Previous Applications:** Cayuga Lake, N.Y.
	Strong Points: An integrated model. Similar method applicable to other lakes
	Weak Points: Required good data on biological processes and temperature. Coefficients used for Cayuga Lake.

WATERSHED INVENTORY FORM NE-1

Watershed identification	Name: Hubbard Brook Area: 3108 ha, 8 gaged watersheds, 12 to 77 hectare Type: Experimental
Administering organization	Name: Northeastern Forest Experiment Station Address: Forestry Sciences Laboratory P.O. Box 640 Durham, N.H. 03824
Location	State: New Hampshire Latitude: 43° 57' N Longitude: 71° 44' W
Physiographic description	Geology: Glaciated gneiss, schist, and granite Typography: Mostly steep and rugged Vegetation: Forests, mainly northern hardwoods, unevenaged Soil: Well-drained podzols derived from glacial till Climate: Temperate, humid, with snow mid-December to mid-April
Use	Past: Forest harvest, minimum recreation such as hunting, hiking Present: Same
Purpose of data collection	Determine effects of forests and forest uses on hydrologic and nutrient cycles
Publications	Numerous publications. Write to administering organization for bibliography.

Data availability To whom When Form	Collected data: Hydrologic, meteorologic, water quality, and water chemistry data are transcribed on forms or computer cards. Data are available through negotiation with administering organization. Supporting data: Data on vegetation, soils, and other parameters are being collected and are in various stages of tabulation.
Date collection initiated	1955
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soils information
Precipitation (C)	Vegetation
Air Temperature (C)	Wildlife
Solar Radiation (C)	Snow Surveys
Suspended Sediment (P)	Soil Moisture
Water Temperature (C)	Soil Water Chemistry from lysimstors
Precipitation and Streamflow Chemistry including calcium, pH, magnesium, sodium, potassium, nitrate, sulfate, ammonium, chloride, phosphate	

Remarks:

Of the 8 gaged watersheds, two have received experimental treatments. One of the watersheds was cleared of forest vegetation and sprayed with herbicides for 3 years. The second treatment involved strip cutting, a form of evenaged management.

WATERSHED INVENTORY FORM NE-2

Watershed identification	Name: Leading Ridge Basins Area: 3 watersheds: 52, 117, 124 hectares Type: Experimental
Administering organization	Name: School of Forest Resources Address: Pa. State University University Park, PA 16802
Location	State: Pennsylvania Latitude: 40^{o} 40' N Longitude: 77^{o} 54' W
Physiographic description	Geology: Shale and sandstone Typography: 12 to 17% slope Vegetation: Oak-hickory forest type Soil: Shale, silt loam Climate: Ave. annual rainfall = 101.6 cm (40 inches). Mean mo. temp. range = -1^{o}-24^{o}C (30^{o}-75^{o}F).
Use	Past: Forest management and cutting Present: Undisturbed forest since 1920's
Purpose of data collection	Study influence of forest cover and manipulation on streamflow
Publications	Sopper, W.E. and Lull, H.W., 1965. The Representativeness of small forested experimental watersheds in northeastern United States: International Assoc. Sci. Hydrol. 66, p. 441-456.

Data availability To whom When Form	Collected data: Streamflow and precip on cards. Water chemistry on data sheets. Data availability negotiable through administering organization. Supporting data: Vegetation, soil, microclimate, and snow survey data are in various stages of tabulation.
Date collection initiated	September 1957
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soils information
Precipitation (C)	Vegetation survey
Air Temperature (C)	Microclimate data
Suspended Sediment (P)	Snow survey data
Water Temperature (P)	
Precipitation and streamflow chemistry including Potassium, Sodium, Calcium, Sulfate, Nitrate, specific conductance, alkalinity, pH (P)	

Remarks:

One watershed is being clearcut in stages to determine impact on streamflow.

WATERSHED INVENTORY FORM NE-3

Watershed identification	Name: Shale Hills Watersheds Area: 2 watersheds: 7.8 ha and 7.8 ha Type: Experimental
Administering organization	Name: School of Forest Resources Address: Pa. State University University Park, PA 16802
Location	State: Pennsylvania Latitude: 40^{0} 40' N Longitude: 77^{0} 54' W
Physiographic description	Geology: Shale Typography: 10 - 30% slopes Vegetation: Oak-hickory forest Soil: Shallow shale silt loam Climate: Annual rainfall = 101.6 cm (40 inches) Mo. temp. range = -1^{0} - 24^{0}C (30 - 75^{0}F).
Use	Past: Cutover in early 1900's Present: Undisturbed since cut in 1900
Purpose of data collection	Study water yield and storm flow from forests
Publications	Nutler, W., and Sopper, W., 1968. Two weirs for accurate stream gaging of small watersheds. Water Resources Res., V.4, No. 3, p. 613-618.

Data availability To whom When Form	Collected data: Streamflow and precipitation on cards. Water chemistry on data sheets. Data availability negotiable through administering organization. Supporting data: Vegetation, soil, and microclimate data have been collected.
Date collection initiated	1962
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Precipitation (C) Air temperature (C) Suspended Sediment (P) Water temperature (P) Precipitation and streamflow chemistry including Potassium Sodium, Calcium, Sulfate, Nitrate, specific conductivity, alkalinity, pH (P)	Soil moisture Vegetation survey Soils information

Remarks:

One of the Shale Hills watersheds is equipped with an irrigation system to provide "artificial" rainfall. The purpose is to study storm runoff for various intensities and durations of rainfall.

WATERSHED INVENTORY FORM NE-4

Watershed identification	Name: Fernow Experimental Forest Area: 9 watersheds ranging from 11.7 to 38.9 ha. Type: Experimental
Administering organization	Name: Northeastern Forest Experiment Station Address: Timber and Watershed Laboratory Parsons, W. Virginia 26287
Location	State: W. Virginia Latitude: 39^{o} 03 'N Longitude: 79^{o} 41' W
Physiographic description	Geology: Interdedded sandstones and shales Typography: Steep terrain Vegetation: Deciduous hardwood forest Soil: Sols Bruns Acids with many course Fragments Climate: Temperate, humid
Use	Past: Cutover late 1800's and early 1900's Some fire then: undisturbed since Present: Forested - under management
Purpose of data collection	Study effects of forests and forest treatments on streamflow
Publications	Numerous publications. Contact administering organization for bibliography.

Data availability To whom When Form	Collected data: Data are available on cards, print-out forms, and data sheets Supporting data: Information on soils, vegetation, climate, and physical characteristics are available in different forms.
Date collection initiated	1955
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soils information
Precipitation (C)	Soil moisture
Air temperature (C)	Microclimate
Solar radiation (C)	Vegetation
Water temperature	
Suspended sediment (P)	
Precipitation and streamflow chemistry including calcium, magnesium, sodium, Potassium, iron, copper, zinc, and ammonium-nitrogen, pH, specific conductance (P)	

Remarks:

Many of the Fernow watersheds have received experimental treatments and would be useful for testing hydrologic and nutrient models.

WATERSHED INVENTORY FORM NE-5

Watershed identification	Name: Wild River (01054200) Area: 1800 ha. (69.5 sq. mi.) Type: Representative
Administering organization	Name: US Geological Survey Address: Washington, D.C. 20242
Location	State: Maine Latitude: 44°23'25" Longitude: 70°58'55"
Physiographic description	Geology: Gneiss, schists, glacial till at higher elevations. Typography: Deeply disected with steep slopes; elevation range, 213.3 - 1,463 m. (700 - 4800 ft.) Vegetation: Hardwoods with small groves of conifers Soil: Climate: Average annual precipitation, 111.7 cm. (44"), Moderate mean temp. extremes, 7.7 - 19.4 c (18 - 67 F.)
Use	Past: Present: White Mountain N. Forest, selective logging.
Purpose of data collection	Benchmark station.
Publications	

Data availability To whom When Form	Collected data: All individuals, upon request, transcribed, published Supporting data: (same)
Date collection initiated	Streamflow, 1964 Precipitation, 1964 Water Quality, 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Nitrate	Snow Depth
Precipitation (C) (4 gages)	Chloride	Wind speed (C)
Water Temperature (C)	Fluoride	Relative humidity (C)
Conductance	Susp. Sediment*	Air Temperature (C)
Dis. Oxygen	Dis. Solids	Solar radiation (C)
Coliform, BOD		Resource surveys
pH		
Hardness		
Silica		
Phosphate		
Iron		
Calcium		
Magnesium		
Potassium		
Sodium		
Bicarbonate		
Carbonate		
Sulfate		

Remarks:

Addition water quality data collected by U.S. Forest Service. Unless noted, all data collected once per month.

*Also collected during peak runoff.

<u>**WATERSHED INVENTORY FORM**</u> NE-6

Watershed identification	Name: Esophus Creek (01362198) Area: 15410 ha (59.5 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: S.E. New York Latitude: 42^{0} 06' 59" Longitude: 74^{0} 23' 20"
Physiographic description	Geology: Glacial till/reddish, non marine sandstone Typography: Mountainous Vegetation: Conifers and hardwoods Soil: Those characteristic of Appalachian Plateaus Province. Climate: Ave. annual precip. 101.6 - 114.3 cm (40 - 45 in.) Mo. mean temp. extremes - -6.6^{0} - 21^{0}C (20^{0} - 70^{0}F)
Use	Past: Present:
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Precipitation - 1953 Stream Flow - 1963 Water Quality - 1967 Daily Precip. - 1943
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Stream flow (C)	Silica	Minor Elements - 2 x/yr.
Precipitation (C)	Magnesium	Pesticides - 2 x/yr.
Conductance	Bicarbonate	Radioactivity - 2 x/yr.
Temperature	Sulfate	
Dissolved Oxygen	Phosphate	
Coliform, BOD	Nitrate	
Suspended Sediment*	Iron	
Calcium	Carbonate	
pH	Chloride	
Hardness	Fluoride	
	Dissolved Solids	
	Potassium	
	Sodium	

Remarks:

*Also collected during storm runoff.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM NE-7

Watershed identification	Name: McDonald's Branch (01466500) Area: 598.3 ha (2.31 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Southern New Jersey Latitude: 39° 53' 05" Longitude: 74° 30' 20"
Physiographic description	Geology: 90% sand/gravel 10% clay/silt Typography: Rather flat Vegetation: Upper 94% - oak and pine Lower 6% - white cedar and swamp hardwoods Soil: Those characteristic of Coastal Plain Province Climate: Ave. annual precip - 111.7 cm (44 in.) Mo. mean temp. extreme - .5° - 23.9°C (33° - 75°F)
Use	Past: Present: Occasional logging
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, Published Supporting data: (Same)
Date collection initiated	Streamflow - 1953 Gr-W. Levels - 1955 Grd-W. Info - 1955 Precipitation - 1955 Air Temperature - 1963 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Dissolved Solids	Minor Elements - 2 x/yr.
Water Level (C)	Sodium	Pesticides - 2 x/yr.
Precipitation - wkly	Silica	Radioactivity - 2 x/yr.
Air Temperature (C)	Iron	
Conductance	Potassium	
Dissolved oxygen	Suspended Sediment*	
Coliform, Biological Oxygen Demand	pH	
Calcium	Hardness	
Magnesium	Phosphate	
	Nitrate	
	Carbonate	
	Bicarbonate	
	Sulfate	
	Chloride	
	Fluoride	

Remarks:

* Also collected during storm runoff.

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM NE-8

Watershed identification	Name: Young Woman's C. (01545600) Area: 11,966 ha (46.2 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Pennsylvania Latitude: 41° 23' 22" Longitude: 77° 41' 28"
Physiographic description	Geology: Sandstone and shale Typography: Broad, flat mountains; narrow steep-sided valleys. Vegetation: Ash, beech, birch, cherry, maple Soil: Those characteristic of Appalachian Plateaus Province Climate: Ave. annual precip - 96.5 cm (38 in.) Mo. mean temp extremes -3° - 29°C (27° - 71°F).
Use	Past: Present: 95% publicly owned, hunting and logging
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1964 Precipitation - 1964 Water quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Sulfate	Minor Elements - 2 x/yr.
Precipitation (C)	pH	Pesticides - 2 x/yr.
Conductance	Silica	Radioactivity - 2 x/yr.
Temperature	Hardness	
Dissolved oxygen	Phosphate	
Coliform Biological Oxygen Demand	Nitrate	
Suspended sediment*	Iron	
Calcium	Magnesium	
Bicarbonate	Carbonate	
	Chloride	
	Fluoride	
	Dissolved solids	
	Potassium	

Remarks:

* Also collected during storm runoff.

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM NE-9

Watershed identification	Name: Little Black Fork Area: 1214 ha. Type: Experimental
Administering organization	Name: U.S. Forest Service Address: Monongahela National Forest Elkins, W. Va. 26241
Location	State: W. Virginia Latitude: 38^{0} 58' 45" Longitude: 79^{0} 43' 36"
Physiographic description	Geology: Pennsylvanian to Mississippian (Pottsville to Chemunge Groups) Typography: Allegheny platteau, steep slopes narrow valleys, relative relief: 594-1189m (1950-3900 feet) Vegetation: Appalachian and cove hardwoods Soil: Colluvial and alluvial Climate: Continental, average annual precipitaion 127-140cm (50-55")
Use	Past: Forested, logged 60 years ago. Present: Low intensity recreation (fishing, hunting)
Purpose of data collection	Monitoring baseline water quality in Appalachian area.
Publications	None

Data availability To whom When Form	Collected data: All individuals upon request through NEFE Station, Parson, W. Virginia. Field Supporting data: All individuals upon request through Monongahela National Forest, Elkins.
Date collection initiated	Water Quality - September 1973 Flow - January 1975
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Conductance	Topographic maps
pH	Soils maps
Acidity	Geology maps
Alkalinity	Aerial photos
Trubidity	Class A weather station a distance of 15 miles at Elkins, W. Virginia
Iron	
Sulfate	
Nitrate	
Calcium	
Magnesium	
Sodium	
Potassium	
Streamflow	
Precipitation	
pH	
Acid	
Alkalinity	
Conductance	

Remarks:

All water quality parameters measured once per month at 56 stations representing all tributaries and changes in soil/geology complexes.

WATERSHED INVENTORY FORM NE-10

Watershed identification	Name: E. Br. Saco River Area: 2,914 ha Type: Representative
Administering organization	Name: U.S. Forest Service Address: White Mtn. N.F. Box 638 Laconia, New Hampshire
Location	State: New Hampshire Latitude: 44^{o} 10' 42" Longitude: 71^{o} 07' 19"
Physiographic description	Geology: Granite Typography: Mountainous, relative relief: 487.6 - 1066.8 m (1600-3500 feet) Vegetation: Northern hardwoods with spruce Soil: Glacial till Climate: Cool continental
Use	Past: Commercial forest with cuts around 1900 and 1970 Present: Commercial forest
Purpose of data collection	To monitor impacts of timber harvest, 1968-1972.
Publications	None

Data availability	Collected data:
To whom	All individuals
When	Upon request
Form	Transcribed (STORET)
	Supporting data:
	All individuals who pay duplication costs if necessary.
	Upon request
	Interpreted (maps, etc. See below.)
Date collection initiated	1965, flow, precip. - 1967, chemical
Date collection terminated	1974, flow, precip. Chemical, continuing through 1975.

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Temperature (C) during summer	Soils Survey
Conductance	Topographic Maps
Streamflow (C)	Aerial Photos
Precipitation (C) (2 gages)	State Geologic Map
Total phosphate	
Organic nitrogen	
Nitrate nitrogen	
Color	
Calcium	
Sodium	
Magnesium	

Remarks:

21% of the watershed was cut during 1968-1972. A 100 Ac bag immediately upstream from the sampling station seems to have a significant impact on water quality at the sample station.

WATERSHED INVENTORY FORM NE-11

Watershed identification	**Name:** Cranberry Barometer Watershed **Area:** 22,663 ha. **Type:** Representative
Administering organization	**Name:** U.S. Forest Service **Address:** Monongahela National Forest Elkins, W. Va. 26241
Location	**State:** W. Virginia **Latitude:** 38° 19' 26" **Longitude:** 80° 26' 11"
Physiographic description	**Geology:** Pennsylvanian (Pottsville and Kanawha Groups-acidic) **Typography:** Moderately steep, benched. Relative relief: 762-1372 m (2500-4500 feet) **Vegetation:** Appalachian and cove hardwoods **Soil:** Alluvial and colluvial **Climate:** Continental, ave. annual Precipitation=140 cm (55 inches)
Use	**Past:** Forested, cut over during last 60 years. **Present:** Cranberry wilderness study area; dispersed recreation.
Purpose of data collection	Baseline water quality and weather
Publications	None

Data availability To whom When Form	Collected data: All individuals upon request Field (raw punch tapes) Supporting data: All individuals upon request some reprod. costs may be necessary.
Date collection initiated	April, 1968
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Temperature (P)	Topographic maps
Streamflow (C)	General soils map
Turbidity (P)	General geology map
Conductivity (P)	Aerial photos
pH (P)	
Precipitation (5 recording gages)	
Radiation (C)	
Wind (C)	
Dew point (C)	
Air Temperature (C)	

Remarks:

P = every 2 weeks

WATERSHED INVENTORY FORM CE-1

Watershed identification	Name: Upper Twin Creek (03237280) Area: 3315 ha (12.8 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Ohio Latitude: 38^o 38' 15" Longitude: 83^o 13' 30"
Physiographic description	Geology: Shale and sandstone Typography: Extremely hilly Vegetation: Dense second-growth hardwood Soil: Those characteristic of Appalachian Plateaus Province Climate: Ave. annual precip. - 107 cm (43 in) Mo. mean temp. extremes - 0^o - 25^oC (32^o - 77^oF)
Use	Past: Present: 90% on State Forest land
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Stream Flow - 1963 Precipitation - 1963 Water Temperature - 1963 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Stream flow (C)	Sodium	Minor Elements - 2 x/yr.
Precipitation (C)	pH	Pesticides - 2 x/yr.
Water Temperature (C)	Bicarbonate	Radioactivity - 2 x/yr.
Conductance	Hardness	
Temperature	Sulfate	
Dissolved Oxygen	Silica	
Coliform, Biological Oxygen Demand	Phosphate	
Suspended Sediment*	Nitrate	
Calcium	Iron	
Magnesium	Carbonate	
	Chloride	
	Fluoride	
	Dissolved Solids	
	Potassium	

Remarks:

* Also collected during storm runoff.

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM CE-2

Watershed identification	Name: Dismal River (06775900) Area: 248640 ha (960 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Central Nebraska Latitude: 41^{o} 46' 45" Longitude: 100^{o} 31' 30"
Physiographic description	Geology: Sand and siltstone Typography: Rolling to hilly sand hills Vegetation: Few native trees - almost entirely rangeland Soil: Those characteristic to Great Plains Province. Climate: Ave. annual precip. - 50.8 cm (20 in.) Mo. mean temp. extremes - -5^{o} - $24^{o}C$ (23^{o} - $76^{o}F$)
Use	Past: Present:
Purpose of data collection	Benchmark Station
Publications	

Data availability	Collected data:
To whom	All individuals
When	Upon request
Form	Transcribed, Published
	Supporting data:
	(Same)
Date collection initiated	Stream flow - 1966 Water quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Stream Flow (C)	Suspended Sediment*	Minor Elements - 2 x/yr.
Conductance	pH	Pesticides - 2 x/yr.
Temperature	Hardness	Radioactivity - 2 x/yr.
Dissolved Oxygen	Phosphate	
Coliform, BOD	Nitrate	
Calcium	Iron	
Bicarbonate	Magnesium	
Silica	Carbonate	
Fluoride	Sulfate	
	Chloride	
	Dissolved Solids	
	Potassium	
	Sodium	

Remarks:

*Also collected during storm runoff.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM CE-3

Watershed identification	Name: Hurricane Creek Area: 29,138 ha. Type: Representative
Administering organization	Name: US Forest Service Address: Rolla, Missouri 65401
Location	State: Missouri Latitude: 36^{o}45' Longitude: 91^{o}16'
Physiographic description	Geology: Dolomitic Karst Typography: Gently rolling to very steep and disected. Max. relief: 91.44 m. (300 ft.) Vegetation: Oak-hickory, some short leaf pine and pasture. Soil: Stony, SCS hydrologic Group B. Climate: Interior continental
Use	Past: Timber, livestock production. Present: Primarily timber production.
Purpose of data collection	Characterize karst hydrologic systems.
Publications	None

Data availability To whom When Form	Collected data: All individuals; upon request: Water quality: transcribed (STØRET); Hydromet: editted. Supporting data: All individuals; upon request: published maps and reports.
Date collection initiated	1969
Date collection terminated	1972

Types of Data Available (P = periodic; C = continuous)

Collected Data

Air Temperature (C)
Water Temperature
Streamflow (C)
Turbidity
Color
Conductance
Dissolved Oxygen
pH
Carbon Dioxide
Alkalinity
Carbonate
Bicarbonate
Tot. Nitrogen
Nitrogen forms
Tot. phosphate
Ortho phosphate
Calcium
Magnesium
Manganese
Sodium
Potassium
Chloride
Sulfate
Fluoride
Copper
Iron
Lead
Zinc
Aluminum
Fecal Coliform
Wind (C)
Numbers and species of benthos
Dew point (C)

Supporting Data

Topographic maps
Vegetative maps
Soil maps
Recreation use map
Conceptual semi-quantitative hydrologic model
Geology description documents
Aerial photos

Remarks:

Interbasin water losses are common within the watershed - 90% lost outside of Hurricane Creek. Water quality data collected 2 times per month. Several similar watersheds having less rigorous hydromet data exist nearby.

WATERSHED INVENTORY FORM CE-4

Watershed identification	Name: S. Hogan Creek near Dillsboro, Indiana (03276700) Area: 9894 ha. (38.2 sq. mi.) Type: Representative
Administering organization	Name: US Geological Survey Address: Washington, D.C. 20242
Location	State: Indiana Latitude: 39°01'47" Longitude: 85°02'17"
Physiographic description	Geology: Thin till overlying limestone and shale. Typography: Rolling hills with steep-sided valleys 176.7 - 552.2 m. (580 - 995 ft.) Vegetation: Pasture (grasses) Soil: Those characteristic of central lowland province. Climate: Average annual precipitation, 101.6 cm. (40"). Moderate mean temp. extremes, 1.1°- 24.9°C (34°- 77°F.)
Use	Past: Present: Pasture
Purpose of data collection	Benchmark station.
Publications	

Data availability To whom When Form	Collected data: All individuals, upon request, transcribed, published. Supporting data: (same)
Date collection initiated	Streamflow, 1961 Precipitation, 1967 Water Quality, 1968
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Fluoride	Groundwater level evaluations
Temperature	Dis. Solids	Minor elements*
Precipitation (C)	Susp. Sediment*	Pesticides*
Conductance		Radioactivity*
Dis. Oxygen		
Coliform, BOD		
pH		
Hardness		
Silica		
Phosphate		
Iron		
Magnesium		
Calcium		
Potassium		
Sodium		
Bicarbonate		
Carbonate		
Sulfate		
Chloride		

Remarks:

Unless noted, all data collected once per month.
*Susp. Sediment, also collected during storm runoff.

*Supporting Data: 2 times per year.

WATERSHED INVENTORY FORM CE-5

Watershed identification	Name: Lusk Creek above Eddyville Area: 11109 ha. Type: Representative
Administering organization	Name: Environmental Protection Agency Address: 2209 W. Main Marion, Illinois
Location	State: S. Illinois Latitude: 37°28'20" Longitude: 88°32'50"
Physiographic description	Geology: Ozark Plateau Typography: Steeply sloping Vegetation: Hardwood Forest Soil: Silt loam Climate: Continental
Use	Past: Forest with some farming on ridge tops. Present: General forest area, dispersed recreation.
Purpose of data collection	Benchmark water quality and hydrology of S. Illinois.
Publications	U.S.G.S. flow records Vegetative descriptions Natural history survey

Data availability To whom When Form	Collected data: All individuals, upon request. Flow, published; W.Q., STØRET Supporting data: All individuals, upon request. Published.
Date collection initiated	W.Q. - February, 1969 Flow - October, 1967
Date collection terminated	W.Q. and Flow

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Manganese	Topog. maps
Precipitation (C)	Nickel	Aerial photos
Temperature	Silver	Soils map
Dis. Oxygen	Sodium	Geologic map
pH	Tot. Dis. solids	Vegetative type map
T. phosphate	Fluoride	Timber inventory
Fecal Coliform	Chloride	Natural history reports
Ammonia - N	Sulfate	
Nitrate, Nitrite-N	Boron	
Organic-N		
Total Nitrogen		
Arsenic		
Barium		
Cadmium		
Total Iron		
Mercury		
Chromium (Hex, Tri)		
Copper		
Lead		

Remarks: Streamflow, precipitation continuous, all other data data collected once per month.

WATERSHED INVENTORY FORM CE-6

Watershed identification	Name: University Area: 20.2 ha total, 4 gaged , Wshed. 4 to 7 hectares Type: Experimental
Administering organization	Name: School of Forestry Address: Fisheries and Wildlife University of Missouri - Columbia
Location	State: Missouri Latitude: 36^0 55' N Longitude: 90^0 18' W
Physiographic description	Geology: Loess (shallow) over Limestone and Dolomite (some Sandstone) Karst subsurface drainage Typography: Narrow ridgetops breaking off into moderately steep headwater drainages Vegetation: Young sawtimber Oak-Hickory Black oak, Scarlet Oak and White Oak predominate Soil: Poorly-drained from loess; moderate draining on ridges; moderately well-drained from dolomite residuum on slopes-very cherty Climate: Temperate Ave. Temp. (59^0) 14.9^0C Ave. Precip. (45.61 in.) 1158 cm
Use	Past: Teaching and demonstration forest some hydrologic, ecologic and silviculture research Present: Research on the effects of various forest practices on water yields and quality.
Purpose of data collection	Determine effects of forest treatments on streamflow and water quality
Publications	Several publications and Master's These on soils, ecology, silviculture, and hydrology. Publication lists and reprints can be obtained from the administrating organization

Data availability To whom When Form	Collected data:	Data available on request from administrating organization on streamflow precipitation, Temperature, humidity, evaporation (pan), water quality, etc.
	Supporting data:	Data on vegetation, geology and soils also available
Date collection initiated	Streamflow data continuous from 1958 from one watershed; 1967 on other three. Meterorologic data available from 1955 (mostly continous). Water quality data collection from 1972	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	
Precipitation (C)	Soils Vegetation
Evaporation (C)	Geology
Temp. and Humid (C)	Soil Water
Streamflow turbidity (C)	Forest Nutrient Cycling
Stream and Predip water quality: Calcium, Magnesium, Nitrogen, Ammonium, Conductance, Hydrox. Aro. Comp. (all) Cobalt, pH, Coliform, Temperature (p)	

Remarks: The Watershed gaged since 1958 will be retained for basic hydrologic process studies. Two of the remaining three experimental watersheds will be treated within the next 18 months to determine the effects of specific land use practices on streamflow yields and water quality from these small, forested, headwater watersheds.

WATERSHED INVENTORY FORM CE-7

Watershed identification	Name: Coshocton , Ohio WS 172 Area: 17.6 ha (43.6 acres) Type: Experimental
Administering organization	Name: North Appalachian Experimental Address: Watershed USDA ARS NCR P.O. Box 478 Coshocton, Ohio 43812
Location	State: Ohio Latitude: 40° 22' N Longitude: 81° 48' W
Physiographic description	Geology: Sandstone, shale, limestone, coal, and clay of the Allegheney and Conemaugh series Typography: Narrow valleys, steep side slopes, moderate stream gradients Vegetation: Mixed pine plantation and native hardwoods Soil: Residual forest soils, Gilpin, Coshocton, Dekalb Ass'n. Climate: Temperate, humid, 96.5 cm (38") annual precip. 63.5 cm (25") snowfall annually
Use	Past: Forest and pasture - Pasture was reforested in 1940 Present: Forest
Purpose of data collection	Evaluate effect of reforestation on runoff and erosion
Publications	From our List of Publications: No.'s 182, 177, 174, 169, 152, 115

Data availability To whom When Form	Collected data: Supporting data: See Types of Data Available (below)
Date collection initiated	1939
Date collection terminated	7-1-72

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Stream flow (C)	Soils information
Precipitation (C)	Vegetation surveys
Air Temperature (C)	Snow record
Solar Radiation (P)	Meadow soil moisture
Chemistry, including (Potassium, Chloride, Nitrogen, Phosphorus) (P)	Nearby watersheds runoff records

Remarks:

WATERSHED INVENTORY FORM LS-1

Watershed identification	Name: Watershed #2 (Marcell Exp. Forest) Area: 9.7 ha. Type: Experimental
Administering organization	Name: N. Central Forest Experiment Sta. Address: U.S. Forest Service Rt. 3 Grand Rapids, Minnesota 55744
Location	State: N. Minnesota Latitude: $47^{o}32'$N Longitude: $93^{o}28'$W
Physiographic description	Geology: Precambrian of Laurentian shield (Ely Greestone) Typography: Gently sloping to rolling, relative relief = 9.1 - 12.2 m. (30 - 40 ft.) Vegetation: Aspen, paper birch, black spruce on organic Soil: Till plains, kettle moraines Climate: Continental
Use	Past: Commerical forest, last harves during 1920's Present: Experimental control watershed
Purpose of data collection	Gain baseline data as a part of paired watershed studies.
Publications	Ten (10): Describe hydrology, hydrogeology, and nutrient yields of watershed.

Data availability To whom When Form	Collected data: All individuals (some reproduction costs may occur): upon request: editted, transcribed, published. Supporting data: All individuals (some reproduction costs may occur); upon request: interpreted.
Date collection initiated	1960
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Temperature	Aluminum	Aerial photos
Conductivity	Copper	Topographic maps
Color	Lead	Soils maps
pH	Zinc	Vegetation type maps
Tot. Acidity	Evaporation pan data	Well profile data
Nitrogen forms	Solor Radiation	Recent history of watershed document
Tot. phosphorus	Soil Moisture	
Streamflow (C)	Groundwater Depth	
Precipitation (C) (4 gages)	Albido	
Air Temperature (C)	Upland runoff plots	
Humidity (C)		
Chloride		
Iron		
Calcium		
Sodium		
Magnesium		
Manganese		
Potassium		

Remarks:

In addition to the above, chemical and nutrient quality of rain and snowfall is monitored. Watershed #2 is a control watershed and 5 similar Watershed's exist within the Marcell Exp. Forest.

WATERSHED INVENTORY FORM LS-2

Watershed identification	Name: Pine River Watershed Area: 68,799 ha. Type: Experimental
Administering organization	Name: US Forest Service Address: N. Central Forest Experiment Sta. Box 632 Cadillac, Michigan
Location	State: N. Lower Peninsula, Michigan Latitude: $44^{o}12'47''$ Longitude: $85^{o}53'47''$
Physiographic description	Geology: Sandy glacial drift 182.8 - 213.3 m. (600 - 700 ft.) over bedrock. Typography: Flat to gently rolling (streams incised in lower reaches) Vegetation: Aspen, N. Hardwoods, Pine Soil: Coarse sands with some clay outcrops in headwaters. Climate: Continental with some modification by L. Michigan.
Use	Past: Logging in late 1800's, farming during 1920 - 1930's. Present: Rural home sites, pulpwood logging, recreation (canoeing)
Purpose of data collection	Determine baseline climate, also relationship of flow and sediment.
Publications	Four (4): Describe sediment loads

Data availability To whom When Form	Collected data: All individuals, upon request, Published (some streamflow, field) Supporting data: All who pay any necessary reproduction costs. Upon request; interpreted (published)
Date collection initiated	1966
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Tot. Nitrogen	Aerial photos
Sediment	Nitrate Nitrogen	Topographic maps
(8 stations)	Tot. Phosphorus	Cover type maps
Tot. Dis. Solids	Ortho-Phosphorus	U.S.G.S. streamflow
Temperature (C)	Chloride	Fish population data
Dis. Oxygen	Manganese	Salmonid egg survival data
Precipitation (C)	Calcium	Stream bottom type
Wind Speed (C)	Magnesium	Groundwater entry patterns to stream
Radiation (C)	Sodium	
Aquatic insect numbers	Potassium	
Color	Sulfate	
Conductance	Iron	
pH	Aluminum	
Turbidity	Zinc	
Air Temp.		
Dis. Oxygen		
Free Carbon Dixoide		
Fecal Coliform		

Remarks:

8 - 12 stations exist within the watershed and not all of the data exists during the entire period of record at all the stations. Chemical - physical water quality data collected 1 time per month at 4 stations.

WATERSHED INVENTORY FORM LS-3

Watershed identification	Name: Popple R. (04063700) Area: 33,929 ha. (131 sq. mi.) Type: Representative
Administering organization	Name: U.S. Geologicial Survey Address: Washington, D.C. 20242
Location	State: Wisconsin Latitude: $45^{\circ}45'50''$ Longitude: $88^{\circ}27'50''$
Physiographic description	Geology: Glacial deposits and igneous metamorphic crystalline rocks. Typography: Gently rolling terrain with flat terraces. Vegetation: Dense coniferous and deciduous Forest--aspen, n. hardwoods pine and swamp trees Soil: Those characteristic of the Superior Upland Province. Climate: Average annual precipitation 74 cm. (29") Moderate mean temp. extrems -10°-19°c. (14-66°F)
Use	Past: Present: Part of state wild-river area
Purpose of data collection	Benchmark station
Publications	

Data availability To whom When Form	Collected data:	All individuals; upon request transcribed, published.
	Supporting data:	(same)
Date collection initiated	Streamflow - 1963 G/W Level - 1966 Precipitation - 1965 S/W Temperature - 1964	Water Quality - 1967 Lake Levels - 1966
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Hardness	Minor Elements*
Precipitation (C)	Phosphate	Pesticides*
Soil & Water Temperature (C)	Nitrate	Radioactivity*
Ground & Water levels	Silica	
Conductance	Carbonate	
Dissolved Oxygen	Sulfate	
Coliform, Biological Oxygen Demand	Chloride	
Suspended Sediment*	Fluoride	
Iron	Dissolved Solids	
pH		
Calcium		
Sodium		
Magnesium		
Potassium		
Bicarbonate		

Remarks: Unless noted, all data collected once per month.

*Suspended Sediment, also collected during storm runoff.

*Supporting data: 2 times per year

WATERSHED INVENTORY FORM LS-4

Watershed identification	Name: Roseau River Area: 279901 ha. (1080.7 sq. mi.) Type: Representative
Administering organization	Name: Minn. Water Poll. Control Agency Address: Roseville, Minnesota 55113
Location	State: Minnesota Latitude: 48°46'34.0" Longitude: 095°43'29.0"
Physiographic description	Geology: Typography: Vegetation: Soil: Climate:
Use	Past: Forested Present: Forest
Purpose of data collection	Baselines
Publications	None

Data availability To whom When Form	Collected data: All individuals: upon request; transcribed (STØRET) Supporting data: All individuals; upon request; published.
Date collection initiated	1967
Date collection terminated	1968

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Temperature	Hardness	Aerial photos
Dissolved Oxygen	Biological Oxygen Demand	Topographic maps
pH	Chemical Oxygen Demand	Precipitation data
Conductance	Total Organic Carbon	
Alkalinity	Chloride	
Phosphorous	Sulfate	
Nitrogen (forms)	Fluoride	
Calcium	Copper	
Sodium	Cadmium	
Potassium	Nickel	
Iron	Zinc	
Silica	Lead	
Streamflow	Manganese	
Turbidity	Mercury	
Tot. Coliform	Arsenic	
Fecal Coliform	Selenium	
Tot. Solids	Chromium	
Suspended Solids	Cyanide	
Turbidity		

Remarks:

All data collected once per month.

WATERSHED INVENTORY FORM LS-5

Watershed identification	Name: Washington Creek (04001000) Area: 3522 ha. (13.6 sq. mi.) Type: Representative
Administering organization	Name: US Geological Survey Address: Washington, D.C. 20242
Location	State: Michigan Latitude: 47°55'15" Longitude: 89°08'50"
Physiographic description	Geology: Old lava flows, sandstone, conglomerate underlie basin. Typography: NE - SW ridge-valley series, rugged highlands, swampy lowland. Elevation range, 182.8 - 426.7 m. (600 - 1400 ft.) Vegetation: Upland: maples, birch Lowland: spruce, fir Soil: Those characteristic of Superior Upland province. Climate: Average annual precipitation, 71 cm. (28"). Moderate mean temperature extremes, -9.4 - 18.9°C (15 - 66°F)
Use	Past: Forest fires prevalent Present: Isle Royale N. Park
Purpose of data collection	Benchmark station
Publications	

Data availability To whom When Form	Collected data: All individuals; upon request transcribed, published. Supporting data: (same)
Date collection initiated	Streamflow - 1964 Precipitation - 1965 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Suspended Sediment*	Minor elements*
Precipitation (C)	Dis. Solids	Pesticides*
Air Temperature (C)	Potassium	Radioactivity*
Water Temperature (C)	Sodium	
Conductance		
Dis. Oxygen		
Coliform, BOD		
pH		
Hardness		
Silica		
Phosphate		
Nitrate		
Iron		
Magnesium		
Calcium		
Carbonate		
Bicarbonate		
Sulfate		
Chloride		
Fluoride		

Remarks:

Unless noted, all data collected once per month.

*Susp. Sed., also collected during storm runoff.

*Supporting Data: 2 times per year.

WATERSHED INVENTORY FORM LS-6

Watershed identification	Name: Kawishiwi R. (05124480) Area: 65527 ha. (253 sq. mi.) Type: Representative
Administering organization	Name: US Geological Survey Address: Washington, D.C. 20242
Location	State: Minnesota Latitude: 47°55'22" Longitude: 91°32'06"
Physiographic description	Geology: Canadian Shield, gabbro, granite, greenstone Typography: Rolling with numerous lakes and swamps Vegetation: Great Lakes Pine Forest Soil: Climate: Average annual precipitation 71.1 cm. (28"). Moderate mean temperature extremes, -13.3 - 19.9°C. (8 - 68°F.)
Use	Past: Present: Superior National Forest dispersed recreation.
Purpose of data collection	Benchmark Station.
Publications	

Data availability To whom When Form	Collected data: All individuals; upon request: transcribed, published. Supporting data: (same)
Date collection initiated	Streamflow - 1966 Precipitation - 1966 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Snow water content
Water Temperature (C)	Snow depth (3 courses)
Precipitation (C)	Wind speeds
pH	Relative humidity
Hardness	Air pressure
Silica	Lake levels
Phosphate	Resource surveys
Nitrate	7 other surveillance sites
Iron	Solar radiation
Calcium	
Magnesium	
Sodium	
Potassium	
Carbonate	
Biscarbonate	
Sulfate	
Chloride	
Fluoride	
Dissolved Solids	

Remarks:

Supporting data collected by U.S. Forest Service.
Unless noted, collected data gathered one per month.

WATERSHED INVENTORY FORM LS-7

Watershed identification	Name: Kawishiwi Watershed Area: 64,752 ha. Type: Representative
Administering organization	Name: U.S. Forest Service Address: Superior National Forest Federal Bldg. Box 338 Duluth, Minnesota 55801
Location	State: **Northern** Minnesota Latitude: 47°55' Longitude: 91°30'
Physiographic description	Geology: Precambrian (south Laurentian shield) Typography: Gently rolling, relative relief = 30.5 m. (100 ft.) Vegetation: Aspen, birch, jackpine Soil: Glacial till and outwash, coarse textured, shallow Climate: Continental
Use	Past: Commercial forest Present: Portion of Boundary Waters canoe area (low intensity recreation).
Purpose of data collection	Baseline climatic and water resource data, evaluate management impacts.
Publications	None

Data availability To whom When Form	Collected data: All individuals who pay necessay reproduction costs; upon request; editted (some transcribed). Supporting data: All individuals who pay necessay reproduction costs; upon request; interpreted (maps, photos, etc.).
Date collection initiated	1966
Date collection terminated	1971

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Temperature Conductance Color pH Alkalinity Tot. Hardness Tot. Phosphorus Nitrogen forms Iron Copper Calcium Sodium Potassium Sulfate Magnesium Tot. Coliform Fecal Coliform Streamflow (C) (2 gages)	Precipitation (C) (6 gages) Radiation (C) Wind speed (C)	Aerial photos Forest Service watershed descriptive reports. Aerial photos Topographic maps General soils report State geology reports Timber type maps

Remarks:

6 water quality stations exist within the watershed fregquency of chemical-biological datata collection, 6 times per year. Data similar to that above is available from 50 nearby lakes and streams located within the Boundary Waters Canoe Area.

<u>WATERSHED INVENTORY FORM</u> LS-8

Watershed identification	Name: Big Fork River Area: 533565 ha. (2060.1 sq. mi.) Type: Representative
Administering organization	Name: Minn. Water Poll. Control Agency Address: Roseville, Minnesota
Location	State: Minnesota Latitude: 48°30'45.0" Longitude: 093°42'36.0"
Physiographic description	Geology: Typography: Vegetation: Soil: Climate:
Use	Past: Forested Present: Forest
Purpose of data collection	Baselines
Publications	None

Data availability To whom When Form	Collected data:	All individuals; upon request: transcribed (STØRET)
	Supporting data:	All individuals; upon request; published.
Date collection initiated	1971	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Temperature	Hardness	Aerial photos
Dissolved Oxygen	Biological Oxygen Demand	Topographic maps
Conductance	Chemical Oxygen Demand	Precipitation data
pH	Tot. Organic Carbon	
Alkalinity	Chloride	
Phosphorus	Sulfate	
Nitrogen	Fluoride	
Calcium	Copper	
Sodium	Cadmium	
Potassium	Nickel	
Cyanide	Zinc	
Silica	Lead	
Iron	Manganese	
Turbidity	Mercury	
Streamflow	Arsenic	
Tot. Coliform	Selenium	
Fecal Coliform	Chromium	
Tot. Solids		
Suspend Solids		

Remarks:

All data collected one per month.

WATERSHED INVENTORY FORM LS-9

Watershed identification	Name: Middle Branch Ontonagon Area: 1538.5 ha. Type: Representative
Administering organization	Name: U.S. Forest Service, Ottawa N.F. Address: 104 S. Lowell St. Ironwood, Michigan 49938
Location	State: W. Upper Peninsula Michigan Latitude: 46°14'58.8" Longitude: 89°17'40.2"
Physiographic description	Geology: Pre-Cambrian formations of Laurentian shield Typography: Gently sloping to rolling, relative relief: 9 - 15.2 m. (30 - 50 ft.) Vegetation: Old growth N. hardwoods with hemlock, aspen, paper birch. Soil: Those characteristic of kettle moraines and outwash plains. Climate: Continental with limited moderation by L. Superior
Use	Past: Private hunting and fishing preserve Present: Low intensity recreation, campsites accessed by canoe.
Purpose of data collection	Baseline water resources data
Publications	One (1): Describes watershed soils, geology, vegetation type

Data availability To whom When Form	Collected data: All individuals, upon request, transcribed (STØPET) Supporting data: All individuals paying any necessary duplication costs. Upon request, interpreted.
Date collection initiated	1969
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Water Temperature	Sulfate	Topographic maps
Streamflow (C)	Chloride	Vegetative maps
Turbidity	Manganese	Soils report
Color	Magnesium	Recreation map
Conductance	Tot. Coliform	
Dis. Oxygen	MBAS	
Alkalinity	Free Carbon Dixoide	
T. Hardness	Rainfall (C)	
T. Phosphate	Air Temp. (C)	
T. Nitrogen (N-forms)	Humidity (C)	
Iron	Solar Radiation (C)	
Copper	Barometric Pressure (C)	
Lead		
Zinc		
Aluminum		
Silica		
Colcium		
Sodium		
Potassium		

Remarks:

Continuous streamflow records during ice-free periods only.
Chemical-physical water quality data collected 12 times per year.

WATERSHED INVENTORY FORM LS-10

Watershed identification	**Name:** East Fork Chippewa River **Area:** 56,658 ha. **Type:** Representative
Administering organization	**Name:** U.S. Forest Service **Address:** Chequamegon National Forest Federal Building Park Falls, Wisconsin 54552
Location	**State:** Northern Wisconsin **Latitude:** 45°59'N **Longitude:** 90°46'W
Physiographic description	**Geology:** Igneous Precambrian rock of Laurentian shield. **Typography:** Gently to moderately rolling **Vegetation:** Northern hardwoods **Soil:** Ground moraines of the Wisconsin glacial period **Climate:** Continental
Use	**Past:** Commercial forest **Present:** Commercial forest
Purpose of data collection	Baseline flow and water quality data
Publications	None

Data availability To whom When Form	Collected data: All individuals; upon request: transcribed (STØRET) Supporting data: All individuals (some reproduction costs for certain data); upon request: interpreted.
Date collection initiated	October - 1971
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) (summer)	Weather Bureau
pH	Precipitation
Specific Conductance	Topographic maps
Temperature	Vegetation type maps
Alkalinity	Aerial photos
Color	Soils map on portions of watershed
Turbidity	
Nitrogen forms	
Calcium	
Magnesium	
Sodium	
Potassium	
Sulfate	
Iron	
Detergents (MBAS)	

Remarks:

3 watersheds having essentially the same data are located within the vicinity of the one described above. Chemical-physical water quality data is collected once per month at all 4 watersheds.

WATERSHED INVENTORY FORM LS-11

Watershed identification	Name: Allen Creek Watershed Area: 1012 ha. Type: Experimental
Administering organization	Name: U.S. Forest Service Address: Nicolet National Forest Federal Building Rhinelander, Wisconsion 54501
Location	State: N. Central Wisconsin Latitude: $45^{o}59'$ Longitude: $88^{o}47'$
Physiographic description	Geology: Laurentian shield (igneous) at depth Typography: Moderately rolling, relative relief = 23 m. (75 ft.) Vegetation: Northern Hardwoods Soil: Outwash plains with stream terraces Climate: Continental, precipitation annually = 75 - 80^{o}cm (30-32")
Use	Past: Commercial forest Present: Commercial forest, wild fowl refuge.
Purpose of data collection	To assess the impact of a lowhead impoundment on water temperature, flow, quality
Publications	None

Data availability To whom When Form	Collected data: All individuals; upon request: transcribed (STØRET) Supporting data: All persons who pay necessary reproduction costs; upon request: interpreted (publications).
Date collection initiated	June - 1969
Date collection terminated	Ongoing through November, 1976

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Temperature (C)	Aerial photos
Turbidity	Topographic map
Color	Vegetative map
Conductance	Soils report & map
Alkalinity	
Total Phosphorus	
Total Nitragen	
Nitrite Nitrate Nitrogen	
Iron	
Copper	
Streamflow(C)	
Radiation (C)	
Precipitation (C) (2 gages)	

Remarks:

All data collected May through October at 5 stations with the Allen Creek watershed.

Watershed identification	Name: Baptism River Area: 36493 ha. (140.9 sq. mi.) Type: Representative
Administering organization	Name: Minn. Water Poll. Control Agency Address: Roseville, Minnesota 55113
Location	State: Minnesota Latitude: 47°20'16.0" Longitude: 091°13'06.0"
Physiographic description	Geology: Laurentian Shield Typography: Vegetation: Soil: Climate: Continental
Use	Past: Forested Present: Forest
Purpose of data collection	Baseline monitoring
Publications	None

Data availability To whom When Form	Collected data:	All individuals; upon request: transcribed (STØRET)
	Supporting data:	All individuals; upon request· published.
Date collection initiated	1973	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Temperature	Biological Oxygen Demand	Aerial photos
Dissolved Oxygen	Chemical Oxygen Demand	Topographic maps
Conductance	Tot. Organic Carbon	Precipitation from numerous stations
pH	Chloride	
Alkalinity	Sulfate	
Phosphorus	Fluoride	
Nitrogen	Copper	
Calcium	Cadmium	
Sodium	Nickel	
Potassium	Zinic	
Turbidity	Lead	
Iron	Manganese	
Silica	Mercury	
Streamflow	Arsenic	
Tot. Coliform	Selenium	
Fecal Coliform	Chromium	
Tot. Solids		
Suspended Solids		
Hardness		

Remarks:

All data collected once per month.

Watershed identification	Name: Obrien Brook Area: 10489 ha. (40.5 sq. mi.) Type: Representative
Administering organization	Name: Minn. Water Poll. Control Agency Address: Roseville, Minnesota
Location	State: Minnesota Latitude: 47°18'35.0" Longitude: 093°10' 03.0"
Physiographic description	Geology: Typography: Vegetation: Soil: Climate:
Use	Past: Forested Present: Forest
Purpose of data collection	Baselines
Publications	None

Data availability To whom When Form	Collected data:	All individuals; upon request; transcribed (STØRET)
	Supporting data:	All individuals; upon request: published.
Date collection initiated	1958, 1974	
Date collection terminated	1965, continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Temperature	Biological Oxygen Demand	Aerial photos
Dissolved Oxygen	Chemical Oxygen Demand	Topographic maps
Conductance	Total Organic Carbon	Precipitation data
pH	Chloride	
Alkalinity	Sulfate	
Phosphorus	Fluoride	
Nitrogen	Copper	
Calcium	Cadmium	
Sodium	Nickel	
Potassium	Zinc	
Iron	Lead	
Silica	Maganese	
Turbidity	Mercury	
Streamflow	Arsenic	
Total Coliform	Selenium	
Fecal Coliform	Chromium	
Total Solids	Cyanide	
Suspended Solids		
Hardness		

Remarks:

All data collected once per month.

WATERSHED INVENTORY FORM LS-14

Watershed identification	**Name:** Brule River **Area:** 73038 ha. (282 sq. mi.) **Type:** Representative
Administering organization	**Name:** Dr. James McLaughlin **Address:** Dept. of Biology College of St. Scholastica Duluth, Minnesota 55811
Location	**State:** N.E. Minnesota **Latitude:** $47^{o}48'$ **Longitude:** $90^{o}3'$
Physiographic description	**Geology:** Keweenawan lava flow bedrock. Surficial Geology is part morains part Glacial till plain. **Typography:** Very rough due to glacial erosion lots of exposed bedrock. **Vegetation:** Mixed hardwoods and conifers **Soil:** Thin and discontinuous glacial drift. **Climate:** Continental with some modification due to Lake Superior.
Use	**Past:** Low intensity recreational use and logging. **Present:** Moderate recreational use and some pulp cutting.
Purpose of data collection	To identify baseline information in conjunction with HEW grant.
Publications	None

Data availability To whom When Form	Collected data: All individuals; upon request: final form not yet determined. Supporting data: All individuals; upon request.
Date collection initiated	August 12, 1974
Date collection terminated	Continuing until July 1, 1975

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Temperature Specific Conductance Total Phosphate Dissolved Oxygen Filterable Solids Biological Oxygen Demand Chemical Nitrates	Lake Superior Watershed Unit: Unit II of the Hydrologic Atlas of Minnesota Series

Remarks:

The ongoing collection program includes collections in August, October, November of last year and April and May of this year. I expect to take June and perhpas a July collection. Similar watershed data exists for the nearby temperance R. ($47^{o}33'$, $90^{o}52'$).

WATERSHED INVENTORY FORM SE-1

Watershed identification	Name: Coweeta Hydrologic Laboratory Area: Entire basin=1865 ha. Many (23) small,gaged Type: Experimental watersheds within the basin.
Administering organization	Name: Southeastern Forest Experiment Station Address: P.O. Box 601 Franklin, N.C. 28734
Location	State: North Carolina Latitude: 35^{0} 04' N Longitude: 83^{0} 26' W
Physiographic description	Geology: Carolina gneiss Typography: Steep, rugged, slopes from near level in valleys to >100% on slopes Vegetation: Northern hardwoods, oak-hickory, pine hardwoods, cove hardwoods Soil: Zonal, Intrazonal, Azonal Climate: Temperate, humid
Use	Past: Forested Present: Forested
Purpose of data collection	Fundamental studies of forest hydrology
Publications	Numerous publications; contact administering organization for bibliography.

Data availability To whom When Form	Collected data: Data tabulated on cards, computer printout, and data sheets. Data availability negotiable through administering organization and their cooperators.* Supporting data: Wide variety of supporting information has been collected. The information is available in a variety of forms.
Date collection initiated	1933
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Stream flow (C) Precipitation (C) Air Temperature(C) Solar Radiation (C) Suspended Sediment (P) Precipitation and stream flow chemistry including the following: ph, Potassium, Sodium, Magnesium, Calcium, Silica, Ammonium, Nitrate, Total nitrogen, Phosphate, Chloride, Sulfate (P) (Above data collated on 23 watersheds)	Soils, soil moisture, vegetation, interception, biomass, micro-climatic

Remarks:

*All data from Coweeta are available through Eastern Deciduous Forest Blome Data Bank at Oak Ridge, Tenn.

Numerous forest cover conversion experiments and land use demonstrations have been made at the Coweeta Laboratory.

WATERSHED INVENTORY FORM SE-2

Watershed identification	Name: Davidson River Watershed Area: 10,522 ha Type: Representative
Administering organization	Name: U.S. Forest Service Address: P.O. Box 2750 Asheville, N.C. 28802
Location	State: North Carolina Latitude: 35^{o} 16' 23" Longitude: 82^{o} 42' 21"
Physiographic description	Geology: Mica gneiss with whiteside granite intrusions Typography: Average slope 40%, relative relief: 644.6 - 1822.7 m (2115 to 5980 ft.) Vegetation: Hardwoods, generally oak species. Soil: Climate: Ave. annual temperature is $13.1^{o}C$ ($55.6^{o}F$) $-26.6^{o}C$ - $36^{o}C$ ($-16^{o}F$ to $97.0^{o}F$)
Use	Past: Commercial forest; logged during early 1920's Present: Commercial logging, recreation
Purpose of data collection	To establish baseline climatic and water quality data
Publications	None

Data availability To whom When Form	Collected data: All individuals Upon request Edited (climatic - field form) Supporting data: All individuals (some duplication costs may be necessary) Upon request Published maps, reports
Date collection initiated	1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Temperature (C)	Temperature	Aerial photos
Wind (C)	Turbidity	Medium intensity soil survey
Radiation (C)	Nitrate - N	Timber type maps
Barometric Pressure (C)	Ortho-phosphate	Topographic maps
Dew Point (C)	pH	Geology descriptive documents
Stream flow (C) (3 stations)	Total coliform	USGS stream flow gage at basin mouth
	Fecal coliform	
	Dissolved oxygen	

Remarks:

Water quality data collected once per month. USGS gage at mouth of watershed initiated 1920. Stage records at 3 USFS stations good, flow conversions fair.

WATERSHED INVENTORY FORM SE-3

Watershed identification	Name: Sopchoppy R. near Sopchoppy, FL (02327100) Area: 25,356 ha (97.9 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Florida Latitude: 30^{0} 07' 45" Longitude: 84^{0} 29' 40"
Physiographic description	Geology: Sandy limestone Typography: Swamps, sloughs, ponds. Elev. range: 15.2-33.5 m (50-110 ft.) Vegetation: Cypress swamps, pines, scrub oak Soil: Sandy, swampy. (Those of Coastal Plain Province) Climate: Ave. annual precip. 142 cm (56"); mo. mean temp. extremes 12.2-27.7^{0}C (54-82^{0}F)
Use	Past: Present: Apalachicola National Forest. Controlled cutting of pine
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1964 Precipitation - 1966 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Calcium	Peak streamflows - partial records
Precipitation (2 gages) (C)	Magnesium	Groundwater level (C)
Water temperature (C)	Sodium	Pesticides, 2 x/yr.
Conductance	Potassium	Radioactivity, 2 x/yr.
Temperature (C)	Bicarbonate	
Dissolved Oxygen	Carbonate	
Coliform	Sulfate	
Biological Oxygen Demand	Chloride	
pH	Fluoride	
Hardness	Nitrates	
Silica	Dissolved Solids	
Phosphate	Suspended sediment	
Iron		

Remarks:

Unless noted, all data collected once per month.
Suspended sediment also collected at peak flows.

WATERSHED INVENTORY FORM SE-4

Watershed identification	Name: Walker Branch Watershed Area: 97.5 ha Type: Experimental
Administering organization	Name: Oak Ridge National Laboratory Address: U.S. Atomic Energy Commission Oak Ridge, Tennessee
Location	State: Tennessee Latitude: 35° 58' N Longitude: 84° 17' W
Physiographic description	Geology: Knox Dolomite - a dense to coarsely crystalline dolomite Typography: Small valley-ridge Vegetation: Forest: Oak-hickory and pine-oak-hickory associations Soil: Typic palpudults Climate: Mean annual precip 138.9 cm (54.7 inches) Mean median temp 14.5°C (58.2°F).
Use	Past: Agriculture until 1942. Succession to forest since 1942. Present: Forested
Purpose of data collection	Provide data on baseline values for unpolluted natural waters.
Publications	Curlin, J.W., and D.J. Nelson, 1968. Walker Branch Watershed Project: Objectives, Facilities and Ecological Characteristics. ORNL-TM-2271, 100 pp.

Data availability To whom When Form	Collected data: All data are available through Eastern Deciduous Forest Brome Data Bank at Oak Ridge, Tenn. Data are stored on cards and tape. Supporting data:
Date collection initiated	1942
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Precipitation (C) Air Temper (C) Relative humidity (P) Precipitation and streamflow chemistry including the following: Calcium, Magnesium, Potassium, Sodium, Ammonium, Nitrate, Sulfate, Phosphate, total nitrogen, pH, Carbonate (P) Suspended Sediment (P)	Soils and vegetation info

Remarks:

WATERSHED INVENTORY FORM SE-5

Watershed identification	Name: Bear Creek Basins SF1 and SF2 Area: 48.6 ha. (120 ac.) Type: Experimental
Administering organization	Name: National Fertilizer Development Center Address: Tennessee Valley Authority Muscle Shoals, Alabama 35660
Location	State: Alabama Latitude: $34^{o}17'$ Longitude: $87^{o}46'$
Physiographic description	Geology: Highland Rim Physiographic province Typography: Ridge and valley Vegetation: Hardwood forested Soil: Varied, sandy to sandy loam and clay Climate: Temperate, 147 cm. (58 in.) annual rainfall 17^{o}C. (63^{o}F.) mean annual temperature
Use	Past: Present: Forested
Purpose of data collection	Develop baseline data and to determine effect of forest fertilization.
Publications	

Data availability To whom When Form	Collected data: All data on file with National Fertilizer Development Center, Muscle Shoals, Alabama Supporting data:
Date collection initiated	Hydromet data started in 1964, water chemistry data in 1969
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Precipitation (C) Air temp. (C) Suspended sediment (P) Stream chemistry: Total nitrogen (P) Nitrate (P) Ammonia (P) Phosphorus (P) Potassium (P) Total sulphur (P) pH (P)	

Remarks: One of the watersheds will be fertilized in May 1975 with 168 kg./ha.(150 lbs./ac.) nitrogen as urea.

WATERSHED INVENTORY FORM SE-6

Watershed identification	**Name:** **Coffeeville Experimental Watersheds** **Area:** (see remarks) **Type:** Experimental
Administering organization	**Name:** Southern Forest Experiment Station **Address:** Forest Hydrology Lab Box 947 Oxford, Mississippi 38655
Location	**State:** Mississippi **Latitude:** 34°00'N **Longitude:** 88°48'W
Physiographic description	**Geology:** Upper Gulf Coastal Plain; underlain by deep unconsolidated strata of sands and clays with remnant of loess blanket on surface. **Typography:** Hilly with slopes up to 40%; gullied. **Vegetation:** Loblolly and slash pine plantation planted 1940-41. **Soil:** Providence, Memphis, Loring on loess; Smithdale on sandy Coastal Plain material. **Climate:** Temperature--humid; 225-day frost-free period; precipitation--about 127 cm. (50 in.) of rain, little snow.
Use	**Past:** Agricultural and then abandoned after erosion. **Present:** National Forest; loblolly and slash pine for erosion control.
Purpose of data collection	To determine effects of pine plantations on hydrologic cycle; in future may use to evaluate impact of forest practices, i.e., logging, on hydrologic and nutrient cycle.
Publications	Ursic, S.J. and P.D. Duffy. 1972. Hydrologic performance of eroded lands stabilized with pine. Miss. Water Resour. Conf. Proc., p. 203-216.

Data availability To whom When Form	Collected data: Some hydrologic and nutrient data published or now being published. Other data transcribed on forms. Data being used by scientists; some may be made available through negotiation with administrating agency. Supporting data: Some soil, forest floor, and vegetation data published; additional data are tabulated.
Date collection initiated	1964
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (ephemeral) (C)	Soils information
Precipitation (C)	Vegetation information
Suspended sediment (P)	Forest floor information
Precipitation and streamflow chemistry (P)	
Including:	
Nitrate	
Ammonium	
Phosphorus	
pH	
Calcium	
Magnesium	
Potassium	

Remarks:

Area: 5 gaged watersheds, 1 to 3 ha. each.

WATERSHED INVENTORY FORM SE-7

Watershed identification	Name: Cataloochee C. (03460000) Area: 12743 ha (49.2 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: North Carolina Latitude: 35^{0} 40' 02" Longitude: 83^{0} 04' 23"
Physiographic description	Geology: Metamorphosed Sandstone and shale Typography: Mountainous Vegetation: Second growth, oaks, hickory, tulip, hemlock, spruce, balsam Soil: Those characteristic of the Blue Ridge Province Climate: Ave. annual precip. - 124.9 cm (49 in.) Mo mean temp. extremes - 3.9^{0} - 23^{0}C (39^{0} - 74^{0}F)
Use	Past: Logging and mining Present: Great Smokey Mts. N. Park
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Stream Flow - 1933 Precipitation - 1964 Wind Movement - 1964 Air Temperature - 1964 Water Temp - 1962 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Stream flow (C)	Suspended sèdiment*	Minor Elements - 2 x/yr.
Precipitation (C)	Dissolved Solids	Pesticides - 2 x/yr.
Wind (C)	Calcium	Radioactivity - 2 x/yr.
Air Temperature (C)	Sodium	
Conductance	Potassium	
Temperature	Bicarbonate	
Dissolved Oxygen	Silica	
pH	Phosphate	
Coliform, BOD	Nitrate	
Hardness	Iron	
	Magnesium	
	Carbonate	
	Sulfate	
	Chloride	
	Fluoride	

Remarks:

* Also collected during storm runoff.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SE-8

Watershed identification	**Name:** Sipsey Fork near Grayson, Alabama (02450250) **Area:** 23,646.1 ha. (91.3 sq. mi.) **Type:** Representative
Administering organization	**Name:** US Geologicial Survey **Address:** Washington, D.C. 20242
Location	**State:** Alabama **Latitude:** 34°17'07" **Longitude:** 87°23'56"
Physiographic description	**Geology:** Sandstone, shale, limestone, chert. **Typography:** Gently rolling plateaus with deeply entrench valleys. Elevation range: 167 - 320 m. (550 - 1050 ft.) **Vegetation:** Mixed pine and hardwood forest. **Soil:** Those characteristic of Appalachian highlands **Climate:** Ave. annual precipitation 132 cm. (52") Mean mo. temp. extreme 8-27°C. (44°- 80°F)
Use	**Past:** **Present:** Commercial logging within Bankhead National Forest
Purpose of data collection	Benchmark station
Publications	

Data availability To whom When Form	Collected data:	All individuals upon request transcribed, published
	Supporting data:	(same)
Date collection initiated	Streamflow - 1966 Precipitation - 1969 Water Quality - 1967	
Date collection terminated	Continuing (all above)	

Types of Data Available (P = periodic; C = continuous)

Collected Data

Streamflow (C)
Precipitation (C)
Conductance
Temperature
Dissolved Oxygen
Coliform
Biological Oxygen Demand
Suspended Sediment
Hardness
pH
Silica
Phosphate
Iron
Magnesium
Calcium
Sodium
Potassium
Bicarbonate
Carbonate
Sulfate
Chloride
Fluoride
Nitrate
Dis. Solids

Supporting Data

Groundwater levels (C)
Minor elements*
Pesticides*
Radioactivity*

Remarks: Unless continuous, all data collected once per month. Suspended sediment also collected during storm runoff.

*2 times per year

WATERSHED INVENTORY FORM SE-9

Watershed identification	Name: Kiamichi R. (07335700) Area: 10,386 ha (40.1 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Oklahoma Latitude: 34^{o} 38' 20" Longitude: 94^{o} 36' 40"
Physiographic description	Geology: Dark slaty shale, siliceous beds and dark sandstones Typography: Wide valley between parallel mtn. ridges Vegetation: Pine and hardwood forest Soil: Those characteristic of Ouachita Province Climate: Ave. annual precip. - 142 cm (56") Mo. mean temp. extremes - 6^{o} - 27^{o}C (42^{o} - 81^{o}F)
Use	Past: Present: Ouachita National Forest logging and farming
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Stream flow - 1965 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Stream flow (C)	Iron	Minor Elements - 2 x/yr.
Conductance	Bicarbonate	Pesticides - 2 x/yr.
Temperature	Silica	Radioactivity - 2 x/yr.
Dissolved Oxygen	Nitrate	
Coliform, Biological Oxygen Demand	Suspended Sediment*	
	Magnesium	
Hardness	Carbonate	
Calcium	Sulfate	
pH	Chloride	
Sodium	Fluoride	
Phosphate	Dissolved Solids	
	Potassium	

Remarks:

*Also collected during storm runoff.

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SE-10

Watershed identification	**Name:** Holiday Crk. (02038850) **Area:** 2209 ha (8.53 mi^2) **Type:** Representative
Administering organization	**Name:** U.S.G.S. **Address:** Washington, D.C. 20242
Location	**State:** Virginia **Latitude:** 37^{o} 24' 55" **Longitude:** 78^{o} 38' 10"
Physiographic description	**Geology:** Metamorphosed sedimentary rock-Kyanite schist, Kynitc quartz **Typography:** Rolling hills. **Vegetation:** Hardwood forest. **Soil:** Those characteristic of the Piedmont Province **Climate:** Ave. annual precipitation 109cm (43") mo. mean temperature extremes- 4^{o} - $26^{o}C$ (40^{o} - $78^{o}F$)
Use	**Past:** **Present:** Appomatox - Buckingham
Purpose of data collection	State Forest - Tree cutting and planting
Publications	Benchmark Station

Data availability To whom When Form	Collected data: All individuals upon request Transcribed, published Supporting data: Same
Date collection initiated	Streamflow - 1966 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Sodium	Pesticides - 2 times per year
Conductance		Radioactivity - 2 times per year
Temperature		
Dissolved Oxygen		
Coliform, Biological Oxygen Demand		
*Suspended Sediment		
pH		
Hardness		
Phosphate		
Calcium		
Magnesium		
Bicarbonate		
Potassium		
Silica		
Nitrate		
Carbonate		
Sulfate		
Fluoride		
Chloride		
Dissolved Solids		

Remarks:

*Also collected during storm runoff.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SE-11

Watershed identification	Name: Cypress Creek (02479155) Area: 13,520 ha. (52.2 sq. mi.) Type: Representative
Administering organization	Name: US Geological Survey Address: Washington, D.C. 20242
Location	State: Mississippi Latitude: 31°01'30" Longitude: 89°01'00"
Physiographic description	Geology: Sand and gravel over sand and clay Typography: Rolling .8 km. (1/2 mi.) flood plains, 518 ha. (2 sq. mi.) swamp, 33.5 - 100.6 m. (110 - 330 ft.) Vegetation: Second growth pine; some deciduous trees. Soil: Those characteristic of Coastal Plain Province. Climate: Average annual precipitation 150 cm (60 in.) Moderate mean temperature extremes 12.2 - 27.7 C (54° - 82°F.)
Use	Past: Present: 60% in Camp Shelby Military Rescruation; 40% in DeSoto National Forest.
Purpose of data collection	Logging
Publications	Benchmark station

Data availability To whom When Form	Collected data: All individuals; upon request: transcribed, published. Supporting data: (same)
Date collection initiated	Streamflow - 1966 Precipitation - 1965 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Bicarbonate	Minor elements*
Precipitation (C)	Chloride	Pesticides*
Air Temperature (C)	Suspended Sediment*	Radioactivity*
Water Temperature (C)	Dissolved Solids	
Conductance	Potassium	
Dissolved Oxygen	Sulfate	
Coliform	Fluoride	
Biological Oxygen Demand	Potassium	
Carbonate		
pH		
Hardness		
Silica		
Phosphate		
Nitrate		
Iron		
Magnesium		
Calcium		
Sodium		

Remarks:

Unless noted, all data collected once per month.

*Suspended Sediment, also collected during storm runoff.

*Supporting Data: 2 times per year.

WATERSHED INVENTORY FORM SE-12

Watershed identification	**Name:** Falling Creek nr. Juliette, Ga (02212600) **Area:** 18,700 ha (72.2 sq. mi.) **Type:** Representative
Administering organization	**Name:** USGS **Address:** Washington, D.C. 20242
Location	**State:** Georgia **Latitude:** 33^{o} 06' **Longitude:** 83^{o} 43'
Physiographic description	**Geology:** Gneiss and Schist **Typography:** Rolling hills, elev. range = 112.7 - 213.3 m (370 - 700 ft.) **Vegetation:** Second growth pines with some hardwoods **Soil:** Those characteristic of Piedmont Province **Climate:** Average annual precipitation, 111.7 cm (44 in.) Mo. mean temp. extremes-- 9.4^{o} - 27.7^{o}C (49^{o} - 82^{o}F)
Use	**Past:** **Present:** Oconee N. Forest, Piedmont
Purpose of data collection	National Wildlife Refuge
Publications	Benchmark Station

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, Published Supporting data: (Same)
Date collection initiated	Streamflow - 1964 Precipitation - 1964 W. Qual. - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Calcium	Minor elements, 2X/yr.
Precipitation (C)	Sodium	Pesticides, 2X/yr.
Water Temp. (C)	Potassium	Radioactivity, 2X/yr.
Conductance	Bicarbonate	
Dissolved Oxygen	Carbonate	
Coliform, Biological Oxygen Demand	Sulfate	
pH	Chloride	
Hardness	Fluoride	
Silica	Nitrates	
Phosphate	Dissolved Solids	
Iron	Suspended Sediment	
Magnesium		

Remarks:

Unless noted, all data collected once per month.
Suspended sediment also collected at high flow.

WATERSHED INVENTORY FORM SE-13

Watershed identification	Name: Buffalo R. (03604000) Area: 115,773 ha (447 sq. mi.) Type: Representative
Administering organization	Name: USGS Address: Washington, D.C. 20242
Location	State: Tennessee Latitude: 35° 29' 45" Longitude: 87° 49' 58"
Physiographic description	Geology: Primarily chert, some limestone, shale, and sandstone Typography: Alluvial valley with moderately steep valley slopes Vegetation: 30% scrub hardwoods pine and cedar Soil: Those characteristic of Interior Low Plateaus Province Climate: Ave. annual precipitation - 132 cm (52 in.) Monthly mean temp. extremes-- 4° - 25°C (40° - 77°F)
Use	Past: Present: Towns of Waynesboro and Hohenwald
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, Published Supporting data: Same
Date collection initiated	Streamflow - 1920 Precipitation - 1940 Air Temperature - 1885 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Fluoride	Minor Elements - 2 times@
Precipitation (C)	Dissolved Solids	Pesticides - 2 times@
Air Temperature (C)	Potassium	Radioactivity - 2 times@
Conductance	Sodium	
Dissolved Oxygen		
Coliform, Biological Oxygen Demand		
Calcium		
Bicarbonate		
pH		
Suspended Sediment*		
Hardness		
Silica		
Phosphate		
Nitrate		
Iron		
Magnesium		
Carbonate		
Sulfate		
Chloride		

Remarks:

*Also collected during storm runoff.
Unless noted, all data collected once per month.
@Per year.

Watershed identification	Name: Little River (03497300) Area: 27,454 ha (106 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Tennessee Latitude: 35^{o} 39' 52" Longitude: 83^{o} 42' 41"
Physiographic description	Geology: Metamorphosed shale, siltstone, sandstone, conglomerate Typography: Mountainous Vegetation: Mixed hardwoods Soil: Those characteristic of the Blue Ridge Province Climate: Ave. annual precip - 147.3 cm (58 inches) Mo. mean temp. extremes-- 4^{o} - 23^{o}C (39^{o} - 74^{o}F).
Use	Past: Present: Great Smokey Mts. National Park
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1963 Temperature - 1963 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Bicarbonate	Minor Elements - 2 x/yr.
Soil and Water Temperature (C)	Phosphate	Pesticides - 2 x/yr.
Conductance	Silica	Radioactivity - 2 x/yr.
Dissolved Oxygen	Nitrate	
Coliform, Biological Oxygen Demand	Carbonate	
Suspended Sediment*	Sulfate	
Calcium	Chloride	
pH	Fluoride	
Hardness	Dissolved Solids	
Iron	Potassium	
	Sodium	

Remarks:
* Also collected during storm runoff.

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SE-15

Watershed identification	Name: N. Sylamore Creek nr. Fifty-Six, Ark. (07060710) Area: 15,125 ha (58.4 sq. mi.) Type: Representative
Administering organization	Name: USGS Address: Washington, D.C. 20242
Location	State: Arkansas Latitude: 35^{0} 59' 30" Longitude: 92^{0} 12' 50"
Physiographic description	Geology: Mostly limestone with some sandstone Typography: Rugged rolling hills. Elev range: 137-426 m (450-1400 ft.) Vegetation: Deciduous forest Soil: Those characteristic of Ozark Plateaus, Interior Highland Climate: Ave. annual precip: 114 cm (45 in.) Mo. mean temp. extremes-- 3^{0} - 48^{0}C (38^{0} - 80^{0}F)
Use	Past: Present: Selective cutting within Ozark National Forest. Recreation areas also developing.
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published
	Supporting data: (Same)
Date collection initiated	Streamflow - 1965 Precipitation - 1968 W. Qual. - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Magnesium	Minor elements, 2X/yr.
Precipitation (C)	Calcium	Pesticides, 2X/yr.
Conductance	Sodium	Radioactivity, 2X/yr.
Temperature	Potassium	
Dissolved Oxygen	Bicarbonate	
Coliform	Carbonate	
Biological Oxygen Demand	Sulfate	
	Chloride	
Hardness	Fluoride	
pH	Nitrate	
Silica	Dissolved Solids	
Phosphate	Suspended Sediment	
Iron		

Remarks:

Unless noted, all data collected once per month.
Suspended sediment collected during high flow, also.

WATERSHED INVENTORY FORM SE-16

Watershed identification	Name: Big Creek (07373000) Area: 13209 ha. (51 sq. mi.) Type: Representative
Administering organization	Name: US Geological Survey Address: Washington, D.C. 20242
Location	State: Louisiana Latitude: 31°32'10" Longitude: 92°24'30"
Physiographic description	Geology: Sand and gravel over sand and clay. Typography: Rolling hills; elevation range of basin 28.7 - 88.1 m. (78 - 289 ft.) Vegetation: Second growth pine Soil: Unconsolidated sand, gravel Climate: Average annual precipitation, 142 cm. Moderate mean temp. extremes, 5°- 27.7°C. (41°- 82°F)
Use	Past: Present: Kisatchie N. Forest, logging, stockponds, gravel pits.
Purpose of data collection	Benchmark station.
Publications	

Data availability To whom When Form	Collected data: All individuals, upon request, transcribed, published. Supporting data: (same)
Date collection initiated	Streamflow, 1942 Precipitation, 1964 Water Quality, 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Fluoride	Minor Elements*
Precip. (2 gages) (C)	Dis. Solids	Pesticides*
Water Temperature (C)	Susp. Sediment*	Radioactivity*
Conductance	Nitrates	
D. Oxygen		
Coliform, BOD		
pH		
Hardness		
Silica		
Phosphate		
Iron		
Calcium		
Magnesium		
Potassium		
Sodium		
Bicarbonate		
Carbonate		
Sulfate		
Chloride		

Remarks: Unless noted, all data collected once per month.

*Susp. Sediment, also collected at peak runoff.

*Supporting Data: 2 times per year.

WATERSHED INVENTORY FORM SE-17

Watershed identification	Name: South Fork Rocky Creek (08103900) Area: 885.8 ha (34.2 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Texas Latitude: 30° 54' 40" Longitude: 98° 02' 10"
Physiographic description	Geology: Limestone, marl, black clay soil Typography: Rough. Flat ridges, sloping canyon walls. Vegetation: 80% grass cover. 20% oak, elm, hackberry, willow, sycamore Soil: Those characteristic of the Great Plains Province Climate: Ave. annual precip. - 76 cm (30 inches) Mo. mean temp. extremes-- 9° - 29°C (48° - 84°F).
Use	Past: Present: Farms and ranches
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1963 Precipitation - 1963 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Iron	Minor Elements - 2 x/yr.
Precipitation (C)	Magnesium	Pesticides - 2 x/yr.
Conductance	Carbonate	Radioactivity - 2 x/yr.
Suspended Sediment*	Sulfate	
Calcium	Chloride	
Bicarbonate	Fluoride	
pH	Dissolved Solids	
Hardness	Potassium	
Phosphate	Sodium	
Nitrate		

Remarks:

* Also collected during storm runoff.

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SE-18

Watershed identification	Name: Blue Beaver C. (07311200) Area: 6371 ha (24.6 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Oklahoma Latitude: 34^{o} 37' 24" Longitude: 98^{o} 33' 48"
Physiographic description	Geology: Granite, Gabbro, Rhyolite Typography: Low granite mountains; narrow valleys Vegetation: Native grass, scattered blackjack, and post oak Soil: Those characteristic of the Central Lowland Province Climate: Ave. annual precip. - 7.36 cm (29 in.) Mo. mean temp. extremes-- 4^{o} - 29^{o}C (40^{o} - 84^{o}F)
Use	Past: Present: Wichita Mtn. Wildlife Refuge and Fort Sill Military Reservation - artillery practice
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Stream Flow - 1964 Water Quality - 1967
Date collection terminated	

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Stream flow (C)	Nitrate	
Calcium	Iron	
Sodium	Magnesium	
Bicarbonate	Carbonate	
Sulfate	Chloride	
pH	Fluoride	
Hardness	Dissolved Solids	
Silica	Potassium	
Phosphate		

Remarks:

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SE-19

Watershed identification	Name: Tallulah R. nr. Clayton, Ga. (02178400) Area: 14,633 ha (56.5 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Georgia Latitude: 34° 53' 25" Longitude: 83° 31' 50"
Physiographic description	Geology: Gneiss, Schist Typography: Rugged terrain, elevation range - (1880-5500 ft.) 573-1676 m Vegetation: White pine, hardwood, laurel. Soil: Those characteristic of the Blue Ridge Province. Climate: Average annual precipitation, 172.7 cm (68 in.). Mo mean. temp. extremes, 5.5° - 23.3°C (42° - 74° F)
Use	Past: Present: Chattahoochee and Nantahala National Forests
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals On request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1964 Precipitation - 1964 Water Quality - 1967
Date collection terminated	Ongoing except most Water Quality 1968.

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	
Precipitation (C)	
Water Temperature (C)*	
pH	
Hardness	
Silica	
Phosphate	
Iron	
Magnesium	
Calcium	
Sodium	
Potassium	
Bicarbonate	
Carbonate	
Sulfate	
Chloride	
Fluoride	
Nitrates	
Dissolved Solids	

Remarks:

* Water temperature ongoing to present

Unless noted, data collected once per month.

WATERSHED INVENTORY FORM SE-20

Watershed identification	Name: White Hollow Basin Area: 694 ha Type: Experimental
Administering organization	Name: Tennessee Valley Authority Address: Water Control Planning Hydraulic Data Branch Knoxville, Tenn.
Location	State: Tennessee Latitude: 35^{0} 24' N Longitude: 84^{0} 04' W
Physiographic description	Geology: Blue Ridge Physiographic Province Typography: Mountainous Vegetation: Forested Soil: Stoney - silt, clay loams Climate: Moderate, 190.5 cm (75 inches)/year annual precip., 12^{0}C (54^{0}F) mean annual temp.
Use	Past: Some agriculture prior to 1935. Reforestation since 1935. Present: Forested
Purpose of data collection	Evaluate effects of reforestation on hydrologic cycle and sedimentation.
Publications	TVA, Forest cover improvement influences upon hydrologic characteristics of White Hallow Watershed. Report No. 0-5163A. Knoxville, Tenn.

Data availability To whom When Form	Collected data: Available on data sheets through TVA Hydraulic Data Branch. Supporting data:
Date collection initiated	1935
Date collection terminated	1972

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Precipitation (C) Air Temperature (C) Relative humidity (C) Suspended sediment (P)	Vegetation and soil information

Remarks:

This watershed provides an opportunity to model the change in sediment yield during conversion of land use from agriculture to forest.

WATERSHED INVENTORY FORM SE-21

Watershed identification	Name: Oxford Experimental Watersheds Area: 18 ha (36 ac) see remarks Type: Experimental
Administering organization	Name: Southern Forest Experiment Station Address: Forest Hydrology Laboratory Box 947 Oxford, MS 38655
Location	State: Mississippi Latitude: 34^0 26' N Longitude: 89^0 29' W Point central among groups
Physiographic description	Geology: Upper Gulf Coastal Plain; underlain by deep unconsolidated strata of clays and snads with remnant of a loess blanket on surface Typography: Hilly slopes up to 40% Vegetation: See Remarks Soil: Lexington, Providence. Loring series developed in loess; Ruston, Smithdale and Ora in Coastal Plain materials; fragipan restricts drainage in some soils Climate: Temperate, humid, 134.6cm (53") annual precipitation: snowfall of no consequence; 224-days frost-free period
Use	Past : See Remarks Present: See Remarks
Purpose of data collection	To determine effects of several vegetative cover types and changes in cover on stromflow and sediment production
Publications	Numerous publications. Write to administering organization for bibiography.

Data availability To whom When Form	Collected data: Considerable data on stromflow sediment yields already published additional data tabulated. Some data may be available through negotiations with administering unit. Supporting data: Data on soils, soil moisture, forest floor, and vegetation tabulated.
Date collection initiated	1957 (See Remarks)
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soil information
Sediment (P)	Soil moisture information
Precipitation (C)	Forest floor information
	Vegetation information

Remarks

Group title	No. Used	Size	Coll. initia.	Past use
Pine Plantations	3	About 1.2 ha. each	1958	Agriculture abandoned planted to pine about 1938
Mature pine-hardwoods	3	1-2 ha each	1959	Grazing
Old field	3	1-1.5 ha each	1957	Agriculture abandoned
Depleted upland hardwoods	3	1-1.5 ha each	1957	Grazed burned sheet eroded

WATERSHED INVENTORY FORM

Watershed identification	Name: Oxford Experimental Watersheds Area: Type:
Administering organization	Name: Address:
Location	State: Latitude: Longitude:
Physiographic description	Geology: Typography: Vegetation: Soil: Climate:
Use	Past: Present:
Purpose of data collection	
Publications	

Data availability To whom When Form	Collected data: Supporting data:
Date collection initiated	
Date collection terminated	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data

Remarks:

Present use
vegetation & treatment

Pole-size loblolly pine plantation on on National Forest; no treatment

Mature shortleag pine-hardwood, National Forest; not treated

Was old field when gaging started; old field converted to loblolly pine by burning and planting pine; long-term objective to determine hydrologic effect of conversion: short-term, effect of fire.

Hardwood over when gaging began; later burned and hardwoods deadened;

objectives--determine effects of conversion and long-term influence of pine on runoff and sediment yield.

WATERSHED INVENTORY FORM SE-22

Watershed identification	Name: Citico Creek Watershed Area: 1823 ha. Type: Experimental
Administering organization	Name: Tennessee Valley Authority Address: Knoxville, Tenn. and U.S. Forest Service Cherokee National Forest
Location	State: Tennessee Latitude: 35° 24' N Longitude: 84° 04' W
Physiographic description	Geology: Blue Ridge Physiographic Province Typography: Mountainous Slopes from 30 to 90% Vegetation: Forested Hardwoods and hemlock Soil: Stony - silt, clay loams, complete survey available Climate: Moderate, 190.5 cm (75 inches) mean annual precipitation, 12°C (54°F) mean annual temperature
Use	Past: Logged between 1920-25. Burned over in 1925. Present: Forested and under management by U.S. Forest Service
Purpose of data collection	Determine effects of high-standard national forest multiple-use management upon hydrology and stream biology.
Publications	Tennessee Valley Authority and U.S. Forest Service. 1972. North Fork Citico Creek Watershed Study: Project Summary Report - 1960 to 1971 and Report for Water Years 1970 and 1971. 34 pp. and Appendix TVA Hydrolic Data Branch. Knoxville.

Data availability To whom When Form	Collected data: All information is available on summary data sheets filed at TVA offices in Knoxville Supporting data: Timber stand information available through USFS Regional Forester in Atlanta
Date collection initiated	October, 1969
Date collection terminated	September, 1961

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Microscopic plant life
Precipitation (C)	Bottom dwelling fauna
Air Temperature (C)	Fish life
Relative humidity (C)	Forest inventory
Water Temperature (C)	
Suspended Sediment (P)	
Dissolved solids, pH, color, specific conductance taken sporadically	

Remarks:

Considerable information available in sedimintation as affected by forest regrowth and logging.

WATERSHED INVENTORY FORM SE-23

Watershed identification	Name: Cossatot R. nr Vandervoort, Ark. (07340300) Area: 23154 ha (89.4 sq. mi.) Type: Representative
Administering organization	Name: USGS Address: Washington, D.C. 20242
Location	State: Arkansas Latitude: 34° 22' 46" Longitude: 94° 15' 08"
Physiographic description	Geology: Shale with compacted sandstone Typography: Lower basin - hilly with narrow valleys; Upper basin - E-W ridges. Vegetation: Mixed conifers and deciduous forest, mod. thick undergrowth. Soil: Those characteristic of Ouachita prov. of Interior highlands Climate: Ave. annual precip - 132 cm (52") Mean Mo. Temp. Extremes 5.5-27°C (42-81°F)
Use	Past: Present: Commercial forest within Ouachita Nat. Forest
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow 1967 W. Qual. 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Carbonate	
Hardness	Sulfate	
pH	Chloride	
Silica	Fluoride	
Phosphate	Nitrate	
Iron	Dissolved Solids	
Magnesium		
Calcium		
Potassium		
Bicarbonate		

Remarks:

Unless noted, data collected once per month.

WATERSHED INVENTORY FORM SE-24

Watershed identification	Name: Upper Bear Creek Basins Area: 12 watersheds from 54.4 to 37,037 hectares Type: Experimental
Administering organization	Name: Tennessee Valley Authority Address: Division of Water Control Planning Hydraulic Data Branch Knoxville, Tenn.
Location	State: Tennessee Latitude: 34^{0} 17' N Longitude: 87^{0} 46' W
Physiographic description	Geology: Highland Rim physiographic Province Typography: Ridge and valley Vegetation: Varied, forested to mostly agriculture Soil: Sandy to sandy loam and clay Climate: Temperate, 147 cm (58 inches) annual average rainfall
Use	Past: Agriculture and forest Present: Same
Purpose of data collection	Obtain data on soil-water-cover relationships
Publications	

Data availability To whom When Form	Collected data: Available on data sheets from TVA in Knoxville Supporting data:
Date collection initiated	1962
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Vegetation
Precipitation (C)	Soils
Suspended Sediment (P)	

Remarks:

Mathematical models have been developed for Upper Bear Creek Basin. Models predict storm hydrographs and monthly water yield.

WATERSHED INVENTORY FORM SE-25

Watershed identification	Name: Limpia Creek Area: 13,572 ha (52.4 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Texas Latitude: 30^{o} 36' 55" Longitude: 104^{o} 00' 10"
Physiographic description	Geology: Volcanic rocks -- andesites and basalts Typography: Mountainous Vegetation: Cottonwood, willow, saltceop oak, hackberry -- cactus, weeds, and native grasses Soil: Those characteristic of Basin and Range Province Climate: Ave. annual precip-- 48.2 - 60.9 cm (19 - 24 inches). Mo. mean temp. extremes-- 3^{o} - $23^{o}C$ (37^{o} - $73^{o}F$).
Use	Past: Present:
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1965 Precipitation - 1965 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Iron	
Precipitation (C)	Magnesium	
Calcium	Carbonate	
Bicarbonate	Sulfate	
pH	Chloride	
Hardness	Fluoride	
Silica	Dissolved Solids	
Phosphate	Potassium	
Nitrate	Sodium	

Remarks:

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SE-26

Watershed identification	Name: Boston Mountain Watersheds Area: 37.8 ha (93.5 acres) 4 gaged watersheds, 5.9 to 13.4 ha (14.6 to 33.2 acres) Type: Experimental
Administering organization	Name: Southern Forest Experiment Station Address: 830 Fairview Street Fayetteville, Arkansas 72701
Location	State: Arkansas Latitude: 35° 45' N Longitude: 93° 45' W
Physiographic description	Geology: Pennsylvanian sandstone - sedimentary Typography: Steep, rugged Vegetation: Hardwood forest Soil: Well drained podzolic soils developed from sandstone. Climate: Temperate, moderately humid, annual precipitation is about 127 cm (50 inches)
Use	Past: Forest products, recreation, including hiking and hunting Present: Same
Purpose of data collection	Determine hydrologic characteristics associated with vegetative changes as well as treatment effects on growth and water quality.
Publications	None

Data availability To whom When Form	Collected data: Hydrologic, meteorologic, i.e., water quality and nutrient data are summarized in reports and on data sheets. Data are available through negotiation with administering unit. Supporting data: Data on topography, soils and vegetation has or will be collected.
Date collection initiated	1972
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Precipitation (C) Air temperature (C) Relative humidity (C) Streamflow chemistry (1973 - present) including Calcium, pH, Magnesium, Manganese, Iron, Phosphorus, Potassium, Nitrate, Sodium, Chloride, Chemical Oxygen Demand, Total Dissolved Solids, Nitrogen	Soils information Vegetation

Remarks:

These watersheds are being calibrated for subsequent treatments. The effects of treatments on vegetative succession, water quality, water yield, nutrients and growth of residual vegetation will be evaluated.

WATERSHED INVENTORY FORM SE-27

Watershed identification	Name: Alum Creek Watersheds Area: 15 ha (37 acres, 4 gaged watersheds) .6 to 13 ha (1.5 to 13 ha) Type: Experimental
Administering organization	Name: Southern Forest Experiment Station Address: 830 Fairview Street Fayetteville, Arkansas 72701
Location	State: Arkansas Latitude: 34^{o} 48' N Longitude: 93^{o} 2' W
Physiographic description	Geology: Uplifted sedimentary rocks of Cambrian to Pennsylvania age Typography: Moderately steep and rugged Vegetation: Pine-hardwood forest Soil: Well drained podzolic soils derived from uplifted sandstone and shale Climate: Temperate, moderately humid, about 127 cm (50 inches) annual rainfall
Use	Past: Forest products, recreation, such as hunting and hiking, light grazing Present: Same, except no grazing.
Purpose of data collection	Determine the effects of vegetative changes on hydrologic characteristics, including nutrients and sediment.
Publications	Several publications. Write to administering organization.

Data availability To whom When Form	Collected data: Hydrologic, meteorologic, water quality and nutrient data are summarized on reports, data sheets or computer cards. Data are available through negotiation with administering organization. Supporting data: Data on vegetation, soils and topography have been collected.
Date collection initiated	1961
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Precipitation (C) Air temperature (C) Suspended sediment (C) Relative humidity (C) Streamflow chemistry, including Calcium, pH, Magnesium, Maganese, Iron, Phosphorus, Nitrate, Sodium, Chloride, Chemical Oxygen Demand, Total Dissolved Solids, Nitrogen (P) (1973 - present)	Soils information Vegetation Soil moisture (1967 - present) Tree growth

Remarks:

Two of the three smaller watersheds have received experimental treatments. One received a complete understory removal plus reducing the pine overstory to 5.75 sq. meters (62 sq. ft.) basal area.

Watershed identification	Name: Koen Watersheds Area: 23.3 ha, 57.5 acres, 5 gauged watersheds, 4.2 to 23.7 acres, 1.7, 9.6 ha Type: Experimental
Administering organization	Name: Southern Forest Experiment Station Address: 830 Fairview Street Fayetteville, Arkansas 72701
Location	State: Arkansas Latitude: 36° 5' N Longitude: 93° 5' W
Physiographic description	Geology: Pennsylvania cherty limestone and sandstone. Typography: Moderately steep and rugged. Vegetation: Hardwood forest. Scattered pine on one watershed. Soil: Well drained podzolic soils from sandstone and limestone. Climate: Temperate, moderately humid, annual rainfall about 144 cm (45 inches).
Use	Past: Forest products, hunting. Present: Same.
Purpose of data collection	Determine effects of forest treatments on hydrologic characteristics.
Publications	None.

Data availability To whom When Form	Collected data: Hydrologic, meteorologic, water quality data are summarized in reports, on data sheets or on computer card. Supporting data: Data on vegetation, soils, and topography.
Date collection initiated	1964
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Vegetation
Precipitation (C)	Soils information
Air temperature (C)	Soil moisture (1969 -)
Suspended sediment (P)	
Relative humidity (C)	
Pan evaporation (P)	
Solar radiation (C)	
Streamflow chemistry (1973 - present) calcium, pH, magnesium, manganese, iron, phosphorus, potassium, nitrate, sodium, chlorine, chemical oxygen demand, total dissolved solids, nitrogen (P)	

Remarks:

These watersheds are under calibration. Plans are to treattwo of the three smaller watersheds, 1.7-2.4 HA (4.2 - 5.9 ac.) and possibly one larger on this year.

WATERSHED INVENTORY FORM SE-29

Watershed identification	Name: Pine Tree Branch Area: 35.6 ha Type: Experimental
Administering organization	Name: Tennessee Valley Authority Address: Division of Water Control Planning Hydraulic Data Branch Knoxville, Tenn.
Location	State: Tennessee Latitude: 35^{o} 40' N Longitude: 88^{o} 21' W
Physiographic description	Geology: Ripley Formation of sandy, unconsolidated material Typography: Small valley-ridge Vegetation: Forested until recent experimental treatment Soil: Unconsolidated sand and light sandy clay Climate: Temperate, 127 cm (50 inches) mean annual precip. Mean annual temp = 16^{o}C (60^{o}F).
Use	Past: Complete cultivation prior to 1941. Land treatment and reforestation started in 1941. Present: Clearcut for research purposes.
Purpose of data collection	Evaluation of erosion control measures.
Publications	TVA, 1941-1960, Reforestation and erosion control influences on the hydrology of the Pine Tree Branch Watershed: Knoxville, Tenn.

Data availability To whom When Form	Collected data: Available on data sheets through TVA Hydraulic Data Branch, Knoxville, Tenn. Supporting data: Same
Date collection initiated	1941
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Precipitation (C) Air temperature (C) Relative humidity (C) Suspended sediment (P) Nutrient ions in streamwater (P)	Vegetation and soil information Effectiveness of erosion control measures

Remarks:

After a period of reforestation from 1941-1974, this watershed was clearcut and replanted. A fertilization is anticipated within the next 2-3 years.

WATERSHED INVENTORY FORM

Watershed identification	Name: B.F. Grant Memorial Forest, WS #14 & 15 Area: WS #14 - 31 ha (77 acres) WS #15 - 42 ha (105 acres) Type: Experimental
Administering organization	Name: School of Forest Resources Address: University of Georgia Athens, Georgia 30602
Location	State: Georgia Latitude: $33^{o}25'$ Longitude: $83^{o}25'$
Physiographic description	Geology: Granite, granite gneiss and schist bedrock, deeply weathered mantle (greater than 8 m) Typography: Piedmont plateau, gullied channels but stabilized Vegetation: Loblolly pine with intermixed hardwood Soil: Cecil, Davidson, Vance and Wilkes series Climate: average rainfall 120 cm (48"), evenly distributed, temperate, humid, warm
Use	Past: Cotton and pasture until 1930's, gullied, pine timber production (unevenage mgt.) and managed hunting. Present: Pine and hunting management (even aged)
Purpose of data collection	To develop an erosion and sediment yield model for harvesting and site preparation activities in intensively managed pine stands of the southeastern piedmont; to determine impacts of these activities on dissolved mineral export from a basin; and to determine changes in seasonal water yield and stormflow production under clearcutting.
Publications	None to date.

Data availability To whom When Form	Collected data: Edited and transcribed to standard forms or computer cards. Summarized data will be available in the project completion report, full data on reasonable requrest after publication. Supporting data: Vegetation data will be updated as the project continues.
Date collection initiated	Spring 1973
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soil
Precipiation (C)	Vegetation
Water temperature (C)	Topography
Baseflow and stormflow chemistry including dissolved Ca, Na, K, Mg, NO_3 and P, pH, conductivity (P)	Channel dynamics
Sediment delivery from selected sub-basins to main stream channel (C)	Source areas
	Specific management activities (measurement, description, photographs)

Remarks: Timber on Watershed #14 was harvested October 1974 to March 1975 and the first stage of site preparation was completed April 1975. The watershed will be planted to loblolly pine late fall 1975.

WATERSHED INVENTORY FORM

Watershed identification	Name: Whitehall Watershed Area: 23.8 ha (59.60 ac) Type: Experimental
Administering organization	Name: School of Forest Resources Address: University of Georgia Athens, Georgia 30602
Location	State: Georgia Latitude: 33°53' N Longitude: 83°22' W
Physiographic description	Geology: Mica schist and gneiss, saprolite, weathered mantle from 0 to 40 m (0 to 100 ft.) deep Typography: Rolling interfluxes, dissected piedmont Vegetation: Mixed forest of various ages (old field loblolly, oak-hickory, 10 percent open) Soil: Deeply weathered Madison and Pacolet, shallow Louisburg Climate: Warm, temperate, humid (120 cm/yr, evenly distributed rainfall
Use	Past: Cotton farming of interfluxes, to exhaustion, abandoned in 1920's Present: Experimental forest plots, genetics arboretum over 15 percent of basin, no fertilization
Purpose of data collection	Baseline water quality and streamflow studies-
Publications	A number of graduate theses. Several staff papers on soil water and streamflow generation.

Data availability To whom When Form	Collected data: Basic data on precipitation, streamflow, soil moisture, temperature, and humidity are available on request, cost of reproduction to be borne by requestor. Supporting data: All information available upon reasonable and specific request.
Date collection initiated	1966
Date collection terminated	1974

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C) Streamflow (C) Temperature air (C) stream (P) Humidity (rel) (C) Soil moisture to 8 m (20 ft.) (P) Precip. and stream chemistry (Cl, Na, Ca, Mg, K. PO_4, NO_3, pH, conductivity) (P)	Thorough soil, geologic, topographic, channel-morphologic information. Sufficient information on vegetation and general ecology.

Remarks: This is perhaps the most thorough set of hydrologic data on southeast Piedmont forested (90 percent) basins at this time.

WATERSHED INVENTORY FORM NR-1

Watershed identification	Name: Silver Creek Study Area Area: 891 ha. Type: Experimental
Administering organization	Name: Intermountain Forest & Range Experiment Sta. Address: 316 E. Myrtle Street Boise, Idaho 83706
Location	State: Idaho Latitude: 44°22' Longitude: 115°45'
Physiographic description	Geology: Coarse quarz monzonite Typography: Steep moderately dissected slopes. Vegetation: Douglas Fir; Ponderosa Pine forest. Soil: Coarse sandy loams and loamy coarse sands. Climate: Pacific Northwest Maritime with inflows of Gulf Coast Air masses during summer and fall.
Use	Past: Light recreational use with domestic grazing during summer. Present: Research for evaluation of environmental effects of logging.
Purpose of data collection	To research various methods and types of logging and the total effect upon the individual and collective watersheds.
Publications	1. Sedimentation in Relation to Logging Activities in the Mountains of Central Idaho

Data availability To whom When Form	Collected data: All individuals on request: research papers. Supporting data: Research papers to be published.
Date collection initiated	One Watershed in 1960 and one in 1963; 5 more watersheds in July to September 1964.
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data

Nitrates (P)
Phosphates (P)
Suspended Sediment (P)
Precipitation (C)
Discharge (C)
Sulfate (P)
Sodium (P)
Potassim (P)
Calcium (P)
Magnesium (P)
Iron (P)
Aluminum (P)
Silicon (P)
Water Temperature (C)
Total Alkalinity (P)
Electrical Conductivity (P)
Dissolved Oxygen (P)
Total Sediment (P)

Total Sediment (P)
Suspended Sediment (P)
Bedload Sediment (P)
Sediment trapped in debris basins (C)

Supporting Data

Soils inventory
Vegetative inventory (habitat typing)
Detailed topographic map

Remarks:

There are seven individual watersheds.

WATERSHED INVENTORY FORM NR-2

Watershed identification	Name: Horse Creek Area: 4356.3 ha. Type: Part of Meadow Creek Barometer
Administering organization	Name: Watershed, USDA Nez Perce Forest Address: Grangeville, Idaho
Location	State: Idaho Latitude: 46^{0} 0' Longitude: 115^{0} 20'
Physiographic description	Geology: Idaho Batholith Typography: Steep convex with lower side slopes in excess of 60%, commons Vegetation: Grand fir - abies grandif Soil: Loessial silt loam Climate: Western Rocky Mountain; average 121.9cm (48") annual precipitation with 60-70% as snow.
Use	Past: None Present: Low intensity hunting Horse Creek
Purpose of data collection	Administration Research Project. Joint R-1/INT Barometer Watershed Project to measure management impacts on soil and water.
Publications	Meadow Creek Barometer watershed annual report published yearly since WY 1964.

Data availability To whom When Form	Collected data: All Forests - Region 1. All others upon request. Supporting data: All individuals upon request.
Date collection initiated	October 1965 2 main waterhseds October 1973 4 subwatersheds October 1974 Subwatersheds.
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data

Physical
Discharge (C)
Bedload sediment (C)
Water Temperature (C)
Turbidity (P)
Filterable solids (P)

Climate
Precipitation (C)
Wind Speed (C)
Air Temperature (C)
Humidity (C)
Snow Depth (P)
Snow Water equivalent (P)

Chemical
pH (P)
Electrical Conductivity (P)
Bicarbonate (P)
Sulfate (P)
Chloride (P)
Nitrate (P)
Sodium (P)
Potassium (P)
Magnesium (P)
Calcium (P)

Supporting Data

Soil Inventory
Geologic mapping
Landform Typing
Stream Channel Survey

REMARKS: Pre-management monitoring until June '77-(78)
Timber Sale Road Construction - June-Sept. 77(78)
Monitor-Sept. 77(78) to June 79(80)
Logging - June 79(80) to Sept. 80(81)
Monitor Indefinite

WATERSHED INVENTORY FORM NR-3

Watershed identification	Name: Stratton Sagebrush Hydrology Study Area Area: 237.6 ha. Sane Cr., 663 ha. Loco Cr. Type: Experimental
Administering organization	Name: Rocky Mountain Forest & Range Experiment Sta. Address: University Station, Box 3313 Laramie, Wyoming 82070
Location	State: Wyoming Latitude: 41^{0} 26' Longitude: 107^{0} 06'
Physiographic description	Geology: Sandstone derived soils from the Brown's Park Formation, a sedimentary formation. Typography: Rolling with moderate slopes Vegetation: Mountain big sagebrush and Wyoming big sagebrush with bunchgrass understory. Soil: Loam and sandy loams. Climate: Typical of Great Basin; 66% of annual precipitation 50.8 cm (20 in.) received in winter as snow. Summers are dry. Snow relocated by winter winds that average 24 m.p.k. (15 m.p.h.)
Use	Past: Grazing land primarily for sheep Present: Same as past use.
Purpose of data collection	Evaluate hydrologic effects of land management practices for big sagebrush vegetation. The effect of sagebrush control using 2,4-D will be the first land management practice tested.
Publications	1. "Hydrologic relations on undisturbed and converted big sagebrush lands: The status of our knowledge." 2. "Soil moisture response to spraying big sagebrush the year of treatment." 3. "Sediment transport from big sagebrush watersheds." 4. "Oversnow runoff events affect streamflow regime and water quality." 5. "An enclosed weir for small streams in snow country."

Data availability To whom When Form	Collected data: All individuals within 6 months. Some data are tabulated by hand on summary forms and other data are summarized on computer print-out sheets. Requester would have to pay reproduction costs if data not reduced in manner requested. Supporting data: All individuals paying reproduction costs.
Date collection initiated	January, 1968, but not all data collections were initiated on this date.
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow volume (C)	Soils inventory
Water temperature (C)	
Suspended sediment (P)	
Bedload sediment deposition (P)	
Precipitation (C)	
Solar radiation (C)	
Wind direction & velocity (C)	
Air temperature (C)	
Snow accumulation index transects (P)	
Herbaceous production (P)	
Ground cover (P)	
Soil moisture index points (P)	

Remarks:

The Stratton Sagebrush Hydrology study is a cooperative study with the Bureau of Land Management, U.S. Department of the Interior and will continue indefinitely. Evaluation of the hydrologic effect of big sagebrush control will require the study to operate through 1981. U.S. Fish and Wildlife Biologists are gathering information about small and large mammal populations, song and game bird populations, aquatic insects and aquatic non-vascular plants as well as some chemical properties of stream water.

WATERSHED INVENTORY FORM NR-4

Watershed identification	Name: Upper Salmon River Area: 466,200 ha. Type: Representative
Administering organization	Name: Sawtooth National Forest Address: 1525 Addison Avenue East Twin Falls, Idaho 83301
Location	State: Idaho Latitude: 43^{0} 30' - 44^{0} 30' Longitude: 114^{0} 07' - 115^{0} 15'
Physiographic description	Geology: Granitic & Challis Volcanics Typography: Glacial Valleys (20%) to steep, strong, moderately dissect. Fluvial slopes. Vegetation: Conifer with open and south exposure, slopes having sagebrush. Soil: Loamy sand to clay loams. Climate: Cold wet winters and moderate to hot dry summers.
Use	Past: Recreation, placer mining and grazing. Present: Recreation, grazing & urbanization - Stanley.
Purpose of data collection	Baseline water quality for subwatershed above urbanization and associated with Forest recreational development - Sawtooth NF.
Publications	Quality of Stream Waters of White Cloud Peaks Area, Idaho -- William W. Emmett - 1972, USGS.

Data availability To whom When Form	**Collected data:** To all persons or agencies on request. **Supporting data:** To all persons or agencies on request.
Date collection initiated	August 1970
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data

Chemical analysis includes all of the following:

pH (P)
Specific conductance (P)
Turbidity (P)
Chemical Oxygen Demand (P)
Biological Oxygen Demand (P)
Total Solids (P)
Total Dissolved Solids (P)
Ammonia (P)
Nitrates (P)
Nitrates (P)
SiO2 (P)
Sulfate (P)
Phosphate (P)
Fluoride (P)
Alkalinity (P)
Hardness (P)
Manganese (P)
Sodium (P)
Potassium (P)
Iron (P)
Precipitatioj (C)
(USDA SCS
(USDC NOAA
Discharge (C) (USGS)

Supporting Data

Land Characteristics and Soil and Hydrologic Evaluation.
Interpretative Inventory
Wildlife Analysis
Ecological Description and Evaluation
Minerals Data
Aquatic Environment and Fisheries Study

Remarks:

WATERSHED INVENTORY FORM NR-5

Watershed identification	Name: Cache Creek (13018300) Area: 2590 ha. (10 sq. mi.) (approx.) Type: Representative
Administering organization	Name: U.S. Geologicial Survey Address: Washington, D.C. 20242
Location	State: Wyoming Latitude: 43°26'50" Longitude: 110°41'50"
Physiographic description	Geology: Alluvium and sandstone, shale. Typography: Mountains and Canyons Vegetation: Pine, Fir, Spruce, Grass and Brush Soil: These characteristic of the Middle Rocky Mountain Province Climate: Average annual precipitation 76 cm. (30") Moderate mean temp. extremes -11°- 14° C. (12-58°F)
Use	Past: Present: Recreation area
Purpose of data collection	Benchmark station
Publications	

Data availability To whom When Form	Collected data: All individuals; upon request: transcribed, published. Supporting data: (same)
Date collection initiated	Streamflow - 1962 Interm. Snow Surveys - 1967 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C) Snow Surveys (P) Conductance Temperature Dissolved Oxygen Coliform, Biological Oxygen Demand Suspended Sediment* pH Iron Phosphate Calcium Magnesium Bicarbonate Nitrate Carbonate Sulfate	Chloride Fluoride Dissovled Solids Potassium Sodium	Minor Elements* Pesticides* Radioactivity*

Remarks:

Unless noted, all data collected once per month.

*Suspended Sediment, also collected during storm runoff.

*Supporting data: 2 times per year

WATERSHED INVENTORY FORM NR-6

Watershed identification	Name: Encampment Barometer Watershed Area: 72 sq. mi. Type: Representative
Administering organization	Name: USDA Forest Service Address: Medicine Bow N.F. Laramie, Wyoming
Location	State: Wyoming Latitude: 41° 10' N Longitude: 106° 50' W
Physiographic description	Geology: Igneous and metamorphosed igneous Typography: Some glaciated - gentle relief less than 10%, over 40% slope - rolling. 8200' - 11,000' Vegetation: 95% forested spruce-fir lodgepole, 50% saw timber. Soil: Yes. Some glaciated - mixture of all types Climate: Continental - west and north frontal system winter, summer t-storms, 60-70% snow precip.
Use	Past: Heavily cut over for RR ties - 1900 Present: Wildlife - Recreation - (5 yr. past) (mixed timber harvest)
Purpose of data collection	Monitor management effects on water resources
Publications	WRRI of Wyoming 1 publication

Data availability To whom When Form	Collected data: All individuals or agencies On request Transcribed w/data processing Supporting data: All individuals or agencies on request Written reports - plans
Date collection initiated	1965
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow	Inventory - Baseline Data
Climatic	Management Implications
Precipitation	
Air Temperature	
Wind	
Solar	
Dewpoint	
Snow	
Soils	
Water Quality	
pH	
Dissolved Oxygen	
Turbidity	
Total Dissolved Solids	
Temperature	
Phosphates	
One complete chemical analysis culinary supply	

Remarks:

WATERSHED INVENTORY FORM NR-7

Watershed identification	Name: Castle Creek (06409000) Area: 21497 ha. (83 sq. mi.) Type: Representative
Administering organization	Name: U.S. Geological Survey Address: Washington, D.C. 20242
Location	State: South Dakota Latitude: 44°00'50" Longitude: 103°49'25"
Physiographic description	Geology: Slate and mica schist high in iron. Typography: Maturely dissected domed mountains. Vegetation: 90% Ponderosa Pine some spruch, willow, aspen. Soil: Those characteristic of Great Plains Province Climate: Average annual precipitation 50.8 cm. (20 in.) Moderate mean temperature extremes -7 - 18°C. (-20° - 65°F)
Use	Past: Present: Black Hills National Forest logging, grazing and growing oats and hay.
Purpose of data collection	Benchmark station
Publications	

Data availability To whom When Form	Collected data: All individuals; upon request: transcribed, published Supporting data: (same)
Date collection initiated	Streamflow - 1948 Precipitation - 1964 Soil & Water Temperature - 1964 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Sulfate	Minor elements*
Precipitation (C)	Chloride	Pesticides*
Temperature (C)	Fluoride	Radioactivity*
Conductance	Dis. Solids	
Dissolved Oxygen	Potassium	
Coliform, Biological Oxygen Demand	Sodium	
Calcium		
Magnesium		
pH		
Bicarbonate		
Suspended Sediment*		
Hardness		
Silica		
Phosphate		
Nitrate		
Iron		
Carbonate		

Remarks:

Unless noted, all data collected once per month.

*Suspended Sediment, also collected during storm runoff.

*Supporting Data: 2 times per year

WATERSHED INVENTORY FORM NR-8

Watershed identification	Name: Hayden Creek near Hayden Lake, Idaho (12416000) Area: 5698 ha (22.0 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Idaho Latitude: 47° 49' 22" Longitude: 116° 39' 10"
Physiographic description	Geology: Quartzite, argillite with thin alluvial deposits near streams Typography: Steep hills, elevation range, 670.5 - 1706.8 meters (2200-5600 feet) Vegetation: Second growth pine and fir Soil: Those characteristic of Rocky Mtn. Province Climate: Ave. ann. precip., 101.6 cm (40"). Mo. mean temp. extremes, -3°-19.4°C (26-67°F)
Use	Past: Present: Forested
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1948 Water quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Sodium	Minor elements, 2x/yr.
Conductance	Potassium	Pesticides, 2x/yr.
Temperature	Bicarbonate	Radioactivity, 2x/yr.
Dissolved Oxygen	Carbonate	
Coliform, Biological Oxygen Demand	Sulfate	
pH	Chloride	
Hardness	Fluoride	
Silica	Nitrates	
Phosphate	Dissolved Solids	
Iron	Suspended sediment*	
Magnesium		
Calcium		

Remarks:
Unless noted, data collected once per month.

* Also collected at peak flows.

WATERSHED INVENTORY FORM NR-9

Watershed identification	Name: Beauvais Creek (06288200) Area: 25900 ha (100 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Montana Latitude: 45^{o} 29' Longitude: 108^{o} 00'
Physiographic description	Geology: Shale/sandstone and pediment gravels Typography: Rolling hills Vegetation: Sparce, native grasses, trees and bushes Soil: Those characteristic of Great Plains Province Climate: Average annual precip - 35.5 cm (14 in.) Mo. mean temp. extremes - 20^{o} - 70^{o}F 66^{o} - 21^{o}C
Use	Past: Present: Crow Indian Reservation. 121 ha (300 acres) dry land wheat farming; 80.9 ha (200) irrigated for hay land. Highly used for grazing.
Purpose of data collection	
Publications	

Data availability	Collected data:
To whom	All individuals
When	Upon request
Form	Transcribed, published
	Supporting data: (Same)
Date collection initiated	Stream Flow - 1967 W. Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Conductance	Dissolved Solids	Minor Element - 2 x/yr.
Temperature	Silica	Pesticides - 2 x/yr.
D. Oxygen	Phosphate	Radioactivity - 2 x/yr.
Coliform, Biological Oxygen Demand	Nitrate	
	Iron	
Calcium	Magnesium	
Sulfate	Sodium	
pH	Potassium	
Hardness	Carbonate	
Suspended Sediment*	Bicarbonate	
Chloride	Stream Flow (C)	
Fluoride	Water Temp (C)	
	Precipitation (C)	

Remarks:

* Also collected during storm runoff.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM NR-10

Watershed identification	Name: Rock Creek (Entire Drainage) Area: 229,215 ha. Type: Representative
Administering organization	Name: U.S. Department of Agriculture Address: Forest Service Lolo National Forest Ft. Missoula, Mont. 59801
Location	State: Montana Latitude: 46° 43' 21" Longitude: 113° 40' 56"
Physiographic description	Geology: Precambrian sedimentary of Belt Superground with minor granitic intrusions Typography: Mature Mountain with steep slopes, well to moderately well dissected. Vegetation: Coniferous forest primarily with minor open grasslands in upper basin. Soil: Loamy sands to sandy loam loess caps over gravelly loam residual soils. Climate: Modified continental
Use	Past: Mining, grazing, timber harvest and recreation Present: Recreation, grazing and timber harvest with very little mining at present
Purpose of data collection	Baseline water quality for an important fishery of National importance.
Publications	1. "Rock Creek Water Quality Study" Parts I and II by Leale E. Streebin, Prof., Univ. of Oklahoma, 1970 and 1972. 2. "Rock Creek Fishery Habitat and Water Quality Study", Summary Reports No. 1, 2, and 3, by Gordon Haugen, 1971, 74 and 75.

Data availability To whom When Form	**Collected data:** All agencies and individuals On request Report Summaries and STORET printout **Supporting data:** All agencies and individuals On request to F.S. or USGS Reports and General Publication
Date collection initiated	June 1970
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Water Temperature (P&C)	Soils
Suspenden Sediment (P&C)	Geology
Turbidity (P)	Vegetation (Habitat Types)
Alkalinity (P)	Wildlife
Biochemical Oxygen Demand (P)	Recreation
Chemical Oxygen Demand (P)	Scenic Overview
Chlorides (P)	Transportation
Conductivity (P)	USGE Hydrologic Gain-Loss Study
Dissolved Oxygen (P)	USGS Groundwater Study
Hardness (P)	
Nitrogen - Ammonia, nitrate & nitrate (P)	
Phosphates: Total & Ortho (P)	
pH (P)	
Tannin & Lignin (P)	
Heavy Metals (P)	
Coliform Bacteria: Total (P)	
Fecal & Streptococcus	
Stream Discharge (C)	

Remarks:
Supporting inventories to be incorporated in Unit Draft Environmental Statements, FY 1976.

WATERSHED INVENTORY FORM NR-11

Watershed identification	Name: East Fork of Smith's Fork Barometer W/S Area: 50,000 acres Type: Representative
Administering organization	Name: Wasatch National Forest Address: 4311 Federal Building 125 South State Street Salt Lake City, Utah 84138
Location	State: Wyoming Latitude: 41^{o} 00' Longitude: 110^{o} 30'
Physiographic description	Geology: Glaciation or morinal Typography: Rolling; some steep slopes Vegetation: Conifer and aspen Soil: Sandy loam to loam Climate: Cool
Use	Past: Multiple use Present: Timber grazing, recreation, oil wells, others
Purpose of data collection	Monitor any physical change from multiple use activities
Publications	PSW Survey II

Data availability To whom When Form	Collected data: All individuals On request Raw Supporting data: All individuals paying reproduction costs
Date collection initiated	1969
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation	Soil Inventory
Discharge	Geologic Mapping
Temperature	Hydrologic Survey
Wind Velocity and Direction	
Radiation	
One time - total chemical analysis	
Suspended sediment	

Remarks:

WATERSHED INVENTORY FORM NR-12

Watershed identification	Name:	Wyman Creek
	Area:	4248 ha
	Type:	Representative
Administering organization	Name:	U.S. Department of Agriculture
	Address:	Forest Service Lolo National Forest Ft. Missoula, Mont. 59801
Location	State:	Montana
	Latitude:	46^{0} 25' 35"
	Longitude:	113^{0} 41' 30"
Physiographic description	Geology:	Predominantly granitic intrusives into Belt Supergroup Sedimentary
	Typography:	Mature mountains deeply incised.
	Vegetation:	Coniferous forest
	Soil:	Sandy loams
	Climate:	Modified continental
Use	Past:	Dispersed recreation - undeveloped
	Present:	Same
Purpose of data collection		Baseline water quality for an important fishery of national importance.
Publications		1. "Rock Creek Water Quality Study" Patts I and II by Leale E. Streebin, Prof, Univ. of Oklahoma, 1970 and 1972. 2. "Rock Creek Fishery Habitat and Water Quality Study," Summary Reports No. 1, 2, and 3, by Gordon Haugen, 1971, 74 and 75.

Data availability To whom When Form	Collected data: All agencies and individuals Upon request Report summaries and STORET printout Supporting data: All agencies and individuals On request to F.S. or USGS Reports and General Publications
Date collection initiated	June, 1970
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Water Temperature (P&C)	Phosphates:	Soils
Suspended Sediment (P&C)	Total & Ortho (P)	Geology
Turbidity (P)	pH (P)	Vegetation (Habitat types)
Alkalinity (P)	Tannin & Lignin (P)	
Biochemical Oxygen Demand (P)	Stream Discharge (C)	Wildlife
Chemical Oxygen Demand (P)		Recreation
Chlorides (P)		Scenic Overview
Conductivity (P)		Transportation
Dissolved Oxygen (P)		USGS Hydrologic Gain-Loss Study
Hardness (P)		
Nitrogen - Ammonia, nitrate & p nitrate		USGS Groundwater Study

Remarks:

Supporting inventories to be incorporated in Unit Draft Environmental Statements, FY 1976.

WATERSHED INVENTORY FORM NR-13

Watershed identification	Name: Alder Creek Area: 3411 ha. Type: Representative
Administering organization	Name: U.S. Department of Agriculture Address: Forest Service Lolo National Forest Ft. Missoula, Mont. 59801
Location	State: Montana Latitude: 46°28'15" Longitude: 113°46'45"
Physiographic description	Geology: Belt Supergroup Sedimentary Typography: Mature mountain, deeply dissected. Vegetation: Coniferous forest Soil: Loamy sands Climate: Modified continental
Use	Past: Timber harvest and dispersed recreation Present: Same
Purpose of data collection	Baseline water quality for an important fishery of National importance.
Publications	1. "Rock Creek Water Quality Study" Parts I and II by Leale E. Streebin, Prof., Univ. of Oklahoma, 1970 and 1972. 2. "Rock Creek Fishery Habitat and Water Quality Study", Summary Reports No. 1, 2, and 3, by Gordon Haugen, 1971, 74 and 75.

Data availability To whom When Form	Collected data: All agencies and individuals; on request; report summaries and STØRET printout Supporting data: All agencies and individuals; on request to Forest Service or USGS Reports and General Publication.
Date collection initiated	June 1970
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Water Temperature (P&C)	pH (P)	Soils
Suspended Sediment (P&C)	Tannin & Lignin (P)	Geology
Turbidity (P)	Stream Discharge (C)	Vegetation (Habitat Types)
Alkalinity (P)		Wildlife
Biochemical Oxygen Demand (P)		Recreation
Chemical Oxygen Demand (P)		Scenic Overview
Chlorides (P)		Transportation
Conductivity (P)		USGS Hydrologic Gain-Loss Study
Dissolved Oxygen (P)		USGS Groundwater Study
Hardness (P)		
Nitrogen:		
Ammonia		
Nitrate		
Phosphorus nitrate		
Phosphates: Total & Ortho (P)		

Remarks:

Supporting inventories to be incorporated in Unit Draft Environmental Statements, FY 1976.

WATERSHED INVENTORY FORM NR-14

Watershed identification	Name: Encampment R. (06623800) Area: 18,829 ha. (72.7 sq. mi.) Type: Representative
Administering organization	Name: U.S. Geologicial Survey Address: Washington, D.C. 20242
Location	State: Wyoming Latitude: 41°01'25" Longitude: 106°49'27"
Physiographic description	Geology: Crystalline rock (granite) metasedimentary rock. Typography: Mountainous Vegetation: Lodgepole, Pine, Fir, Spruce Soil: Those characteristic of the South Rockey Mountains Province Climate: Average annual precipitation 76 cm. (30") Moderate mean temp. extremes - 9°- 13°C (15 - 55°F)
Use	Past: Present: Seasonal Recreation
Purpose of data collection	Benchmark station
Publications	

Data availability To whom When Form	Collected data: All individuals; upon request: transcribed, published Supporting data: (same)
Date collection initiated	Streamflow - 1964 Interm. Snow Survey - 1964 Water Quality - 1967 Wind speed - 1966 R. Humidity - 1966 Air Temp. - 1966
Date collection terminated	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Snow Survey
Water Quality	Wind speed
pH	R. Humidity
Hardness	Air Temperature
Phosphate	Solar Radiation
Nitrate	
Calcium	
Bicarbonate	
Silica	
Carbonate	
Sulfate	
Chloride	
Fluoride	
Dissolved Solids	
Potassium	
Sodium	

Remarks:

Unless noted, all data collected once per month. Supporting data collected by U.S. Forest Service.

WATERSHED INVENTORY FORM NR-15

Watershed identification	Name: Big Wood River System Area: 165,760 ha. Type: Representative
Administering organization	Name: Sawtooth National Forest Address: 1525 Addison Avenue East Twin Falls, Idaho 83301
Location	State: Idaho Latitude: 43^{0} 30' 40^{0} 52' Longitude: 114^{0} 04' 114^{0} 42'
Physiographic description	Geology: Challis Volcanic and Wood River Sedimentries Typography: Moderate to strongly dissected steep mountain slopes Vegetation: Conifer north exposures and sagebrush grass south exposures Soil: Sandy loam to clay loam with 10 to 70 percent coarse fragments Climate: Mountainous cold wet winter with moderate summer.
Use	Past: Timber harvest recreational and urbanization development - Ketchum & Hailey Present: Hailey
Purpose of data collection	Recreation and urbanization development of Sun Valley, Ketchum Hailey, and Bellevue. Baseline water quality for subwatersheds above urbanization development and recreational development effects.
Publications	

Data availability To whom When Form	Collected data: To all persons and agencies on request. Supporting data: To all persons and agencies on request.
Date collection initiated	Summer 1970
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Chemical Analysis includes all of the following;	
pH (P)	
Specific Conductance (P)	Land System Inventory
Turbidity (P)	Geologic Mapping
Chemical Oxygen Demand (P)	Forest Land Use Plan
Biological Oxygen Demand (P)	Blaine County Plan
Total Solids (P)	Recreation Utilization
Total Dissolved Solids (P)	
Caluium (P)	
Ammonia (P)	
Nitrates (P)	
Nitrites (P)	
Silica (P)	
Sulfate (P)	
Phosphate (P)	
Fluoride (P)	
Alkalinity (P)	
Manganese (P)	
Sodium (P)	
Potassium (P)	
Iron (P)	
Precipitation (C) (USDA SCS USDC NOAA)	
Discharge (C) (USGS)	

REMARKS:

WATERSHED INVENTORY FORM NR-16

Watershed identification	Name: Grizzly Creek Area: 1738. ha. Type: Representative
Administering organization	Name: U.S. Department of Agriculture Address: Forest Service Lolo National Forest Ft. Missoula, Mont. 59801
Location	State: Montana Latitude: 46^{o} 35' 25" Longitude: 113^{o} 38' 05"
Physiographic description	Geology: Belt Supergroup Sedimentary Typography: Mature mountain Vegetation: Coniferous forest Soil: Loamy sands to sandy loams Climate: Modified continental
Use	Past: Timber harvest, mining and dispersed recreation Present: Same
Purpose of data collection	Baseline water quality for an important fishery of national importance.
Publications	1. "Rock Creek Water Quality Study" Parts I and II by Leale E. Streebin, Prof., Univ. of Oklahoma, 1970 and 1972. 2. " Rock Creek Fishery Habitat and Water Quality Study," Summary Reports No. 1, 2, and 3, by Gordon Haugen, 1971, 74, and 75.

Data availability To whom When Form	Collected data: All Agencies and Individuals on Request Report Summaries and STORET printout Supporting data: All Agencies and Individuals On request to F.S. or USGS Reports and General Publication
Date collection initiated	June 1970
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Water Temperature (P&C)	Soils
Suspended Sediment (P&C)	Geology
Turbidity (P)	Vegetation (Habitat Types)
Alkalinity (P)	Wildlife
Biochemical Oxygen Demand (P)	Recreation
Chemical Oxygen Demand (P)	Scenic Overview
Chlorides (P)	Transportation
Conductivity (P)	USGS Hydrologic Gain-Loss Study
Dissolved Oxygen (P)	USGS Groundwater Study
Hardness (P)	
Nitrogen - Ammonia, nitrate & mitrate (P)	
Phosphates: Total & Ortho (P)	
pH (P)	
Tannin & Lignin (P)	
Stream Discharge (C)	

Remarks:

Supporting inventories to be incorporated in Unit Draft Environmental Statements, FY 1976.

WATERSHED INVENTORY FORM NR-17

Watershed identification	Name:	Swiftcurrent Creek (05014500)
	Area:	8133 ha (31.4 sq. mi.)
	Type:	Representative
Administering organization	Name:	U.S.G.S.
	Address:	Washington, D.C. 20242
Location	State:	Montana
	Latitude:	48° 48' 10"
	Longitude:	113° 39' 20"
Physiographic description	Geology:	Varicolored argillite, quartzite, and 1 limestone, minor amts. basalt
	Typography:	Steep mtns; glacier modif. valleys; 5% lakes
	Vegetation:	Coniferous trees, aspen Various shrubs - little grass cover
	Soil:	Those characteristic of Northern Rocky Mtns. Province
	Climate:	Ave. annual precipitation - 203.2 cm (80 in.) Mo. mean temp. extremes - (20° - 60°F) -6.6° - 15.5°C
Use	Past:	
	Present:	Glacier National Park
Purpose of data collection	Benchmark Station	
Publications		

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, Published Supporting data: (Same)
Date collection initiated	Snow Survey - 1960 Intermittent Stream flow - 1912 Stream Flow - 1959 Precipitation - 1956 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Stream Flow (C)	Nitrate	
Precipitation (C)	Iron	
Air Temp. (C)	Sulfate	
Water Temp. (C)	Chloride	
Calcium	Fluoride	
Magnesium	Dissolved Solids	
Bicarbonate	Potassium	
pH	Sodium	
Hardness		
Silica		
Phosphate		

Remarks:

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM NR-18

Watershed identification	Name: West Branch Weiser River Area: 1036.0 ha Type: Experimental
Administering organization	Name: U. S. Forest Service Address: Payette Natl. Forest McCall, Idaho 83638
Location	State: Idaho Latitude: 45° 01' 50" Longitude: 116° 26' 05"
Physiographic description	Geology: Columbia River Basalts Typography: Moderate - Steep plateau Vegetation: Pine - Fir Soil: Loam to silt loam Climate: Continental Moderate
Use	Past: Logging - grazing Present: Same
Purpose of data collection	Project Water quality monitoring
Publications	1. Office of Water Data Coordination Pacific N. W. List of surface water quality stations.

Data availability To whom When Form	Collected data:	Available on request
	Supporting data:	Available on request must pay repro. costs.
Date collection initiated	Mixed	Discharge - 1959 Sus. Sed. - 1969 Bedload - 1965 Precp. - 1964 Coliforim - 1970 Others - 1974
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Water Temp (C)	Soil - Hydrologic Reconn.
Air Temp (P)	
Precipitation (C)	
Discharge (C)	
Susp, Sed. (P)	
Bedload Sed. (C)	
Total Calif. (P)	
Turbidity (P)	
Conductivity (P)	

Remarks: This was set up as an administrative study. Several attempts to run a water budget were made.

WATERSHED INVENTORY FORM NR-19

Watershed identification	Name: Rapid River Area: 14,763 ha Type: Representative
Administering organization	Name: U. S. Forest Service Address: Payette National Forest McCall, Idaho 83638
Location	State: Idaho Latitude: 45^0 15' 44' Longitude: 116^0 25' 41"
Physiographic description	Geology: Columbia River Basalts seven Devil Volcnaics Triassic Sedimentary Typography: Moderate to very steep glacial and fluvial slopes. Vegetation: Pine - Fir Soil: Silt -loam to loamy Climate: Continental Moderate
Use	Past: Limited grazing Low intensity recreation Present: Same
Purpose of data collection	Baseline water quality for high value Watershed.
Publications	1. Office of water Data Coordination Pacific N.W. List of water quality station.

Data availability To whom When Form	Collected data:	All individuals on request
	Supporting data:	All individuals paying reproduction costs. On request
Date collection initiated	June 1971	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Water Temperature (C)	Soil - Hydrologic Reconnaissance
Turbidity (P)	
Suspended Sediment (P)	
pH (P)	
Conductivity (P)	
Complete chemical (P)	
Discharge (P)	
Total coliform (P)	
Precipitation (P)	

Remarks: High value watershed. Supplies Rapid River Fish Hatchery

WATERSHED INVENTORY FORM NR-20

Watershed identification	Name: Bear Den Crk. (06332515) Area: 19166 ha. (74 sq. mi.) Type: Representative
Administering organization	Name: USGS Address: Washington, D.C. 20242
Location	State: North Dakota Latitude: 47° 47' Longitude: 102° 46'
Physiographic description	Geology: Sandy silt, Sandstone, silt, clay, Lignite Typography: Steep land slopes and gently rolling land surfaces Vegetation: 90% native grasses Soil: Those characteristic of: Great Plains Province Climate: Ave. annual Precip.-38.1 cm (15 in.) Mo. mean temp Extremes - 8°-7° F -13°-21°C
Use	Past: Present: Fort Berthold Indian Reservation (½) Cattle grazing
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals upon request Transcribed, Published Supporting data: (same)
Date collection initiated	Cont. Stream flow - 1966 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Stream Flow (C)	
Sodium	
Bicarbonate	
Sulfate	
pH	
Hardness	
Silica	
Phosphate	
Nitrate	
Iron	
Magnesium	
Calcium	
Carbonate	
Chloride	
Fluoride	
Dis. Solids	
Potassium	

Remarks:

Unless noted, all data is collected once per month.

WATERSHED INVENTORY FORM NR-21

Watershed identification	Name: Wickahoney C. nr. Bruneau, Idaho (13169500) Area: 65527 ha. (253 sq. mi.) Type: Representative
Administering organization	Name: U.S. Geological Surveys Address: Washington, D.C. 20242
Location	State: Idaho Latitude: 42° 47' 06" Longitude: 115° 59' 00"
Physiographic description	Geology: Silicic volcanic rock Typography: Rolling hills. Elevation range, 914.4-1,828.8 m (3,000-6,000 feet.) Vegetation: Sagebrush, grass Soil: Those characteristic of Columbia Plateau province Climate: Ave. annual precipitation= 25.4 cm (10") Mean mo. temperature extremes, (30-73°F) -1.1-22.7°C
Use	Past: Present: Grazing, stockponds
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individual Upon request Transcribed, published. Supporting data: Same
Date collection initiated	Streamflow 1938* Water Quality 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) pH Hardness Silica Phosphate Iron Calcium Magnesium Sodium Potassium Bicarbonate Carbonate Sulfate Chloride Fluoride Nitrates Dissolved Solids	

Remarks:

* Interrupted 1949 - 1965.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM NR-22

Watershed identification	Name: Logan Creek Area: 180 sp mi (46,620 ha. Type: Representative
Administering organization	Name: U.S. Department of Agriculture Address: Forest Service Flathead N.F. Box 147, Kalispell, Mont. 59901
Location	State: Montana Latitude: 48^{o} 25' Longitude: 114^{o} 40'
Physiographic description	Geology: Glacial moraines overlying Precambrian bedrock Typography: Gentle to moderately rugged Vegetation: Coniferous Soil: Silty soils Climate: Modified north Pacific coast type
Use	Past: Recreation, logging Present: Recreation, logging
Purpose of data collection	Baseline water quality data with particular application to P.L. 92-500, non-point pollution
Publications	NONE

Data availability To whom When Form	Collected data:	All individuals paying reproduction costs On request Paper copy of report(s)
	Supporting data:	All individuals paying re-production costs On request Paper copy of written report(s)
Date collection initiated	July 1974	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (P)	Soils
Water temperature (P)	Geology
Biological Oxygen Demand (P)	Mining
Suspended solids (P)	Vegetative inventory
Turbidity (P)	Wildlife inventory
Fecal coliform (P)	Recreation inventory
Conductivity (P)	
Orthophosphate (P)	
Nitrate, nitrite (P)	
pH (P)	
Total alkalinity (P)	
Organic color (P)	
"complete chemistry" (Calcium, Magnesium, Sodium, Chloride, Alkaline, Hydroxide, Carbonate, Sulfate, Floride)(P)	
Metals (Iron, Zinc, Copper, Cadmium, Manganese, Mercury, Arsenic, Lead, Nickel) (P)	
Biological factors (Periphyton and benthic invertebrates) (P)	

Remarks:

Present study to terminate in June 1975

WATERSHED INVENTORY FORM NR-23

Watershed identification	Name: Ruby River (Headwaters area) Area: 51,800 ha. Type: Representative Range Land
Administering organization	Name: U.S.D.A. Forest Service Address: Beaverhead National Forest Dillon, Montana 59725
Location	State: Montana Latitude: 45° Longitude: 112°
Physiographic description	Geology: Lithology-sedimentary shales, sandstones, and limestones; igneous basalt, rhyolite, and tuff. Cryoplanated with nivational glaciation. Typography: North drainage with open 20-30% sloped grass parklands to the east and 30-60% slopes on partly timbered slopes to the West. Elevations mostly between 1828.8-2,743m (6000 & 9000 ft.). Vegetation: Variety of grass, sedge, forb, sage communities. Mixed conifer and aspen groves on north slopes. Soil: Sandy loam, cryoplanated upland soils. Clayey and stoney soils also represented. Climate: Continental, typical of most of Northern Rocky Mountains east of the Continental Divide.
Use	Past: Summer sheep and cattle pasture Present: Summer sheep and cattle pasture
Purpose of data collection	Characterization of rangeland watersheds; determine effects of range management erosion, sedimentation, and stream environment.
Publications	

Data availability To whom When Form	Collected data: Available to public. WQ data available from STORET. Supporting data: Mostly available from collecting person or agency.
Date collection initiated	1973 Baseline chemical and physical water quality characterization 1975 Watershed and fisheries study
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (P)	Range condition inventory-FS
Snow survey (P)	Range type mapping-FS
Precipitation (P)	Precipitation Map-FS
Water quality	Fish Population-MT F&G Dept.
Suspended sediment (P)	(C) Streamflow records-USGS
Total coliform (P)	Snow survey records-SCS
Nitrates (P)	Geologic mapping (3 grad. studies)
Phosphates (P)	
Temperature (P)	Soil & Landform mapping-FS
Chemical (P)	Hydrology-SCS
	Ruby Dam and Reservoir-B.R.
	Vigilante Exp. Sta.-FS

Remarks:
1-3 year watershed and fisheries study initiated in spring of 1975. Fourteen water quality stations established with data storage in STORET system (stations BE6001-BE6015). Main emphasis placed on daily suspended sediment sampling during snowmelt runoff and summer rainstorms.

WATERSHED INVENTORY FORM NR-24

Watershed identification	Name: Worswick Creek Area: 1036. ha. Type: Representative
Administering organization	Name: Sawtooth National Forest Address: 1525 Addison Avenue East Twin Falls, Idaho
Location	State: Idaho Latitude: 42° 35' Longitude: 114° 46'
Physiographic description	Geology: Granitics Typography: Moderately dissected steep mountain slopes. Vegetation: Sagebrush - grass with pockets and north exposure timber. Soil: Sandy loam to loamy sand Climate: Mountainous cold wet winters with hot dry summers.
Use	Past: Sheep Driveway - Grazing. Present: Grazing - Watershed Rehabilitation.
Purpose of data collection	Proposed timber sale and timber sale access road.
Publications	Data still in notes..

Data availability To whom When Form	Collected data: To all persons and agencies on request. Supporting data: To all persons and agencies on request.
Date collection initiated	May 1974.
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Sediment (P)	Soil - hydrologic studies
Total Coliform (P)	
Temperature (P)	
pH (p)	
Turbidity (P)	
Suspended Sediment (P)	
Conductivity (P)	
Dissolved Oxygen (P)	

Remarks:

WATERSHED INVENTORY FORM NR-25

Watershed identification	Name: N. Fork Fish Cr. Area: 10 sq. mi. Type: Management monitoring
Administering organization	Name: Bridgen-Teton N.F. Address: Box 1888 Jackson, Wyoming 83001
Location	State: Wyoming Latitude: 43^{o} 40' Longitude: 110^{o} 10'
Physiographic description	Geology: Sandstone and shale formations Typography: Benchy mountain slopes Vegetation: Lodgepole pine, Engleman spruce, subalpine fir Soil: Fine loamy Climate: Continental - cool
Use	Past: Timber harvest and limited grazing Present: Timber harvest
Purpose of data collection	A special study to intensively monitor the water quality impact of a timber sale.
Publications	

Data availability To whom When Form	Collected data: All On request STORET storage Supporting data: Land use inventories available to public - reproduction charge
Date collection initiated	June 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Turbidity (P)	Landtype inventory
Water Temperature (P)	Vegetative habitat type
Suspended Sediment (P)	Fisheries - channel stability
Phosphates (P)	Climatic
Nitrates (P)	Resource productivity
Streamflow (P)	Special on-site soil investigation

Remarks:

Water quality monitoring is required as a result of an environmental statement called for in a judicial decision applying to the timber sale.

WATERSHED INVENTORY FORM NR-26

Watershed identification	Name: Zena Creek Study Area (Five Watersheds) Area: 1033.4 ha. Type: Experimental
Administering organization	Name: Intermountain Forest & Range Experiment Sta. Address: 316 C. Myrtle Street Boise, Idaho 83706
Location	State: Idaho Latitude: $45^{o}2'$ Longitude: $115^{o}40$
Physiographic description	Geology: Coarse quartz monzonite Typography: Very steep moderately dissected slopes Vegetation: Douglas Fir and Ponderosa Pine Forest Soil: Coarse sandy loams and loamy coarse sands Climate: Pacific Northwest Maritime with inflows of Gulf Coast Air masses during summer and fall.
Use	Past: No use Present: Research for evaluation of environmental effects of logging.
Purpose of data collection	To study overall impact of logging methods upon the individual and collective watersheds.
Publications	Sedimentation in relation to Logging Activities in the Mountains of Central Idaho

Data availability To whom When Form	Collected data: All individuals on request Research Paper Supporting data: Research papers to be published.
Date collection initiated	September, 1959
Date collection terminated	On three watersheds and five sediment ponds.

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Total Sediment (C)	Soil - hydrologic survey
Discharge (C) (on 3 watersheds)	Vegetation habitat typing
Precipitation (C)	
Temperature (C)	

Remarks: There has been a logging moratorium for past five years which has prevented research from being carried to completion. There are Five watersheds involved.

WATERSHED INVENTORY FORM SW-1

Watershed identification	Name: Beaver Creek Watersheds Area: 14,815 ha. (57.2 sq.mi.) Type: Experimental
Administering organization	Name: USDA, Forest Service Address: Rocky Mountain Forest & Range Experiment Sta. Forestry Sciences Lab Flagstaff, Arizona 86001
Location	State: Arizona Latitude: $34^{o}44'$ Longitude: $111^{o}43'$
Physiographic description	Geology: Igneous rock of volcanic origin Typography: Rolling with moderate slopes Vegetation: Pinyon juniper to ponderosa pine Soil: Clay to silt loam Climate: Cool sub-humid
Use	Past: Grazing and timber harvesting Present: Grazing
Purpose of data collection	Multiple use evaluations of watershed treatments.
Publications	1. Effects of pinyon-juniper removal on natural resources products and uses in Arizona. 2. Opportunities for increasing water yields and other multiple use values on ponderosa pine forest lands. 3. Others.

Data availability To whom When Form	Collected data: All individuals paying reproduction costs On request Magnetic tape, transcribed reports, office reports, publications Supporting data: Same
Date collection initiated	1959
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Total sediment (P)	Iron	Soils Inventory
Suspended sediment (P,C)	Flouride	Geology Survey
Discharge (C)	Solphate	Vegetive Inventory
Precipitation (C)	PH	Wildlife Inventory
Water quality (P)	TDS	
Snow surveys (P)	Bicabonate Calcium	
Water & air temp. (C)	Chloride	
Relative Humidity (C)	Magnesium	
Wind	Mitrate	
Radiation	Total Nitrogen	
	Ortho	
	Phosphate	
	Silica	
	Sodium	

Remarks: There are 20 major Watersheds instrumented and 17 sub Watersheds within the major ones. The areas of the major ones. The areas of the major Watersheds ranges from 25.9 to 61475 ha (0.10 to 25 sq. miles). The sub watersheds range in area from 51.8 to 59.7 ha (0.20 to 0.23 sq. miles) Major Watersheds 1 thru 6 are in the pinyon juniper vegetative community and watersheds 7 thru 20 are in the ponderosa pine type. The major watersheds were instrumented in 1959 and 1962. The sub watersheds were instrumented between 1969 and 1973.

WATERSHED INVENTORY FORM SW-2

Watershed identification	**Name:** Fraser Experimental Forest **Area:** 9,328 ha **Type:** Experimental
Administering organization	**Name:** Rocky Mountain Forest & Range Exp. Sta. **Address:** Ft. Collins, Colorado 80521
Location	**State:** Colorado **Latitude:** 39°54' **Longitude:** 105°53'
Physiographic description	**Geology:** Generally metamorphic--schist and gneiss derived from granite. **Typography:** Mountainous; max. elevation 3,904 m, min. elevation 2,660 m. **Vegetation:** Predominantly spruce-fir, lodgepole pine with alpine meadows and barrens. **Soil:** Derived from gneisses and schists, well drained, poorly profiled, of low fertility. **Climate:** Sub-alpine
Use	**Past:** Late 1800's logged for RR ties and lumber **Present:** Since 1937 an experimental forest with some recreation
Purpose of data collection	Multifunctional resource management
Publications	A 10-page bibliography exists.

Data availability To whom When Form	Collected data: Public paying costs* On request Published reports, raw data Supporting data: Public paying costs* On request Published reports, raw data * Costs vary with data desired.
Date collection initiated	1937 1969 water quality (see Remarks)
Date collection terminated	Much ongoing, some terminated (see Remarks)

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Air temperature	Iron	Geologic
Water temperature	Carbonate	Vegetative
Precipitation	Bicarbonate	Soils
Runoff	Alkalinity	Wildlife
Relative humidity	Hardness	Fisheries
Wind	Chlorides	
Snow	Sodium	
Bedload sediment	Potassium	
Cations, anions	Calcium	
Calcium	Magnesium	
Magnesium	pH	
Phosphate		
Nitrate		
Silica		
Sulfates		

Remarks: Component watersheds:

E. St. Louis Creek	794 ha	streamflow	1943-present
Fool Creek	286 ha	sediment	1952-1966
		streamflow	1942-present
Deadhorse Creek	267 ha	sediment	1955-present
Lexen Creek	122 ha	sediment	1956-present

WATERSHED INVENTORY FORM SW-3

Watershed identification	Name: Straight Canyon Barometer Watershed Area: 38,447 ha Type: Representative
Administering organization	Name: USDA Forest Service Address: Manti-LaSal National Forest 350 East Main Street Price, Utah 84501
Location	State: Utah Latitude: 39° 17' Longitude: 111° 16'
Physiographic description	Geology: Tertiary and cretaceous limestones, sandstones and shales, partially mantled with landslide and morainal material Typography: High elevation plateau deeply cut by canyons which are broad at the head and steep and narrow at lower elevations. Vegetation: Elevation range 2,134-3,353 m (7,000-11,000 ft). Above 2,438 m (8000 ft) and on north aspects: aspen, spruce-fir, and grass-forb types. Below 2,438 m (8000 ft) pinyon-juniper & Sage-grass. Soil: Shallow to deep, medium to fine textures. Climate: Characteristic of Central Utah Hydrologic Province & South Central Utah Climatic Zone.
Use	Past: Heavy grazing by sheep and cattle. Irrigation storage reservoirs. Dispersed recreation. Timber harvest Present: Sheep and cattle grazing under permit. Multipurpose reservoir. Year-round recreation use. Intensive recreation use. Summer home developments. Timber harvest. Watershed improvement projects.
Purpose of data collection	1. Baseline water quality 2. Monitoring effects of various management activities 3. Surveillance of culunary water sources
Publications	1. Hydrologic Analysis and Water Yield Improvement Program. 2. Water Quality Moinitoring Plan 1972. 3. The Results of Water Quality Monitoring 1967-1972.

Data availability To whom When Form	Collected data: All individuals on request. STORET users. STORET printout Supporting data: All individuals on request who pay reproduction costs.
Date collection initiated	Typewritten reports and ADP printouts, 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Temperature (P)	Hydrologic Condition Survey and Analysis
Suspended sediments (P)	Snow Survey Records
Turbidity (P)	Stream Gaging Records
Color (P)	Climatological Station Records
Total Alkalinity (P)	
Total Hardness (P)	
Nitrate (P)	
Phosphate (Ortho) (P)	
Dissolved Oxygen (P)	
Total coliform (P)	
Fecal Coliform (P)	
Fecal Streptococcus (P)	
Precipitation (C)	
Discharge (C)	

Remarks:

Land systems inventory in progress - scheduled for completion FY 1976. Soil survey - 10,118 ha (25,000 acres) scheduled for FY 1976 or FY 1977. Under the present water quality monitoring plan, 17 stations are being monitored periodically.

WATERSHED INVENTORY FORM SW-4

Watershed identification	Name: Black River Barometer Watershed Area: 59,150 ha (146,160 acres) Type: Representative
Administering organization	Name: USDA Forest Service Address: Apache-Sitgreaves National Forest P.O. Box 640 Federal Building Springerville, Arizona 85938
Location	State: Arizona Latitude: See Remarks Longitude: See Remarks
Physiographic description	Geology: Basalt Typography: Mountain Lands Vegetation: Ponderosa Pine/mixed conifer Soil: Clay loam Climate: 25 inches precipitation
Use	Past: Timber harvesting, grazing, recreation Present: Same as past.
Purpose of data collection	Develop and test hydrologic models and resource management alternatives
Publications	1. Operation Plan, Black River Barometer Watershed.

Data availability To whom When Form	Collected data: All individuals Upon request Computer printouts, raw daya, summary compilation Supporting data: All individuals upon request Written reports
Date collection initiated	1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Climatic (C)	Fluoride	Soil Inventory
Water Quality (P)	Hydrogen Sulfide	Geologic mapping
Alkalinity	Nitrate	Vegetation inventory
Carbon Dioxide	Phosphate	Timber inventory
Chloride	Bacteria	Grazing use
Copper	Streamflow (C)	Recreation use
Hardness	Soil moisture (P)	
Iron	Water temperature (P)	
Manganese	Snow course (P)	
Dissolved oxygen		
pH		
Sulfate		
Total Dissolved Solids		
Turbidity		
Flow		
Chlorine		
Chromate		
Detergents		

Remarks:

There are four watersheds:

Beaver Creek & Heifer Branch	33^{0} 44" 10'	109^{0} 20' 30"
East Fork Black River	33^{0} 45 00	109^{0} 21' 10"
West Fork Black River	33^{0} 45" 30'	109^{0} 22' 25"

WATERSHED INVENTORY FORM SW-5

Watershed identification	Name: Chicken Creek Area: 87.8 ha Type: Experimental
Administering organization	Name: USDA Forest Service Address: IF&RES Forestry Sci. Lab. 860 North 12th East Logan, Utah 84321
Location	State: Utah Latitude: 40° 57' 30" Longitude: 111° 47'
Physiographic description	Geology: Gneiss and schist over Pre-Cambrian quartz Typography: Gentle sloping meadow with moderate sideslopes Vegetation: Aspen - Mountain grass and shrub Soil: Rocky ridge crest; moderate fine textured deep loam Climate: Mid-elevation 2,134-2,438 m (7-8,000 ft) Mountain - dry summer, wet winter; 101.6 cm (40 in) average annual precipitation
Use	Past: Heavy grazing, timber harvest Present: Protected research watershed. No use or fire since mid-1930's
Purpose of data collection	Research - effect timber harvest - (aspen) on water yield and quality and vegetation biomass
Publications	Johnston, R.S. and R.D. Doty, 1972. Description and hydrologic analysis of two small watersheds in Utah's Wasatch Mountains. USDA For. Serv. Res. Pap. INT-27 53 p. Johnston, R.S., 1969. Aspen sprout production and water use. USDA For. Serv. Res. Note INT-89, 6 p.

Data availability To whom When Form	Collected data: All individuals on request following completion of research - others prior to completion if no publication conflict. Computer summary. Supporting data: Requester pay production cost
Date collection initiated	October 1, 1965
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Discharge (C)	Ortho-Phosphate (P)	Geologic and shallow siesmic inventory
Precipitation (C)	Nitrate-Nitrogen (P)	Soils mapping
Air Temperature (C)	Calcium (P)	Vegetation inventory and mapping
Radiation-humidity (P)	Magnesium (P)	Some wildlife inventory
Suspended Sediment (P)	Sodium (P)	
pH (P)	Potassium (P)	
Specific Conductivity (P)		
Total hardness (P)		
Total alkalinity (P)		
Sulfate (P)		
Chloride (P)		
SAR (P)		

Remarks:

Water quality monitoring - weekly May-November, monthly thereafter.
Quality control - excellent
Data collection scheduled through 1980.
Water samples collected from several points on stream May-November.

WATERSHED INVENTORY FORM SW-6

Watershed identification	Name: Seven Springs Watersheds Area: 497.8 ha. (1,230 acres) Type: Experimental
Administering organization	Name: USDA Forest Service Address: Rockey Mountain Forest & Range Experiment Sta. Forest Hydrology Lab Tempe, Arizona
Location	State: Arizona Latitude: 33°57'54" Longitude: 109°22'16"
Physiographic description	Geology: Basalt, cinder cones Typography: Rolling hills Vegetation: Grassland Soil: Loam, basalt rock Soil depth .6 - .9 m. (2' - 3' ft.) Climate: 50.8 cm. (20 in.) precipitation
Use	Past: Grazing Present: Grazing
Purpose of data collection	The watersheds are being gaged to evaluate the hydrology of high mountain grasslands. A snow management study is being planned.
Publications	None

Data availability To whom When Form	Collected data: All individuals on request. Daily Summaries: 1. Runoff - Computer Printout 2. Precipitation - Hand compilation 3. Temperature - Computer printout 4. Incoming radiation - Computer printout Supporting data: All individuals, upon request, Apache-Sitgreaves National Forest. Reports and surveys and written reports.
Date collection initiated	Runoff - February, 1963 Precipitation - November, 1963 Temperature - December, 1964 Incoming Radiation - September, 196
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Runoff (C)	Iron	Survival of coniferous transplants
Precipitation (C)	Fluoride	Range surveys
Temperature (C)		
Incoming radiation (C)		
Wind (C)		
Pan Evaporation (P)		
Water Quality (P)		
Suspended Sediment		
Tot. Dissolved Solids		
Calcium		
Chloride		
Magnesium		
Nitrate Nitrogen		
Orthophosphate		
Silicone		
Sodium		
Sulfate		
pH		
Bicarbonate		

Remarks:

Paired watersheds

East Fork 302.7 ha. (748 acres)
West Fork 195 ha. (482 acres)

WATERSHED INVENTORY FORM SW-7

Watershed identification	Name: Vallecita Crk. nr. Bayfield, Colo.(09352900) Area: 18674 ha (72.1 mi.) Type: Representative
Administering organization	Name: USGS Address: Washington, D.C. 20242
Location	State: Colorado Latitude: 37° 28' 45" Longitude: 107° 32' 35"
Physiographic description	Geology: Metamorphic rock Typography: Mountainous, elevation range - (7,900-14,084 ft.) 2,408 - 4,293 m Vegetation: Forested, Engelmann Spruce Soil: Those characteristic of S. Rockey Mtn. province Climate: Ave. Precip. (30") 76.2 cm Mo. Mean Temp. extremes - 17°-55°F 83°-127°C
Use	Past: Present: Wilderness area
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow 1962 Precipitation 1962 W. Qual. 1962
Date collection terminated	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Precipitation (C) (except winter) Air Temperature (C) Suspended sediment * Standard chemical analyses *	

Remarks:

* Monthly sampling,
Several small lakes within basin.

WATERSHED INVENTORY FORM SW-8

Watershed identification	Name: Halfmoon Creek nr. Malta, Colo. (07083000) Area: 5957 ha. (23 sq. mi.) Type: Representative
Administering organization	Name: U.S. Geological Survey Address: Washington, D.C. 20242
Location	State: Colorado Latitude: 39°11'10" Longitude: 106°22'55"
Physiographic description	Geology: Upper basin: schist Lower basin: morainal material Typography: Mountainous having steep slopes. Elev. range: 2969 m. - 4399 m. (9740' - 14431') Vegetation: Lodge pole pine, Engelmann spruce, and fir. Soil: Those characteristic of S. Rocky Mountain province. Climate: Ave. annual precipitation - 50.8 - 101.6 cm. (20-40") Moderate mean temperature extremes -18 - 57°F (-7.7 - 13.8°C)
Use	Past: Past burned; forested. Present: San Isabel National Forest
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	**Collected data:** All individuals upon request Transcribed, published. **Supporting data:** All individuals upon request Transcribed, published.
Date collection initiated	Streamflow - 1946 Precipitation - 1966 Water Quality - 1966
Date collection terminated	

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Sulfate	Minor elements*
Precipitation (C)	Chloride	Radioactivity*
Temperature (C)	Fluoride	Pesticides*
Conductance	Nitrates	
Dissolved Oxygen	Dissolved Solids	
Coliform	Suspended Sediment*	
Biological Oxygen Demand		
pH		
Hardness		
Silica		
Phosphate		
Iron		
Magnesium		
Calcium		
Sodium		
Potassium		
Bicarbonate		
Carbonate		

Remarks:

Unless noted, all samples collected once per month.

*Suspended sediment collected also during high flow.

*Supporting Data: 2 times per year.

WATERSHED INVENTORY FORM SW-9

Watershed identification	Name: Lake Cr. Barometer Wtrshd. Area: 80 sq. mi. Type: Representative
Administering organization	Name: USDA Forest Service Address: Pike-San Isabel N.F. Pueblo, Colorado
Location	State: Colorado Latitude: 39° 10' N Longitude: 106° 30' W
Physiographic description	Geology: Igneous or metamorphosed igneous - small area limestone Typography: 9200'-14,200' elev., 50% above 12,000', and slope 35%, rugged glaciated terrain Vegetation: 45-50% alpine, median elev. lodgepole, spruce-fir Soil: Yes. Ground morraines in valleys. Residual soils on slopes-colluvium. Climate: Continental cold, general S.W. storm track, summer, t-storms
Use	Past: Heavy sheep grazing - limited timber Present: Limited sheep grazing Limited timber harvest High recreation use
Purpose of data collection	
Publications	No

Data availability To whom When Form	Collected data: All individuals On request Transcribed of Data Process Supporting data: All individuals or agencies on request. Written reports - plans
Date collection initiated	1964
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)		Inventory - Baseline Data
Climatic	Precipitation	Management Implications
	Air Temperature	
	Wind	
	Solar (C)	
	Dewpoint	
	Snow	
Soils		
Avalance-Snow Fence (P)		
Water Quality (P)		

Water Quality (P):
- pH
- Dissolved Oxygen
- Turbidity
- Total Dissolved Solids
- Temperature
- Phosphate

One complete chemical analysis for all culinary supplies including the following:

Aluminum	Conductivity
Total coliform	Nickel
Arsenic	Copper
Barium	Hardness
Boron	Carbonate
Chloride	Sulfate
Phenols	Fluoride
Lead	Dissolved Oxygen
Mercury	Biological Oxygen Demand
Zinc	Temperature
Silver	pH
Nitrates	Manganese
Phosphates	
Magnesium	

Remarks:

WATERSHED INVENTORY FORM SW-10

Watershed identification	Name: Mogollan Crk. (09430600) Area: 17871 ha (69 sq mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: New Mexico Latitude: 33° 09' 50" Longitude: 108° 38' 55"
Physiographic description	Geology: Volcanic and quartz latates Typography: Steep and mountainous Vegetation: High elev. - pine and spruce Lower elev. - Juniper, cottonwood, Will Soil: Those characteristic of the Basin and Range Climate: Ave. annual precip. - 33 cm (13 in.) Mo. mean temp. extremes - 30° - 65° F -1.1° - 18.3° C
Use	Past: Present: Gila Wilderness Area
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, Published Supporting data: (Same)
Date collection initiated	Stream Flow - 1967 Water Quality - 1968
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Phosphate	Minor elements - 2 x/yr.
Conductance	Bicarbonate	Pesticides - 2 x/yr.
Dissolved Oxygen	Sulphate	Radioactivity - 2 x/yr.
Coliform, BOD	Nitrate	
Calcium	Silica	
Magnesium	Suspended Sediment*	
Sodium	Iron	
pH	Carbonate	
Hardness	Chloride	
	Fluoride	
	Dissolved solids	
	Potassium	

Remarks:
*Also collected during storm runoff.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SW-11

Watershed identification	Name: Three Bar Watersheds Area: 119.2 ha (294.5 ac.) Type: Experimental
Administering organization	Name: USDA Forest Service Address: Rockey Mt. Forest & Rng. Exp. Stat. Forest Hydrology Lab. ASU Campus, Tempe Arizona 85281
Location	State: Arizona Latitude: 33^0 43' Longitude: 111^0 19'
Physiographic description	Geology: Piecambrain Granite Typography: Rough steep slopes elevation 1006 to 1615 m (3300 to 5300 feet) Vegetation: Heavy density mixed chaparral. Soil: Granite soils Deeply Weathered Climate: Semiarid precipitation approx 58.4 cm (23 inches)
Use	Past: Grazing prior to 1940, game mgmt. and light recreation up to wildlire of 1959. Present: Watershed Conversion
Purpose of data collection	Monitor experimental conversion of Brush covered watersheds to grass cover to determine water yield improvement potential
Publications	1. Picloram movement from a chaparrel Watershed, 1973. 2. Increases in stream how after concerting chaparrel cover to grass, 1971. 3. Burned chaparrel to grass: Early effects on water and sediment yields from two granitic soil watersheds in Arizona 4. Others

Data availability To whom When Form	Collected data: All individulas on request summaries hand compelation, computer printouts, written reports Supporting data: All individuals on request written reports.
Date collection initiated	Runoff 1956 Precipitation 1956 Temperature 1962 Water Quality 1968
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Runoff (C) Piecipitation (C) Temperature (C) Water Quality (P)	Vegetation Survey Brush control Analysis Herbicide residue in soil and stream water

PH Chloride
Tot. Sol. Salts Carbonate
Elect. Cond. Bicarbonate
Calcium Nitrate
Magnesium Ammoriumm
Sodium Phosplide
Potassium

Remarks: Four Watersheds instrumented

Three Bar - B	18.1 ha (45 ac.)
Three Bar - C	38.9 ha (96 ac.)
Three Bar - D	33.7 ha (83 ac.)
Three Bar - F	28.5 ha (70 ac.)

WATERSHED INVENTORY FORM SW-12

Watershed identification	Name: Wet Bottom Creek near Childs, Arizona Area: 9427 ha. (36.4 sq. mi.) Type: Representative
Administering organization	Name: U.S. Geological Survey Address: Washington, D.C. 20242
Location	State: Arizona Latitude: 34°09'39" Longitude: 111°41'32"
Physiographic description	Geology: Granite with large outcrops of basaltic andesite. Typography: Rugged with mesas and ridges separated by steep canyons; elevation range: -670 - 2270 m. (2,200 - 7,450 ft.) Vegetation: Chaparral with pin on - juniper and pine at high elevation. Soil: Those characterisitc of Intermountain Platteau Climate: Average annual precipitation 50 - 76 cm. (20-30"). Mean moderate temperature extremes: 7-29°c. (45-85°F)
Use	Past: Present: Mazatzal Wilderness Area
Purpose of data collection	Benchmark station
Publications	

Data availability To whom When Form	Collected data:	All individuals; upon reqest: transcribed, published
	Supporting data:	(same)
Date collection initiated	Streamflow - 1967 Water Quality - 1967	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Sulfate	Minor elements*
Conductance	Chloride	Pesticides*
Temperature	Fluoride	Radioactivity*
Dissolved Oxygen	Nitrate	
Coliform	Dissolved Solids	
Biological Oxygen Demand		
Suspended Sediment		
Hardness		
pH		
Silica		
Phosphate		
Iron		
Magnesium		
Calcium		
Sodium		
Potassium		
Bicarbonate		
Carbonate		

Remarks:

Unless noted, all data collected once per month. Suspended sediment also collected during storm runoff.

*Supporting Data: 2 times per year

WATERSHED INVENTORY FORM SW-13

Watershed identification	Name: Rio Mora (08377900) Area: 13779 ha (53.2 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: New Mexico Latitude: 35° 46' 38" Longitude: 105° 39' 26"
Physiographic description	Geology: Siltstone, sandstone, shale, limestone Typography: Mountainous Vegetation: 80% - pine, spruce, fir. Some aspen and scrub oak. Soil: Those characteristic of S. Rocky Mtns. Province. Climate: Ave. annual precip. - 60.9 cm (24 in.) Mo. mean temp. extremes - 27° - 60° F -2.7° - 15.5° C
Use	Past: Present: Pack trails, cattle grazing, pecos wilderness area
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, purchased Supporting data: (Same)
Date collection initiated	Stream Flow - 1963 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Silica	Minor Elements - 2 x/yr.
Conductance	Phosphate	Pesticides - 2 x/yr.
Temperature	Nitrate	Radioactivity - 2 x/yr.
Dissolved Oxygen	Iron	
Coliform, BOD	Magnesium	
Suspended Sediment*	Carbonate	
pH	Sulfate	
Calcium	Chloride	
Hardness	Fluoride	
Bicarbonate	Dissolved Solids	
	Potassium	
	Sodium	

Remarks:

*Also collected during storm runoff.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SW-14

Watershed identification	Name: Red Butte Creek (10172200) Area: 1878 ha (7.25 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Utah Latitude: 40° 46' 50" Longitude: 111° 48' 20"
Physiographic description	Geology: Limestone, shale, sandstone Typography: Mountainous Vegetation: Oak brush, evergreens, aspen, weeds, willows, small maple Soil: Those characteristic of the Middle Rocky Mts. Province Climate: Ave. annual precip - 63.5 cm (25 in.). Mo. mean temp extremes -4°-21°C (25°-70°F)
Use	Past: Timber cutting, grazing Present: Preserved water supply for Fort Douglas
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Mo. streamflow - 1942 · S/W temperature - 1964 C. streamflow - 1963 · Water quality - 1967 Precipitation - 1941
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Calcium	Minor elements - 2 x/yr.
Precipitation (C)	Bicarbonate	Pesticides - 2 x/yr.
S/W Temperature (C)	Carbonate	Radioactivity - 2 x/yr.
Conductance	Magnesium	
Dissolved Oxygen	Sulfate	
pH	Chloride	
Coliform, Biological Oxygen Demand	Fluoride	
Suspended Sediment*	Dissolved Solids	
Hardness	Potassium	
Iron	Sodium	

Remarks:

* Also collected during storm runoff.

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SW-15

Watershed identification	Name: S. Twin R. (10249300) Area: 5180 ha (20 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Central Nevada Latitude: 28^{0} 53' 00" Longitude: 117^{0} 14' 35"
Physiographic description	Geology: Limestone, shales, and undifferentiated intrusives. Typography: Very rough mountainous terrain, potruding cliffs, steep slopes Vegetation: Thin pinon pine and grass, dense willow thickets along stream. Soil: Those characteristic of the Basin & Range Province Climate: Ave. annual precipitation - unknown. Mo. mean temp. extremes - 29^{0} - 72^{0} F; 1.7^{0} - 22^{0} C
Use	Past: Present:
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Stream Flow - 1965 S-W Temp. - 1965 W. Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Magnesium	Minor Elements - 2 x/yr.
Water temp. (C)	Bicarbonate	Pesticides - 2 x/yr.
Conductance	Silica	Radioactivity - 2 x/yr.
Temperature	pH	
Dissolved Oxygen	Hardness	
Coliform, BOD	Phosphate	
Calcium	Potassium	
Sodium	Iron	
Nitrate	Suspended Sediment*	
	Carbonate	
	Sulfate	
	Fluoride	
	Chloride	
	Dissolved Solids	

Remarks:

* Also collected during storm runoff.
Unless noted, data collected once per month.

WATERSHED INVENTORY FORM SW-16

Watershed identification	Name: Sheep Creek Area: 388 ha Type: Representative
Administering organization	Name: U.S.D.A. Forest Service Address: Fishlake National Forest Richfield, Utah 84701
Location	State: Utah Latitude: 38° 47' Longitude: 111° 41'
Physiographic description	Geology: Landslide debris from the North Horn Formation Typography: Old landslides, slumps, and land flows -- hummocky of interrupted drainage with benches and slump basin Vegetation: Aspen Soil: Silt loams and loams near surface grading into clays in the sub-surface layers Climate: Continental moderate
Use	Past: Grazing, wildlife, and recreation Present: Grazing, wildlife, and recreation
Purpose of data collection	Measure changes resulting from type conversion
Publications	Sheep Creek Water Evaluation Project

Data availability To whom When Form	Collected data: All individuals paying reproduction costs on request Supporting data: All individuals paying reproduction costs on request
Date collection initiated	1957
Date collection terminated	September, 1970, except for discharge, precipitation, and snow surveys which is ongoing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (C)	Soils inventory
Precipitation (C)	Vegetative inventory
Snow Surveys (C)	Wildlife survey
Temperature (Air) (P)	
Relative Humidity (P)	
Soil Moisture (P)	
Suspended Sediment (P)	
Temperature (Water) - 1958 to 1971	
Chemical Analysis (total of 22 tests) (P)	

Remarks:

This was an administrative study to determine if water yield could be increased by converting aspen cover to grass.

WATERSHED INVENTORY FORM SW-17

Watershed identification	Name: Steptoe Creek (10244950) Area: 2875 ha (11.1 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: E. - Central Nevada Latitude: 39^{0} 12' 05" Longitude: 114^{0} 41' 15"
Physiographic description	Geology: Limestone and some dolomite Typography: Steep mountainous terrain Vegetation: Pinon Pines and grass Soil: Those characteristic of Basin and Range Province Climate: Ave. annual precip - unknown Mo. mean temp. extremes - 23^{0} - 67^{0} F -5^{0} - 19.4^{0} C
Use	Past: Present: Sheep grazing
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Stream Flow - 1966 W. Temp. - 1966 W. Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Stream Flow (C)	Phosphate	
Water Temp (C)	Nitrate	
Calcium	Iron	
Magnesium	Carbonate	
Bicarbonate	Sulfate	
pH	Chloride	
Hardness	Fluoride	
Silica	Dissolved Solids	
	Potassium	
	Sodium	

Remarks:

Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM SW-18

Watershed identification	Name: Castle Creek - East Fort, West Fork Area: 834.9 ha. (2063 acres) Type: Experimental
Administering organization	Name: USDA, Forest Service Address: Rocky Mountain Forest & Range Experiment Sta. Forest Hydrology Lab Tempe, Arizona 85281
Location	State: Arizona Latitude: 33°42' 35 Longitude: 109°10' 55
Physiographic description	Geology: Basalt parent material Typography: Relatively flat Vegetation: Ponderosa Pine Soil: Fine, Fine Loamy, Basalt rock - soil depth .6 m. (2 1/2') Climate: 55.9 cm. (22") precipitation
Use	Past: Virgin Pine Forest Present: West Fork Harvested, East Fork Control
Purpose of data collection	Experiment to test the effects of patch cutting in a Pine Forest on water quality and on other resources.
Publications	Managing A Ponderosa Pine Forest To Increase Water Yield

Data availability To whom When Form	Collected data: All individuals on request daily summaries: 1. Runoff - Computer printout 2. Precipitation - hand compilation 3. Temperature - Computer printout 4. Incoming radiation - Computer printout Supporting data: Apache-Sitgreaves National Forest reports and surveys.
Date collection initiated	Runoff - March, 1956 Precipitation - August, 1956 Temperature - November, 1965 Incoming radiation - September, 1965
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Runoff (C)	Soil inventory
Precipitation (C)	Timber inventory
Temperature (C)	Grazing utilization
Incoming Radiation (C)	
Water Quality	
Suspended Sediment	
Tot. Dissolved Soilds	
Bicarbonate	
Calcium	
Chloride	
Magnesium	
Nitrate Nitrogen	
Silicone	
Sodium	
Sulfate	
pH	
Phosphorous	
Iron	
Fluride	

Remarks:

Paired watersheds

East Fork 471 ha. (1163 acres)
West Fork 364 ha. (900 acres)

WATERSHED INVENTORY FORM SW-19

Watershed identification	Name: Tesuque Watersheds Area: 1555 ha Type: Representative
Administering organization	Name: U.S. Dept. of Agriculture Forest Service Address: Santa Fe National Forest P.O. Box 1689 Santa Fe, New Mexico 87501
Location	State: New Mexico Latitude: 35^{0} 45' Longitude: 106^{0} 50'
Physiographic description	Geology: Precambrian undivided Embudo granitic Typography: Uneven mountain terrain Vegetation: Pinon-juniper thru spruce, fir and alpine Soil: Loam to sandy loam with up to 35% coarse fragments. Climate: Cold snow-forest climate with warm summers.
Use	Past: Low intensity recreation Present: Heavy recreation, one ski area
Purpose of data collection	Originally to evaluate water yield potential. Presently to monitor management activities and establish baseline water quality.
Publications	1. Hydrologic - Nutrient cycle Interactions in undisturbed and man manipulated ecosystems. 2. Snow Accumulation and Disappearance by Aspect and Vegetation type in the Santa Fe Basin, New Mexico 3. Effects of Road Surfacing and Salting on roadside vegetation in New Mexico Mountain Areas

Data availability To whom When Form	Collected data: All individuals On request Published and raw data (Some available through USGS and University of New Mexico) Supporting data: All individuals On request Summarized
Date collection initiated	1961-1965
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Soil Inventory
Temperature (C)	Vegetative Inventory
Humidity (C)	Range utilization
Streamflow (C)	
Water Quality (P)	
Nitrates	
Ammonia	
Calcium	
Magnesium	
Sodium	
Potassium	

Remarks: The watershed consists of 8 sub-watersheds

No.	Name	Size	Mean Elev.
15	Rio En Medio	403 sq. mi.	11,450 feet
8	No. Fk. Tesuque	1024	10,790
7	Middle Fk. Tesuque	275	10,670
6	So. Fk. Tesuque	302	10,655
5	Little Tesuque	410	10,175
4	Trib. #4 Little Tesuque	442	9,849
3	Trib. #3 Little Tesuque	416	9,330
2	Trib. #2 Little Tesuque	288	8,660

WATERSHED INVENTORY FORM SW-20

Watershed identification	Name: Willow Creek Area: (see remarks) Type: Experimental
Administering organization	Name: USDA Forest Service Address: Rocky Mountain Forest & Range Experiment Sta. Forest Hydrology Lab Tempe, Arizona 85281
Location	State: Arizona Latitude: $33^{0}39'$ Longitude: $109^{0}18'$
Physiographic description	Geology: Basalt Typography: Relatively Flat Vegetation: Mixed Conifer Soil: Fine, Fine loamy, Basalt, Rock Climate: 63.5 cm. (25 in.) precipitation
Use	Past: Virgin Forest Present: Timber Harvesting of East Fork
Purpose of data collection	Evaluation of water yields resulting from harvesting the East Fork Forest by a combination of overstorm removal and selection method.
Publications	None

Data availability To whom When Form	Collected data: All individuals as requested. Daily Summaries: 1. Runoff - computer printout 2. Precipitation - had compilation Supporting data: Apache-Sitgreaves National Forest surveys and reports.
Date collection initiated	Runoff - July, 1958 Precipitation - August, 1958
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Runoff (C)	Timber Inventory
Precipitation (C)	Grazing use
Water Quality (P)	Soils inventory
Silica	
Sodium	
Orthophosphate	
Iron	
Flouride	
Sulphate	
pH	
Total Dissolved Solid	
Bicarbonate	
Calcium	
Chloride	
Magnesium	
Nitrate	
Total Nitrogen	
Water Tempature (P)	
Snow Course (P)	

Remarks:

These are paired watersheds one control, one treatment.

Area: E. Fork 199.1 ha. (492 acres)
W. Fork 117.4 ha. (290 acres)

Watershed identification	Name: Heber Watersheds Area: 67.3 ha. (166.3 acres) Type: Experimental
Administering organization	Name: USDA Forest Service Address: Rocky Mountain Forest & Range Experiment Sta. Forestry Sciences Lab Flagstaff, Arizona 86001
Location	State: Arizona Latitude: (see remarks) Longitude: (see remarks)
Physiographic description	Geology: Tertiary gravels Paleozoic sandstone Typography: Rolling with moderate slopes. Vegetation: Ponderosa pine Soil: Loam to sandy loam Climate: Cool and subhumid
Use	Past: Timber harvest and grazing Present: Same
Purpose of data collection	Multiple use evaluation of watershed treatments.
Publications	None

Data availability To whom When Form	Collected data: All individuals pay reproduction costs on request. Transcribed reports, mag. tape, office reports, publications. Supporting data: Same
Date collection initiated	1972
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Snow surveys (P)	Vegetative Inventory
Suspended sediment (P)	Wildlife Inventory
Water Quality (P)	
Iron	
Floride	
Sulphate	
pH	
Tot. Dis. Solids	
Bicarbonate	
Calcium	
Chloride	
Magnesium	
Nitrate	
Total Nitrogen	
Orthophosphate	
Silica	
Sodium	
Discharge (C)	
Precipitation (C)	

Remarks:

There are four instrumented watersheds.

HE 1	7.77	ha.	(.03 sq. mi.)
HE 2	10.4	ha.	(.04 sq. mi.)
HE 3	23.3	ha.	(.09 sq. mi.)
HE 4	25.9	ha.	(.10 sq. mi.)

WATERSHED INVENTORY FORM SW-22

Watershed identification	Name: Rattleburn Watersheds Area: 31.1 ha. (768 acres) Type: Experimental
Administering organization	Name: USDA Forest Service Address: Rockey Mountain Forest & Range Experiment Sta. Forestry Sciences Lab Flagstaff, Arizona 86001
Location	State: Arizona Latitude: (see remarks) Longitude: (see remarks)
Physiographic description	Geology: Paleozoic limestone Typography: Rolling with moderate slopes Vegetation: Ponderosa Pine Soil: Loam Climate: Cool subhumid
Use	Past: Timber harvesting and grazing Present: Same
Purpose of data collection	Multiple use evaluations of watershed treatments
Publications	

Data availability To whom When Form	Collected data: All individuals paying reproduction costs on request. Transcribed reports, mag. tape, office reports, publications. Supporting data: Same as above
Date collection initiated	1972
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Suspended Sediment (P)	Soil Inventory
Water Quality (P)	Vegetative Inventory
Iron	
Fluoride	
Sulphate	
pH	
Total Dis. Solids	
Bicarbonate	
Calcium	
Chloride	
Magnesium	
Nitrate	
Total Nitrogen	
Ortho phosphate	
Silica	
Sodium	
Suspended Sediment (P)	
Water Quality (P)	
Discharge (C)	
Precipitation (C)	

Remarks:

There are 3 watersheds.

RB1	5.18 ha. (.02 sq. mi.)	LAT: 35°01'35"	LONG: 111°51'08"
RB2	7.77 ha. (.03 sq. mi.)	LAT: 35°00'35"	LONG: 111°51'32"
RB3	18.13 ha. (.07 sq. mi.)	LAT: 35°00'19"	LONG: 111°51'15"

WATERSHED INVENTORY FORM SW-23

Watershed identification	Name: Whitespar Watersheds Area: 220.2 ha. (543 acres) Type: Experimental
Administering organization	Name: USDA Forest Service Address: Rocky Mountain Forest & Range Experiment Sta. Forest Hydrology Lab Tempe, Arizona 85281
Location	State: Arizona Latitude: Longitude:
Physiographic description	Geology: Granite intruded with schist. Typography: Rough steep slopes. Elevation 5800 ft. to 7000 ft. Vegetation: Moderate to high density mixed chaparral. Soil: Derived from granite and schist. Deeply weathered. Climate: Semiarid, 61 cm. (24 in.) precipitation.
Use	Past: Grazing Present: Grazing and conversion.
Purpose of data collection	To monitor the conversion of a watershed by brush removal to determine increased water yield.
Publications	1. Suppression of Channel Side Chaparral cover increases streamflow. 2. Converting Chaparral to grass to increase streamflow

Data availability To whom When Form	Collected data: All individuals; on request; summaries, computer printouts, written reports. Supporting data: All individuals; on request: written reports.
Date collection initiated	Runoff - 1958 Precipitation - 1958 Temperature - 1960 Water Quality - 1972 Herbicide residue - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Runoff (C)	Brush Control Analysis
Precipitation (C)	Vegetation Survey
Temperature (C)	Wildlife Survey
Water Quality (P)	
pH	
Tot. Soluable Salts	
Electrical Conductivity	
Calcium	
Magnesium	
Sodium	
Potassium	
Chloride	
Carbonate	
Bicarbonate	
Nitrate	
Ammonium	
Phosphate	

Remarks:

Two Watersheds are instrumented

Whitespar A 121.8 ha. (300 acres)
Whitespar B 98.4 ha. (243 acres)

WATERSHED INVENTORY FORM SW-24

Watershed identification	Name: Truckee River Sub basins Area: 0.87 to 30.73 sq. mi. Type: Experimental and Representative
Administering organization	Name: Renewable Resources Center Address: University of Nevada Reno, Nevada
Location	State: Nevada Latitude: 38^{0}-39^{0} Longitude: 119^{0}-120^{0}
Physiographic description	Geology: Ranges from granite, andesite, volcanic, granodiorite, mixed metavolcanic and meta sedimentary, sedimentary Typography: Steep ridges, narrow stream bottom Vegetation: Jeffrey pine, manzanita, mtn mahogany Soil: Coarse, shallow Climate: Subhumid continental to humid Cold winter, mod. to heavy precip.
Use	Past: Grazing, some logging Present: Grazing, recreation
Purpose of data collection	Water quality research investigating sources and movement of sediments and dissolved nutrients.
Publications	1. Suspended sediment production and basin characteristics of twenty-four Truckee River subbasins. 2. A preliminary analysis of factors affecting nitrogen and phosphorus production from small watersheds. 3. Nutrient and sediment production from forested watersheds. 4. Nutrients and suspended sediments for forested watersheds in the east-central Sierra Nevada.

Data availability To whom When Form	Collected data: All individuals On request Format - computer printout
	Supporting data: All individuals for cost of reproduction On request Written reports
Date collection initiated	August 1970
Date collection terminated	August 1974

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Nitrate Nitrogen (P) Organic Nitrogen (P) Orthophosphate (P) Suspended Sediment (P) Discharge (P) Electrical Conductivity (P) Stream Temperature (P)	Soils, geology, vegetation, wildlife, land-use, and other information are available from this agency and others.

Remarks:

31 forested watersheds in the east-central Sierra-Nevada and Truckee River Subbasins.

Snow quality and quantity measurements are being made on a regional basis. An analysis of this watershed is in progress in terms of factors which apparently affect yields of dissolved nutrients and suspended sediments. Primary investigations by Renewable Resources Center
U. of Nevada
Reno

WATERSHED INVENTORY FORM SW-25

Watershed identification	Name: Halfway Creek Area: 187.8 ha. Type: Research
Administering organization	Name: USDA Forest Service Address: Intermountain for Rng. & Exp Sta. Forestry Sciences Laboratory 860 North 12th East Logan, Utah 84321
Location	State: Utah Latitude: 41° 00' 30" Longitude: 111° 51'
Physiographic description	Geology: Pre-Cambrian metamorphic gneiss and schist Typography: 30-40% gradients, "V" shaped channels to bedrock south slope. Vegetation: Oakbrush - lower slopes to mountain brush grass higher elevation. Soil: Coarse, immature, rocky, shallow Climate: Dry summer, wet winter, 76-101.6cm (30-40") annual precipitation
Use	Past: Heavy grazing, timber harvest Present: Protected since 1930
Purpose of data collection	Baseline water quality research watersheds
Publications	Doty, R.D. and E. Hookano, Jr. 1974. Water Quality of three small watersheds in Northern Utah. USDA Forest Service Research Note INT-186 6 p. Doty, R.D. 1971. Contour trenching effects on streamflow from Utah watershed. USDA, Forest Service Research Paper INT-95 19 p.

Data availability To whom When Form	Collected data: All individuals on request Published. Supporting data: On request
Date collection initiated	1970
Date collection terminated	1972

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (C)	Geologic mapping
pH (P)	Vegetation Survey
Specific Conductance (P)	
Total Organic Demand (P)	
Total Alkalinity (P)	
Calcium (P)	
Magnesium (P)	
Phosphorus (P)	
Potasium (P)	
Nitrogen (P)	
Suspended Sediment (P)	
Total Coliform (P)	
Fecal Coliform (P)	
Fecal Streptococcus (P)	

Remarks:

Samples collected weekly April- November. Semimonthly thereafter
Upper 20% watershed contour trenched 1964.

WATERSHED INVENTORY FORM SW-26

Watershed identification	Name: Corduroy Creek Area: 56.7 ha Type: Research
Administering organization	Name: USDA Forest Service Address: IF&RES Forestry Sci. Lab. 860 North 12th East Logan, Utah 84321
Location	State: Utah Latitude: Longitude: 111° 51'
Physiographic description	Geology: Pre-Cambrian metamorphic gneiss and schist Typography: 30-40% gradients, "V" shaped channels to bedrock south slope Vegetation: Oakbrush - lower slopes to mtn. brush grass higher elevation Soil: Coarse, immature, rocky, shallow Climate: Dry summer, wet winter, 76 - 101 cm (30-40 inches) annual precipitation
Use	Past: Heavy grazing, timber harvest Present: Protected since 1930
Purpose of data collection	Baseline water quality research watersheds
Publications	Doty, R.D. and E. Hookano, Jr., 1974. Water quality of three small watersheds in Northern Utah. USDA For. Ser. Res. Note INT-186. 6 p. Doty, R.D., 1971. Contour trenching effects on streamflow from a Utah watershed. USDA, For. Serv. Res. Pap. INT-95. 19 p.

Data availability To whom When Form	Collected data: All individuals On request Published Supporting data: On request
Date collection initiated	1970
Date collection terminated	1972

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Discharge (C)	Suspended Sediment*	Geologic mapping
pH (P)	Total coliform	Vegetation survey
Specific conductivity (P)	Fecal coliform	
	Fecal Streptococcus	
Total alkalinity (P)		
Calcium (P)		
Magnesium (P)		
Phosphorus (P)		
Potassium (P)		
Nitrate-Nitrogen (P)		
SAR		

Remarks:

WATERSHED INVENTORY FORM SW-27

Watershed identification	Name: North Creek Area: 23,828 ha Type: Representative
Administering organization	Name: Forest Service, USDA Address: Dixie National Forest 500 South Main Street Cedar City, Utah 84720
Location	State: Utah Latitude: 37° 46' Longitude: 111° 41'
Physiographic description	Geology: Straight cliffs and Wahweap Sandstone formations, and Basalt and andesite Typography: Canyon walls, colluvial slopes, long ridges, and steep toeslopes Vegetation: Pinyon, juniper, oakbrush, ponderosa pine, and aspen Soil: Canyon walls and colluvial slopes - gravelly sandy loam. Ridges and toeslopes - gravelly clay loam Climate: Continental semiarid
Use	Past: Grazing and recreation Present: Grazing, recreation, and timber harvest
Purpose of data collection	Baseline water quality
Publications	None

Data availability To whom When Form	Collected data: All individuals on request Supporting data: All individuals paying reproduction costs
Date collection initiated	July 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Fecal coliform (P)	Soils inventory
Turbidity (P)	
Water temperature (P)	
Dissolved oxygen (P)	
pH (P)	
Specific conductivity (P)	
Complete chemical analysis (P)	
Total coliform (P)	
Fecal streptococcus (P)	

Remarks:

Data collection will continue through 1976.

WATERSHED INVENTORY FORM SW-28

Watershed identification	Name: Pleasant Creek Area: 44,548 ha Type: Representative
Administering organization	Name: Forest Service, USDA Address: Dixie National Forest 500 South Main Street Cedar City, Utah 84720
Location	State: Utah Latitude: 38° 17' Longitude: 111° 6'
Physiographic description	Geology: Kayenta sandstone, glacial drift, and mixed alluvium Typography: Rocky dissected canyons and sideslopes, glaciated troughs, and slopes, and alluvial valleys Vegetation: Pinyon, juniper, ponderosa pine, scattered oak and aspen and sage Soil: Valleys - deep sandy loam soils; glaciated areas - cobbly loams and clay loam soils. Canyons & sideslopes-shallow gravelly soils with numerous rock outcrops. Climate: Continental semiarid
Use	Past: Grazing and recreation Present: Grazing and recreation
Purpose of data collection	To determine recreational impacts on water quality
Publications	None

Data availability To whom When Form	Collected data: All individuals on request Supporting data: All individuals paying reproduction costs
Date collection initiated	June 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Fecal coliform (P)	Soils inventory
Nitrates (P)	Benthic Organism Sampling
Phosphates (P)	
Turbidity (P)	
Water Temperature (P)	
Specific conductivity (P)	
pH (P)	
Dissolved Oxygen (P)	
Total coliform (P)	
Fecal streptococcus (P)	

Remarks:

Data collection will continue through 1976 on a regular basis; after 1976 data will only be collected periodically if no water quality problems were detected during the initial monitoring period.

WATERSHED INVENTORY FORM SW-29

Watershed identification	Name: Pine Creek Area: 20,202 ha Type: Representative
Administering organization	Name: Forest Service, USDA Address: Dixie National Forest 500 South Main Street Cedar City, Utah 84720
Location	State: Utah Latitude: 37° 45' Longitude: 111° 35'
Physiographic description	Geology: Navajo sandstone, and shale and gypsum from the carmel formation Typography: Sandstone canyons and mesa tops, and shaley sideslopes Vegetation: Scattered pinyon, juniper, ponderosa pine, and manzanita Soil: Canyons - rock outcrop, no soils; Mesa tops - shallow fine loamy sand soils; sideslopes - shallow very fine sandy loam soils. Climate: Continental semiarid
Use	Past: Grazing and timber harvest Present: Grazing
Purpose of data collection	Baseline water quality
Publications	None

Data availability To whom When Form	Collected data: All individuals on request Supporting data: All individuals paying reproduction costs
Date collection initiated	July 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Fecal coliform (P)	Soils inventory
Turbidity (P)	
Water temperature (P)	
Dissolved oxygen (P)	
pH (P)	
Specific conductivity (P)	
Complete chemical analysis (P)	
Total coliform (P)	
Fecal streptococcus (P)	

Remarks:

Data collection will continue through 1976.

WATERSHED INVENTORY FORM SW-30

Watershed identification	Name: Kingston Area: 23 sq. mi. Type: Representative
Administering organization	Name: Forest Supervisor Address: Toiyabe National Forest 111 No. Virginia St., Rm. 601 Reno, NV 89501
Location	State: Nevada Latitude: 39^{o} 13' N Longitude: 117^{o} 05' W
Physiographic description	Geology: Volcanic and sedimentary Typography: Mature dissected front lands, narrow canyons Vegetation: Pinyon-juniper, sagebrush willow Soil: Variable with slope position and parent material Climate: Moist subhumid, dry subhumid, and moist steppe
Use	Past: Mining, grazing Present: Recreation, grazing, mineral exploration, subdivision below NF Boundary
Purpose of data collection	Background data to control mining activity, to insure protection of fishery and downstream domestic use
Publications	None

Data availability To whom When Form	Collected data: All individuals on request Supporting data: All
Date collection initiated	August 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data

Discharge (C)
Dissolved Oxygen (P)
Silica (P)
Calcium (P)
Magnesium (P)
Sodium (P)
Potassium (P)
Carbonate (P)
Bicarbonate (P)
Sulfate (P)
Chloride (P)
Fluoride (P)
Nitrate (P)
Nitrite (P)
Phosphorus (P)
Cyanide (P)
Benthic (P)
Hardness (P)
Conductivity (P)
Sediment (P)
pH (P)
Temperature (P)
Coliform (BP)
Arsenic (P)
Copper (P)
Zinc (P)
Mercury (P)

Supporting Data

Geologic mapping
Vegetation inventory
Soil reconnaissance
Land use plan

Remarks:

One of few good perennial fishing streams in central Nevada. Has deactivated streamgage and precip. storage gage. Near proposed SCS SNOTEL site.

WATERSHED INVENTORY FORM SW-31

Watershed identification	Name: Mingus Watersheds Area: 83 ha. (205 acres) Type: Experimental
Administering organization	Name: USDA Forest Service Address: Rockey Mountain Forest & Range Experiment Sta. Forest Hydrology Laboratory Tempe, Arizona 85281
Location	State: Arizona Latitude: $34^{o}39'$ Longitude: $112^{o}11'$
Physiographic description	Geology: Pie cambrian volcanic and sedimentary rock Typography: Rough steep slopes Elevation 6,000 - 6,900 ft. Vegetation: Moderate Density mixed chaparral Soil: Schistose and slatey rocks, some sandy loam. Deeply weathered. Climate: Semi arid 45.7 cm. (18 in.) precipitation
Use	Past: Grazing Present: Grazing
Purpose of data collection	To monitor experimental conversion from brush to grass by chemicals to determine potentials for water yield improvement.
Publications	None

Data availability To whom When Form	Collected data:	All individuals, on request, computer printout, raw data, compiled written reports.
	Supporting data:	All individuals, on request written reports.
Date collection initiated	Runoff - 1958 Precipitation - 1958 Temperature - 1959 Water Quality - 1974	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Runoff (C)	Vegetation Survey
Precipitation (C)	Brush Control Analysis
Temperature (C)	Soil fertility
Water Quality(P)	Herbicide residues in soil and stream water
pH	
Tot. Sol. Salts	
Elect. Cond.	
Calcium	
Magnesium	
Sodium	
Potassium	
Chloride	
Carbonate	
Bicarbonate	
Nitrate	
Ammonium	
Phosphate	

Remarks: There are three watersheds instrumented.

Mingus A	38.9 ha. (96.0 acres)
Mingus B	25.9 ha. (64 acres)
Mingus C	18.2 ha. (44.8 acres)

WATERSHED INVENTORY FORM SW-32

Watershed identification	Name: Whipple Creek Area: 145.3 ha Type: Research
Administering organization	Name: USDA Forest Service Address: IF&RES Forestry Sci. Lab. 860 North 12th East Logan, Utah 84321
Location	State: Utah Latitude: Longitude: 111° 51'
Physiographic description	Geology: Pre-Cambrian metamorphic gneiss and schist Typography: 30-40% gradients, "V" shaped channels to bedrock south slope Vegetation: Oakbrush - lower slopes to mtn. brush grass higher elevation Soil: Coarse, immature, rocky, shallow Climate: Dry summer, wet winter, 76-101.6 cm (30-40 in) annual precipitation
Use	Past: Heavy grazing, timber harvest Present: Protected since 1930
Purpose of data collection	Baseline water quality research watersheds
Publications	Doty, R.D. and E. Hookano, Jr., 1974. Water quality of three small watersheds in Northern Utah. USDA For. Serv. Res. Note INT-186. 6 p. Doty, R.D., 1971. Contour trenching effects on streamflow from a Utah watershed. USDA, For. Serv. Res. Pap. INT-95. 19 p.

Data availability To who When Form	Collected data: All individuals on request. Published. Supporting data: On request
Date collection initiated	1970
Date collection terminated	1972

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Discharge (C)	Suspended Sediment (P)	Geologic mapping
pH (P)	T. Coliform (P)	Vegetation survey
Specific conductivity (P)	Fecal coliform (P)	
Total Dissolved Solids (P)	Fecal streptococcus (P)	
T. Alkalinity (P)		
Calcium (P)		
Magnesium (P)		
Phosphorous (P)		
Potassium (P)		
Nitrate-Nitrogen (P)		
SAR (P)		

Remarks:

WATERSHED INVENTORY FORM SW-33

Watershed identification	Name: Thomas Creek Watersheds Area: 421.9 ha. (1042 acres) Type: Experimental
Administering organization	Name: Rocky Mountain Forest & Range Experiment Sta. Address: Forest Hydrology Lab Tempe, Arizona 85281
Location	State: Arizona Latitude: 33°40'28" Longitude: 109°16'08"
Physiographic description	Geology: Basalt Typography: Steep slopes near Weirs, relatively flat at upper ends. Vegetation: Mixed conifer Soil: Fine, fine loamy, basalt rock Soil depth .9 - 1.83 m. (3' - 6') Climate: 63.5 cm. (25 in.) precipitation
Use	Past: Virgin Forest, grazing Present: Virgin Forest
Purpose of data collection	The watersheds are under calibration for a multiple use treatment on South Fork in 1976. Intent is to monitor multiple use.
Publications	None

Data availability To whom When Form	Collected data: All individuals as requested: Daily summaries: 1. Runoff - computer printout 2. Precipitation - hand compilation Supporting data: Apache-Sitgreaves National Forest, reports, surveys and written reports.
Date collection initiated	Runoff - August, 1960 Precipitation - November, 1962 Temperature - July, 1973 Solar & Net Radiation - July, 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Runoff (C)	Sulphate	Timber inventory
Precipitation (C)	pH	Esthetic evaluation
Temperature (C)	Total Dissolved Solids	Soil inventory
Solar Radiation (P & C)	Bicarbonate	
Sediment Sampling (P)	Calcium	
Relative Humidity (C)	Chloride	
Snow Survey (P)	Magnesium	
Soil Moisture (P) (limited)	Nitrate	
Transmissity (P)	Total Nitrogen	
Snow density (P)		
Water Quality (P)		
Silica		
Sodium		
Orthophosphate		
Iron		
Flouride		

Remarks:

Paired watersheds control and treated

North Fork 178.5 ha. (441 acres)
South Fork 243.2 ha. (601 acres)

WATERSHED INVENTORY FORM SW-34

Watershed identification	Name:	San Luis Basins
	Area:	777 ha (3 sq. mi.)
	Type:	Experimental
Administering organization	Name:	Rocky Mountain Forest and Range Exp. Sta.
	Address:	5423 Federal Bldg. 517 Gold Ave. SW Albuquerque, New Mexico 87101
Location	State:	New Mexico
	Latitude:	35^{o} 45'N
	Longitude:	107^{o} 05'W
Physiographic description	Geology:	Alluvial, formed from eroding shale and sandstone
	Typography:	Flat with high mesas
	Vegetation:	Grassland and some pinyon-juniper sagebrush.
	Soil:	Alluvial fill, clays and loams
	Climate:	Semi-arid
Use	Past:	Grazing
	Present:	Research/Grazing
Purpose of data collection		To determine methods of watershed restoration through the use of vegetation and mechanical land treatments.
Publications		Ground Cover Changes in relation to runoff and erosion in west central New Mexico Summer Deferred grazing can improve deteriorated semi desert ranges Production Capabilities of some Upper Rio Puerco soils of New Mexico

Data availability To whom When Form	Collected data: All persons Allow 2 months to deliver Tabular for Supporting data: (Same)
Date collection initiated	1952
Date collection terminated	1972

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Geology
Snowfall (P)	Ground Cover
Sedimentation (P)	Animal Use

Remarks:

There are 3 basins instrumented.
There is a 20 year data base.

WATERSHED INVENTORY FORM SW-35

Watershed identification	Name: Watersheds A and B Area: Each 10 acres - ¼ mile apart Type: Experimental
Administering organization	Name: USDA Forest Service Address: Intermountain Forest & Range Expt. Stn. Ogden, Utah 84401
Location	State: Utah Latitude: $39^{o}15'$ N Longitude: $111^{o}30'$ W
Physiographic description	Geology: Residual soil on limestone bedrock Typography: Moderate sloping to SW Vegetation: Subalpine herbaceous range with Engelmann spruce clumps Soil: Clayey loam Climate: Great Basin Montane
Use	Past: Livestock grazing Present: Protected
Purpose of data collection	To relate vegetation and soil conditions to quantity and quality of water from small range watersheds.
Publications	Two 1. A study of the influence of herbaceous plant cover on surface runoff and soil erosion in relation to grazing on the Wasatch Plateau in Utah. 2. Watersheds A and B -- a study of surface runoff and erosion in the subalpine zone of Utah.

Data availability To whom When Form	Collected data: All individuals On request Copy machine copies Supporting data: All individuals paying copy costs.
Date collection initiated	1912
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Suspended sediment (P)	Soils Inventory
Bedload (P) total catch	Geologic mapping
Discharge (C)	Vegetative inventory and ecological changes
Precipitation (C)	

Remarks:

Watersheds are currently protected from grazing, being monitored, but not used for any activity.

WATERSHED INVENTORY FORM SW-36

Watershed identification	Name: Mammoth Creek Area: 27,195 ha. Type: Representive
Administering organization	Name: Forest Service U.S.D.A. Address: Dixie National Forest 500 South Main Street Cedar City, Utah 84720
Location	State: Utah Latitude: 37^{0} 37' Longitude: 112^{0} 27'
Physiographic description	Geology: Eocene Wasatch formation and volcanic deposits. Typography: Basalt flows, steep side slopes and alluvial valley bottoms. Vegetation: Aspen, ponderosa pine, spruce, pinyon, juniper and grasses. Soil: Alluvial valleys - deep gravelly silt loam and silt clay loam soils. Side slopes - Moderately deep to deep gravelly silty clay loam soils. Climate: Continental semiarid
Use	Past: Grazing and timber harvest Present: Grazing timber harvest and subdivision.
Purpose of data collection	To determine the effects of subdivision development on water quality.
Publications	None

Data availability To whom When Form	Collected data: All individuals on request Supporting data: All individuals paying reproduction costs.
Date collection initiated	July 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (U.S.G.S.) (C)	Soil Inventory
Fecal coliform (P)	Benthic organism sampling
Temperature (P)	
Turbidity (P)	
Dissolved oxygen (P)	
pH (P)	
Specific conductivity (P)	
Complete chemical analysis (P)	
Total coliform (P)	
Fecal streptococcus (P)	

Remarks:
Data collection will continue through 1976 on a regular basis, after 1976 data will only be collected periodically if on water quality problems were detected during the inital monitoring period.

WATERSHED INVENTORY FORM SW-37

Watershed identification	Name: Antimony Creek Area: 25,133 ha Type: Experimental
Administering organization	Name: Forest Service, U.S.D.A. Address: Dixie National Forest 500 South Main Street Cedar City, Utah 84720
Location	State: Utah Latitude: 38° 09' Longitude: 112° 00'
Physiographic description	Geology: Tertiary volcanic rocks and basalt flows. Typography: Gently sloping hill country above the plateau rim and steep dissected slopes below the rim. Vegetation: Aspen, subalpine fir, Engelmann, spruce, grass, sagebrush. Soil: Moderately deep to deep gravelly loams and gravelly clay loams above the plateau rim, and shallow gravelly soils below the rim. Climate: Continental semiarid.
Use	Past: Grazing and timber harvest Present: Grazing and timber harvest
Purpose of data collection	Baseline water quality
Publications	One: Antimony Barometer Watershed Accomplishment Report.

Data availability To whom When Form	Collected data: All individuals on request Supporting data: All individuals paying reproduction costs.
Date collection initiated	July 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (U.S.G.S.) (C)	Hydrolocic analysis
Fecal coliform (P)	Soils inventory
Turbidity (P)	Precipitation data
Water Temperature (P)	Temperature data
Dissolved oxygen (P)	Dew Point data
pH - (P)	Wind data
Specific conductivity (P)	
Complete chemical analysis (P)	
Total coliform (P)	
Fecal streptococcus (P)	

Remarks:

Antimony Creek was an active barometer watershed from 1967 to 1972. The accomplishment report on the watershed was published in April 1975.

Water quality data collection will continue through 1976.

WATERSHED INVENTORY FORM SW-38

Watershed identification	Name: Blue Springs Creek Area: 3885 ha Type: Representative
Administering organization	Name: Forest Service U.S.D.A. Address: Dixie National Forest 500 South Main Street Cedar City,Utah 84720
Location	State: Utah Latitude: 37^{o} 42' Longitude: 112^{o} 39'
Physiographic description	Geology: Alluvial deposits, Brian head formation and intermediate volcanics Typography: Alluvial valleys and rocky toeslopes. Vegetation: Engelmann spruce, douglas fir, aspen, and ponderosa pine. Soil: Valley bottoms - imperfectly drained clayey soils. Toeslopes - moderately deep gravelly clay loam soils. Climate: Continental semiarid
Use	Past: Grazing Present: Grazing
Purpose of data collection	Baseline water quality
Publications	None

Data availability To whom When Form	Collected data: All individuals on request Supporting data: All individuals paying reproduction costs.
Date collection initiated	July 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Fecal coliform (P)	Soils inventory
Nitrates (P)	Benthic organism sampling
Phosphates (P)	
Turbidity (P)	
Water temperature (P)	
Dissolved oxygen (P)	
pH (P)	
Specific conductivity (P)	
Total coliform (P)	
Fecal streptococcus (P)	

Remarks:

Data collection will continue through 1976.

WATERSHED INVENTORY FORM SW-39

Watershed identification	Name: Coal Creek Area: 20,979 ha Type: Representative
Administering organization	Name: Forest Service, U.S.D.A. Address: Dixie National Forest 500 South Main Street Cedar City, Utah 84720
Location	State: Utah Latitude: $37^{\circ} 41'$ Longitude: $113^{\circ} 5'$
Physiographic description	Geology: Shallow soils over tertiary Brian head and Wasatch sedimentary deposits, and cretaceous Kaiparowits and straight cliffs deposits Typography: Steep walled canyons, rugged cliffs, wooded slopes, and grassy benches. Vegetation: Aspen, white fir, Douglas fir, and grasses and forbs Soil: Clay loams, sandy loams and silt loams. Climate: Continental semiarid
Use	Past: Grazing and recreation Present: Grazing and recreation
Purpose of data collection	To determine the effects of recreation on water quality
Publications	One: Hydrologic Analysis of the National Forest Lands within the Coal Creek Drainage.

Data availability To whom When Form	Collected data: All individuals on request Supporting data: All individuals paying reproduction costs.
Date collection initiated	June 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Fecal coliform (P)	Hydrologic analysis
Turbidity (P)	Precipitation data
Water temperature (P)	Range analysis
Dissolved oxygen (P)	Soils inventory
pH (P)	
Specific conductivity (P)	
Total coliform (P)	
Fecal streptococcus (P)	

Remarks:

Data collection will continue through 1976 on a regular basis;after 1976 data will only be collected periodically if no water quality problems were detected during the initial monitoring period.

WATERSHED INVENTORY FORM SW-40

Watershed identification	Name: Whiterocks Area: 113 sq. mi. Type: Representative
Administering organization	Name: U.S.D.A. Forest Service Address: Ashley National Forest 437 E. Main Vernal, Utah 84078
Location	State: Utah Latitude: 40^{o} 33' 54" Longitude: 109^{o} 55' 37"
Physiographic description	Geology: Glaciated valleys cut in pre-cambrian and younger formations. Drift covered valley-unglaciated divides Typography: Flat cirque basins surrounded by steep walls leading to stream canyons. Vegetation: Lodgepole pine, spruce-fir, aspen, sagebrush Soil: Cobbles, sand, sandy loam, clay loam Climate: Mountain
Use	Past: Grazing, timber harvest, recreation Present: Grazing, timber harvest, recreation
Purpose of data collection	Baseline water quality
Publications	None

Data availability To whom When Form	Collected data: All On request To be placed on STORET Supporting data:
Date collection initiated	May 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Turbidity (P)	Iron (P)	Range Environmental Analysis
pH (P)	Lead (P)	Timber Inventory
Total dissolved (P) solids	Magnesium (P)	Hydrologic Recon.
Alkalinity (P)	Nitrate (P)	Land Use Plan
Aluminum (P)	Phosphate (P)	Geologic Map (University of Utah)
Bicarbonate (P)	Potassium (P)	
Calcium (P)	Silica (P)	
Carbonate (P)	Sodium (P)	
Chloride (P)	Sulfate (P)	
Copper (P)	Total coliform (P)	
Fluoride (P)	Fecal coliform (P)	
Total Hardness (P)	Discharge (C)	
Hydroxide (P)		

Remarks:

WATERSHED INVENTORY FORM SW-41

Watershed identification	Name: Dry Fork Ashley Area: 44.4 sq. mi. Type: Representative
Administering organization	Name: U.S.D.A. Forest Service Address: Ashley National Forest 437 E. Main Vernal, Utah 84078
Location	State: Utah Latitude: 40^{o} 37' 35" Longitude: 109^{o} 49' 10"
Physiographic description	Geology: Mature topography underlain by moderately dipping quartzites, sandstones, and limestones. Some glaciation Typography: Rolling uplands dissected by rejuvenated streams Vegetation: Lodgepole pine, spruce-fir, sage-grass Soil: Rocky sand, sandy loam, clay loam Climate: Mountain
Use	Past: Grazing, timber harvest Present: Grazing, timber harvest, low intensity recreation
Purpose of data collection	Baseline water quality for municipal watershed
Publications	None

Data availability To whom When Form	Collected data: All On request To be placed on STORET Supporting data:
Date collection initiated	May 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Turbidity (P)	Iron (P)	Range Environmental Analysis
pH (P)	Lead (P)	Timber Inventory
Total dissolved solids (P)	Magnesium (P)	Hydrologic recon.
Alkalinity (P)	Nitrate (P)	Geologic map (University of Utah)
Aluminum (P)	Phosphate (P)	
Bicarbonate (P)	Potassium (P)	
Calcium (P)	Silica (P)	
Carbonate (P)	Sodium (P)	
Chloride (P)	Sulfate (P)	
Copper (P)	Total coliform (P)	
Fluoride (P)	Fecal coliform (P)	
Total Hardness (P)	Discharge (C)	
Hydroxide (P)		

Remarks:

WATERSHED INVENTORY FORM SW-42

Watershed identification	Name: Yellowstone Area: 131 sq. mi. Type: Representative
Administering organization	Name: U.S.D.A. Forest Service Address: Ashley National Forest 437 E. Main Vernal, Utah 84078
Location	State: Utah Latitude: 40^{o} 30' 43" Longitude: 110^{o} 20' 27"
Physiographic description	Geology: Glaciated valleys cut in pre-cambrian and younger formations. Draft covered valleys - unglaciated divides Typography: Flat cirque basins surrounded by steep walls leading to stream canyons Vegetation: Lodgepole pine, spruce-fir, aspen, sage-grass Soil: Cobbles, sand, sandy loam, clay loam Climate: Mountain
Use	Past: Grazing, timber harvest, recreation Present: Grazing, timber harvest, recreation
Purpose of data collection	Baseline water quality
Publications	None

Data availability To whom When Form	Collected data: All On request To be placed on STORET Supporting data:
Date collection initiated	May 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Turbidity (P)	Iron (P)	Range Environmental Analysis
pH (P)	Lead (P)	Timber Inventory
Total dissolved solids (P)	Magnesium (P)	Hydrologic recon.
Alkalinity (P)	Nitrate (P)	Geologic map (University of Utah)
Aluminum (P)	Phosphate (P)	
Bicarbonate (P)	Potassium (P)	
Calcium (P)	Silica (P)	
Carbonate (P)	Sodium (P)	
Chloride (P)	Sulfate (P)	
Copper (P)	Total coliform (P)	
Fluoride (P)	Fecal coliform (P)	
Total Hardness (P)	Discharge (C)	
Hydroxide (P)		

Remarks:

WATERSHED INVENTORY FORM SW-43

Watershed identification	Name: Headwaters Uinta Area: 160 sq. mi. Type: Representative
Administering organization	Name: USDA Forest Service Address: Ashley N.F. 437 E. Main Vernal, Utah 84078
Location	State: Utah Latitude: 40° 32' 08" Longitude: 110° 03' 46"
Physiographic description	Geology: Glaciated valleys cut in pre-cambrian and younger formations. Drift covered valleys - unglaciated divides Typography: Flat cirque basins surrounded by steep wl walls leading to stream canyons Vegetation: Lodgepole pine, spruce-fir, aspen, sage-grass Soil: Cobbles, sand, sandy loam, clay loam Climate: Mountain
Use	Past: Grazing, timber harvest, recreation Present: Grazing, recreation
Purpose of data collection	
Publications	None

Data availability	Collected data:
To whom	All
When	On request
Form	To be placed on STORET
	Supporting data:
Date collection initiated	May 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data

Turbidity (P)
pH (P)
Total dissolved (P) solids
Alkalinity (P)
Aluminum (P)
Bicarbonate (P)
Calcium (P)
Carbonate (P)
Chloride (P)
Copper (P)
Fluoride (P)
Total hardness (P)
Hydroxide (P)
Iron (P)
Lead (P)
Magnesium (P)
Nitrate (P)
Phosphate (P)
Potassium (P)
Silica (P)
Sodium (P)
Sulfate (P)
Total coliform (P)
Fecal coliform (P)
Discharge (C)

Supporting Data

Range Environmental Analysis
Timber Inventory
Geologic Map (University of Utah)

Remarks:

WATERSHED INVENTORY FORM SW-44

Watershed identification	Name: Sowers Area: 43 sq. mi. Type: Representative
Administering organization	Name: U.S.D.A. Forest Service Address: Ashley National Forest 437 E. Main Vernal, Utah 84078
Location	State: Utah Latitude: 40° 29' 36" Longitude: 110° 27' 33"
Physiographic description	Geology: Gently dipping lacastrian and alluvial sediments on uplifted plateau being dissected by rejuvinated streams Typography: Vegetation: Aspen, sage-grass Soil: Shale-clay loam Climate: Mountain
Use	Past: Grazing Present: Grazing
Purpose of data collection	Baseline water quality
Publications	None

Data availability To whom When Form	Collected data: All On request To be placed on STORET Supporting data:
Date collection initiated	May 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Turbidity (P)	Iron (P)	Range Environmental Analysis
pH (P)	Lead (P)	Timber Inventory
Total dissolved (P) solids	Magnesium (P)	Hydrologic recon.
Alkalinity (P)	Nitrate (P)	Geologic map (University of Utah)
Aluminum (P)	Phosphate (P)	
Bicarbonate (P)	Potassium (P)	
Calcium (P)	Silica (P)	
Carbonate (P)	Sodium (P)	
Chloride (P)	Sulfate (P)	
Copper (P)	Total coliform (P)	
Fluoride (P)	Fecal coliform (P)	
Total hardness (P)	Discharge (C)	
Hydroxide (P)		

Remarks:

WATERSHED INVENTORY FORM SW-45

Watershed identification	Name: Rock Creek (Lower) Area: 149 sq. mi. Type: Representative
Administering organization	Name: USDA Forest Service Address: Ashley National Forest 437 E. Main Vernal, Utah 84078
Location	State: Utah Latitude: 40° 29' 36" Longitude: 110° 34' 39"
Physiographic description	Geology: Glaciated valleys cut in pre-cambrian and younger formations. Drift covered valleys, unglaciated divides Typography: Flat cirque basins surrounded by steep walls leading to stream canyons Vegetation: Ponderosa pine, lodgepole pine, spruce-fir, aspen, sage-grass Soil: Cobbles, sand, sandy loam, clay loam Climate: Mountain
Use	Past: Grazing, timber harvest, recreation Present: Grazing, recreation
Purpose of data collection	Baseline water quality
Publications	None

Data availability To whom When Form	Collected data: All On request To be placed on STORET Supporting data:
Date collection initiated	May 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Turbidity (P)	Iron (P)	Range Environmental Analysis
pH (P)	Lead (P)	Timber Inventory
Total dissolved solids (P)	Magnesium (P)	Hydrologic Recon.
Alkalinity (P)	Nitrate (P)	Geologic map (University of Utah)
Aluminum (P)	Phosphate (P)	
Bicarbonate (P)	Potassium (P)	
Calcium (P)	Silica (P)	
Carbonate (P)	Sodium (P)	
Chloride (P)	Sulfate (P)	
Copper (P)	Total coliform (P)	
Fluoride (P)	Fecal coliform (P)	
Total Hardness (P)	Discharge (C)	
Hydroxide (P)		

Remarks:

WATERSHED INVENTORY FORM SW-46

Watershed identification	Name: Ashley Area: 101 sq. mi. Type: Representative
Administering organization	Name: USDA Forest Service Address: Ashley National Forest 437 E. Main Vernal, Utah 84078
Location	State: Utah Latitude: 40° 34' 39" Longitude: 109° 37' 17"
Physiographic description	Geology: Mature topography, underlain by moderately dipping quartzites, sandstones, and limestones being dissected by rejuvinated streams. Some glaciation Typography: Rolling uplands with steep incised stream canyons Vegetation: Lodgepole pine, spruce-fir, sage-grass Soil: Rocky sand, sandy loam, clay loam Climate: Mountain
Use	Past: Grazing, timber harvest, recreation Present: Grazing, timber harvest, recreation
Purpose of data collection	Baseline water quality
Publications	None

Data availability To whom When Form	**Collected data:** All On request To be placed in STORET **Supporting data:**
Date collection initiated	May 1974
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Turbidity (P)	Iron (P)	Range Environmental Analysis
pH (P)	Lead (P)	Timber Inventory
Total dissolved (P) solids	Magnesium (P)	Hydrologic Recon.
Alkalinity (P)	Nitrate (P)	Land Use Plan
Aluminum (P)	Phosphate (P)	Geologic map (University of Utah)
Bicarbonate (P)	Potassium (P)	
Calcium (P)	Silica (P)	
Carbonate (P)	Sodium (P)	
Chloride (P)	Sulfate (P)	
Copper (P)	Total coliform (P)	
Fluoride (P)	Fecal coliform (P)	
Total Hardness (P)	Discharge (C)	
Hydroxide (P)		

Remarks:

WATERSHED INVENTORY FORM NW-1

Watershed identification	Name: H.J. Andrews Watersheds 1 to 10 Area: 40 ha Type: Experimental
Administering organization	Name: USDA Forest Service Address: PNWF&RES Forest Sci. Lab. 3200 Jefferson Way Corvallis, Oregon 97330
Location	State: Oregon Latitude: 44° 14' Longitude: 122° 15'
Physiographic description	Geology: Cenezoic tuffs and breccia, Pliocene andesite, some glacial colluvium Typography: Steep stream dissected, 30 to 70% slopes Vegetation: Conifer, Douglas Fir predominate Soil: Loam to clay loam Climate: Maritime, 77.8 - 304.8 cm (70 - 120 inches) of precipitation
Use	Past: Timber harvesting and research Present: Same
Purpose of data collection	To monitor the effects of various silvicultural cutting methods on stream flow and water quality
Publications	1. Hydrologic and related characteristics of three small watersheds in the Oregon Cascades. Rothachereta1, 1967. 2. Comparative chemical quality - Natural and Disturbed Streams following Logging and Slash Burning. R.L. Fredriksen, 1971. 3. Erosion and sedimentation following road construction and harvest on unstable soils in 3 small western Oregon watersheds. 4. Others

Data availability To whom When Form	Collected data: Data base available upon request Supporting data: Available as published documents, reports, and raw data
Date collection initiated	1948-1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soil Temperature and Moisture
Precipitation(C)	Vegetation Survey and Map
Sediment yield (C)	Interception rates
Water quality (P)	Erosion studies
Temperature, Nitrate, Nitrite, Phosphates, Sodium, Calcium, Magnesium, Silicon, pH, Potassium, Carbonate, Aluminum, Cations	Regeneration Potentials
Radiation (C)	Decomposition rates of detritus
Air temperature (C)	Nutrient cycle
Dew point temperature (C)	Biomass estimates
Soil and litter solution chemistry (P)	Litter fall and decomposition rates
Soil moisture tension (C)	Stream flora and fauna survey

Remarks:

There are ten instrumented watersheds. Instrumentation was initiated at various times on given watersheds from 1948-1967. Watersheds are referred to as "HJA #1 through 10." Total area approximates 100 acres.

WATERSHED INVENTORY FORM NW-2

Watershed identification	Name: Cedar Area: 36625 ha. (90,500acres) Type: Representative
Administering organization	Name: U.S. Department of Agriculture Address: Forest Service P.O. Box 3623 Portland, Oregon 97208
Location	State: Washington Latitude: 47° 30' Longitude: 121° 30'
Physiographic description	Geology: Volcanic overlain with glacial material Typography: Steep Average Slope 30% Elevation 161-1676 M (530 to 5500 feet) Vegetation: Douglas fir, hemlock, true fir. Soil: Loam from basalt Climate: Marine 229 - 381 cm (90"-150") Precipitation mean temperature 48°F, 9°C
Use	Past: Timber Harvest - No recreation permitted Present: Same as above
Purpose of data collection	PHS Study - Not a Barometer Watershed.
Publications	1. PHS Study Watershed-Human use level a water Quality 2. Hydrologic characteristics Cedar and Green River Watersheds. Others

Data availability To whom When Form	**Collected data:** All individuals now Computer printouts Raw data Reports **Supporting data:** Same as above
Date collection initiated	1965
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

<u>Collected Data</u>	<u>Supporting Data</u>
Hydrometerologic (C)	Soils Inventory
Water Quality (P)	Geologic Inventory
Bacterial	Vegetation Inventory
Complete Chemical	Wildlife Inventory
Physical	Utilization Study

Remarks:

U.S. Forest Service - PHS Coop Study - Municipal Supply for City of Seattle.
There are up to 100 parometers collected regarding water quality, i.e. trace elements, nutrients, radiological data, heavy metals, herbicides/pesticides, viruses, etc. to numerous to list here.

WATERSHED INVENTORY FORM NW-3

Watershed identification	Name: Clackamas River Area: 177,827 ha (609.37 sq. mi.) Type: Representative
Administering organization	Name: U.S.D.A. Forest Service Address: P.O. Box 3623 Portland, Oregon 97208
Location	State: Oregon Latitude: 45^{o} 10' Longitude: 121^{o} 30'
Physiographic description	Geology: Andesite over Basalt Typography: Steep slopes 226-2201 m (740-7222 ft) elevation Vegetation: Douglas fir, hemlock, true fir Soil: Climate: Marine Mean annual temperature $10^{o}C$ ($50^{o}F$) 10.3-20.5 cm (50-100 inches) precip.
Use	Past: Heavy timber harvesting, recreation, wildlife Present: Same
Purpose of data collection	PHS Study, Barometer Watershed Program
Publications	1. PHS Study "Watershed -- Human Use Level and Water Quality" 2. Hydrologic characteristics Cedar and Green River Watersheds 3. Others

Data availability To whom When Form	Collected data: All individuals Now Computer printouts, raw data, reports Supporting data: Same
Date collection initiated	1965-1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Soils Inventory
Snowfall (C)	Geology Inventory
Streamflow (C)	Wildlife Inventory
Temperature (C)	Vegetation Inventory
Water quality (P)	Utilization Study
Bacterial	
Physical	
Complete Chemical	

Remarks:

Domestic watershed for several cities -- Oregon City, Lake Oswego, etc.

There are up to 100 parameters collected regarding water quality, i.e., trace elements, nutrients, radiological, heavy metals, herbicides/pesticides, viruses, etc., too numerous to list here.

WATERSHED INVENTORY FORM NW-4

Watershed identification	Name: Green River Area: 60,705 ha. (234.4 sq.mi.) Type: Representative
Administering organization	Name: USDA Forest Service Address: P.O. Box 3623 Portland, Oregon 97208
Location	State: Washington Latitude: 47° 20' Longitude: 121° 30'
Physiographic description	Geology: Volcanic overburden with Glacial Material Typography: Steep-Average slope 30% Elevation 273 m -1829 m (895' to 6000') Vegetation: Douglas-fir, hemlock and true fir Soil: Loam from basalt Climate: Marine - 114-254cm (45"-100") Precipitation 9°C (48°F) mean annual temperature
Use	Past: Timber Harvest, recreation (limited) power line corridor, railroad Present: Same as above
Purpose of data collection	PHS Study and Barometer Watershed
Publications	1. PHS Study Watershed Human use level and Water Quality 2. USFS Publication "Hydrologic Characteristics Cedar and Green River Watersheds 3. Others

Data availability To whom When Form	Collected data: Available from STORET under PHS(or EPA) file Supporting data: Available for reproduction costs and computer costs.
Date collection initiated	1965-1967
Date collection terminated	Continuing to same extent in the Barometer Watershed Program

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Soils Inventory
Snowfall (C)	Geologic Inventory
Streamflow (C)	Vegetation Inventory
Temperature (C)	Use (numbers by types)
Sediment (C)	Wildlife Inventory
Radiation (C)	
Relative Humidity (C)	
Water Quality (P)	
Complete chemical	
Physical	
Bacteriological	

Remarks: Coop USFS-PHS Study sometimes referred to as NW Study. Also a USFS Barometer Watershed. Municipal Watershed for City of Tocoma. There are up to 100 parameters collected regarding water quality, i.e. heavy metals, nutrients, trace elements, viruses, etc., to numerous to list here.

WATERSHED INVENTORY FORM NW-5

Watershed identification	Name: Entiat Experimental Forest Area: (3 indiv. watersheds) 1870 ha. (Approx. 513 ha in each drainage) Type: Experimental
Administering organization	Name: USDA Forest Service Address: PNF&RES P. O. Box 3141 Portland, Oregon 97208
Location	State: Washington Latitude: 47° 55' Longitude: 120° 28'
Physiographic description	Geology: Granodiorite and quartz diorite Typography: South-southwest aspect. Average slope 50% but 90% slopes are common Vegetation: (Before wildfire in 1970) varied with elevation. Species include ponderosa pine,Douglas-fir,lodgepole pine,whitebark pine,subalpine fir Soil: Volcanic origin consisting of ash and pumice. Texture is moderately coarse. Drainage is good. Depth ranges from zero on rock outcrops to 6 m (20 ft). Climate: Mediterranean, cool summer
Use	Past: Timber salvage after wildfire in 1970 Present: Deer hunting during regular season. Study water yield changes and erosion rates following wildfire and revegetation.
Purpose of data collection	
Publications	1. Streamflow Nitrogen loss following forest erosion control fertilization. G.O. Klock, 1971. 2. Watershed behavior after forest fire in Washington. Helvey, 1973. 3. Stream chemistry following a forest fire and urea fertilization in North Central Wash. Tiedemann,1973. 4. Others.

Data availability To whom When Form	Collected data: All individuals on request. Tabulated raw data or analyzed data in publications. Supporting data: All individuals paying reproduction costs. On request. Report form.
Date collection initiated	1959
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (C)	Soils inventory
Precipitation (C)	Timber inventory (before fire)
Air temperature (C)	Revegetation inventory 1st, 2nd, and 3rd years after fire. 120 permanent transects.
Water temperature (C)	
Soil moisture (P)	
Suspended sediment (P)	
Nitrates (P)	
Phosphates (P)	
Sulfate (P)	
Calcium (P)	
Magnesium (P)	
Potassium (P)	
Sodium (P)	

Remarks:

WATERSHED INVENTORY FORM NW-6

Watershed identification	Name: North Fork Quinault R. (12039300) Area: 19192 ha. (74.1 sq. mi.) Type: Representative
Administering organization	Name: U.S. G.S. Address: Washington, D.C. 20242
Location	State: Washington Latitude: 47° 35' 45" Longitude: 123° 37' 25"
Physiographic description	Geology: Slate over glacial deposits. Typography: Rugged mountains Vegetation: Virgin Hemlock, Fir, Spruce, Cedar Soil: Those characteristic of the Pacific Border Province Climate: Average annual precipitation 508cm (200") Mo. mean temperature Extremes- -7°-15°C (20°-60°F)
Use	Past: Present: Olympic National Park
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals upon request Transcribed, published Supporting data: Same
Date collection initiated	Streamflow - 1964 Precipitation - 1965 Soil/Water Temperature - 1965 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Dissolved Solids	Minor Elements-2 times per year
Precipitation (C)	Potassium	Pesticides-2 times per year
Soil/Water Temperature (C)		Radioactivity-2 times per year
Conductance		
Dissolved Oxygen		
Coliform, Biological Oxygen Demand		
pH		
Hardness		
Iron		
*Suspended Sediment		
Calcium		
Sodium		
Bicarbonate		
Phosphate		
Nitrate		
Magnesium		
Carbonate		
Sulfate		
Chloride		
Fluoride		

Remarks:

*Also collected during storm runoff.
Unless noted, all data collected once per month.

WATERSHED INVENTORY FORM NW-7

Watershed identification	Name: Minam R. (13331500) Area: 62,160 ha (240 sq. mi.) (approx.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: Oregon Latitude: 45^{o} 37' 12" Longitude: 117^{o} 43' 32"
Physiographic description	Geology: Predominantly basalt Typography: Complex mountains, volcanic plateaus Vegetation: Ponderosa pine, lodge pole pine, white fir, western larch Soil: Those characteristic of Columbia Plateaus Province Climate: Ave. annual precip - 53.3 - 152.4 cm (21 - 60 inches). Mo. mean temp. extremes -4^{o} - 18^{o}C (24^{o} - 64^{o}F).
Use	Past: Present: Wilderness area
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1912 S-W temperature - 1965 Water quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Phosphate	Minor Elements - 2 x/yr.
S/W temperature (C)	Bicarbonate	Pesticides - 2 x/yr.
Conductance	Nitrate	Radioactivity - 2 x/yr.
Temperature	Silica	
pH	Magnesium	
Dissolved Oxygen	Carbonate	
Hardness	Sulfate	
Coliform Biological Oxygen Demand	Chloride	
	Fluoride	
Iron	Dissolved Solids	
Suspended Sediment*	Potassium	
Calcium	Sodium	

Remarks:
* Also collected during storm runoff.

Unless noted, all data collected once per month.

<u>WATERSHED INVENTORY FORM</u> NW-8

Watershed identification	Name: Coyote Creek Watersheds Area: 236.3 ha (583 acres) Type: Experimental
Administering organization	Name: U.S.D.A. Forest Service Address: PNWF&RES For. Sci. Lab. 3200 Jefferson Way Corvallis, Oregon 97331
Location	State: Oregon Latitude: 43^{0} 01' Longitude: 122^{0} 43'
Physiographic description	Geology: Tuff breccia cenezoic Typography: Steep, stream dissecte Vegetation: Mixed conifer Soil: Loam to clay loam Climate: Maritime
Use	Past: Research Present: Research
Purpose of data collection	To monitor stream flow and water quality and nutrient-soil budgets after logging
Publications	"Fertilization and Water Quality"

Data availability	Collected data:
To whom	All individuals
When	Available now
Form	Summary form
	Supporting data:
	Available now to all individuals
Date collection initiated	1963
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Stream flow (C)	Erosion Data
Precipitation (C)	Vegetative cover
Nutrient and dust levels (C)	Regeneration rates
Nitrogen, Phosphorus, Carbon in dust (C)	Soil Temperature
Chemical Water Quality (C) Nitrate, Ammonium nitrate, Organic nitrogen, Total phosphorus, Ortho phosphate, cations aluminum, sulfur	Air Temperature
Water Temperature (C)	Channel soil and debris storage
Sediment yield (C)	

Remarks:

There are four instrumental watersheds:
#1 30% timber volume removed by shelterwood cuts
#2 30% timber volume removed by small clear cuts
#3 100% timber volume removed by clear cut
#4 undisturbed control

WATERSHED INVENTORY FORM NW-9

Watershed identification	Name: Alsea Watersheds Area: 575 ha Type: Experimental
Administering organization	Name: Address: Oregon State University School of Forestry Corvallis, Oregon 97331
Location	State: Oregon Latitude: See Longitude: Remarks
Physiographic description	Geology: TYEE SANDSTONE Typography: Steep slopes Vegetation: Douglas Fir - Red Alder Soil: Silt loam, fine sandy loam Climate: Temperate Marine 100 inches of precipitation per year
Use	Past: Timber harvest Present: Same
Purpose of data collection	To determine the effect of timber harvest on aquatic resources
Publications	1. Effects of Forest Management on Stream Temperature, G.W. Brown, 1972 2. Effects of Clear cutting on Stream Temperature, G.W. Brown, et. al., 1970 3. Effects of logging on periphyton in coastal streams of Oregon, E. W. Hansmann, et. al., 1973 4. Many others.

Data availability	Collected data:	From various sources
To whom		Available to all individuals
When		Upon request
Form		Cards, charts, summaries
	Supporting data:	
		All individuals
		Written documents
Date collection initiated	September 1958	
Date collection terminated	September 1973	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (C)	Soils inventory
Temperature (C)	Fish populations
Water Quality (P)	
Potassium	
Suspended Sediment	
Phosphate	

Remarks: Refers to three gaged watersheds

	Area	Latitude	Longitude
Needle Branch	70 ha	44° 30' 35"	123° 51' 20"
Deer Creek	303 ha	44° 32' 05"	123° 52' 35"
Flynn Creek	202 ha	44° 32' 20"	123° 51' 05"

WATERSHED INVENTORY FORM NW-10

Watershed identification	Name: HI - 15 Basins Area: 13 ha (32 acres), 15.4 ha (38 acres), 21.5 ha (53 acres) Type: Experimental
Administering organization	Name: USDA Forest Service Address: Pac. Northwest For. & Range Exp. Sta. Portland, Oregon 97208
Location	State: Oregon Latitude: 44^{0} N Longitude: 122^{0} W
Physiographic description	Geology: Glacial till and andesite bedrock. Typography: Fairly gentle most slopes, 15 to 30% Vegetation: Mostly young Douglas Fir Soil: Stoney -- gravelly loams Climate: Average annual precip. 215.9 cm (85 inches) Pacific Maritime
Use	Past: Logging Present:
Purpose of data collection	Effect of partial cutting on south slope watersheds
Publications	None

Data availability To whom When Form	Collected data: To all individuals Takes one month to deliver Summarized in table form Supporting data: Charge for reproduction costs
Date collection initiated	1964
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Vegetation inventory
Snowfall (P)	Soil inventory
Streamflow (C)	
Sediment (C)	
Chemical quality (C)	

Remarks:

There are 3 separate Basins, Watersheds 6, 7, 8 H.J.A.

WATERSHED INVENTORY FORM NW-11

Watershed identification	Name:	Fox Creek Watersheds
	Area:	See remarks 382.5 ha
	Type:	Experimental
Administering organization	Name:	USDA Forest Service
	Address:	Pac. Northwest For. & Rng. Exp. Sta. For. Sci. Lab. 3200 Jefferson Way, Corvallis, Oregon 97330
Location	State:	Oregon
	Latitude:	45° 26'
	Longitude:	122° 05'
Physiographic description	Geology:	Pliocene basalt
	Typography:	Gentling sloping glaciated
	Vegetation:	Old Growth Douglas Fir
	Soil:	Cobbely loam from glacial moraine deposits
	Climate:	Cool mountain
Use	Past:	Timber production and water supply
	Present:	Research and water supply
Purpose of data collection		To study water quality and nutrient - soil budgets
Publications		Timber Production and Water Quality, Progress in Planning for the Bull Run -- Portland, Oregon's Municipal Watershed, R.L. Fredriksen, 1975.

Data availability To whom When Form	Collected data: Available now on request Supporting data: Same
Date collection initiated	1957
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Vegetation Survey
Streamflow (C)	Soil Temperature
Carbon, Nitrogen, Phosphorus in dust (C)	Litter decomposition
Nitrate, Ammonium nitrate, Organic nitrogen (C)	
Total Phosphorus (C)	
Water temperature (C)	

Remarks:

There are three instrumental watersheds:
#1 58.7 ha clearcut and burned
#2 253.0 ha control
#3 70.8 ha 25% clearcut and not burned.

WATERSHED INVENTORY FORM NW-12

Watershed identification	Name: High Ridge Evaluation Area (Umatille Barometer Watershed) Area: 176.0 ha total. Type: Representative
Administering organization	Name: U.S.D.A. Forest Service Address: Umatilla National Forest Pendleton, Oregon 97801
Location	State: Oregon Latitude: 45^{0} 41' Longitude: 118^{0} 05'
Physiographic description	Geology: Volcanic ash loess overlying basalt Typography: 2-25 percent slopes facing generally northeast. Vegetation: Grand, subalpine, and Douglas fir, Engelmann spruce, western larch Soil: .9 - 1.8 m (3 to 6 feet) deep, silt loam developed in recent volcanic ash over older soil profile Climate: Maritime with annual precip. averaging 127 cm (50 inches) (mostly as snow) and mean monthly temp. is 5^{o}C (41^{o}F).
Use	Past: Deer and elk hunting area Present: Deer and elk hunting area
Purpose of data collection	Document changes in water quantity, quality, and timing after various intensities of timber harvest.
Publications	None

Data availability To whom When Form	Collected data: Data are not available until after analyses have been made. Supporting data: Available to all individuals from Forest Supervisor, Umatilla N.F., Pendleton, Ore.
Date collection initiated	Discharge and precipitation measurements began in 1968. Other measurements began in 1972.
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data

Discharge
Precipitation
Air Temperature
Water Temperature
Soil Moisture
Bedload
Wind
Soil Temperature
Total organic nitrogen
Ammonia nitrogen
Urea Nitrogen
pH
Specific conductance
Total alkalinity
Phosphates
Sulfate
Magnesium
Potassium
Sodium
Litter fall
Benthic organisms
Fecal coliform
Total coliform
E. coliform

Supporting Data

Soils inventory
Timber inventory
Chemical soil properties
Wildlife use patterns
Understory vegetation characterized

Remarks:
Timber harvest is scheduled for summer 1975.

WATERSHED INVENTORY FORM NW-13

Watershed identification	Name: Tonalite Creek Area: 14.5 sq. mi. Type:
Administering organization	Name: USDA Forest Service Address: Tongass National Forest Chatham Area, P.O. Box 757 Sitka, Alaska 99835
Location	State: Alaska Latitude: 57° 40' 42" Longitude: 135° 13' 17"
Physiographic description	Geology: Typography: Glaciated U-shaped valleys filled with till and alluvium. Steep valley walls, dissected with V-notch drainages. Rough peaks above timber. Vegetation: Hemlock-spruce Soil: Interspersed organics (muskegs) and well-drained mineral soils Climate: Maritime
Use	Past: Dispersed recreation Present: Same
Purpose of data collection	A portion of Kadashan Barometer Watershed; streamflow and water quality characterization.
Publications	Water Resources Data for Alaska Part 1. Surface Water Records Part 2. Water Quality Records 1969-1974

Data availability To whom When Form	Collected data: Discharge and water quality data is published annually by USGS. Precipitation data available from Forest Supervisor on request. Computer printout of total daily precipitation. Supporting data: Individuals pay cost of requested printouts. Some internal written reports available.
Date collection initiated	Winter 1968
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Discharge (P)	Silica (P)	Soils Inventory
Precipitation (C) (May-Oct)	Total Iron (P)	Geologic mapping
Temperature (C)	Calcium (P)	Fisheries research and data
Suspended Sediment (P)	Magnesium (P)	
Nitrate & Nitrite (P)	Sodium (P)	
Dissolved Solids (P)	Potassium (P)	
Non-carbonate Hardness (P)	Sulfate (P)	
Bicarbonate (P)	Chloride (P)	
Conductance (P)	Fluoride (P)	
pH (P)		
Color (P)		

Remarks: A subwatershed within Kadashan Barometer Watershed. Road construction may begin in 1977, timber harvesting may begin in 1979. Monitoring will continue through the cutting period to a point in time when impact is over. Beginning this year, a regular sampling schedule will be set up with monitoring for the following: turbidity and suspended sediment; specific conductance; pH; temperature; dissolved oxygen, color; total organic carbon; total nitrogen; total phosphorus. This drainage will be held for a period of years as a control unit.

WATERSHED INVENTORY FORM NW-14

Watershed identification	**Name:** Kadashan River **Area:** 10.2 sq. mi. **Type:**
Administering organization	**Name:** USDA Forest Service **Address:** Tongass National Forest Chatham Area, P.O. Box 757 Sitka, Alaska 99835
Location	**State:** Alaska **Latitude:** 57^{o} 39' 36" **Longitude:** 135^{o} 11' 06"
Physiographic description	**Geology:** **Typography:** Glaciated U-shaped valleys filled with till and alluvium. Steep valley walls, dissected with V-notch drainages. Rough peaks above timber. **Vegetation:** Hemlock-spruce **Soil:** Interspersed organics (muskegs) and well-drained mineral soils. **Climate:** Maritime
Use	**Past:** Dispersed recreation **Present:** Same
Purpose of data collection	A portion of Kadashan Barometer Watershed; streamflow and water quality characterization.
Publications	Water Resources Data for Alaska Part 1. Surface Water Records Part 2. Water Quality Records 1969-1974

Data availability To whom When Form	Collected data: Discharge and water quality data is published annually by USGS. Precipitation data available from Forest Supervisor on request. Computer printout of total daily precipitation. Supporting data: Individuals pay cost of requested printouts. Some internal written reports available.
Date collection initiated	Winter 1968
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Discharge (P)	Silica (P)	Soils Inventory
Precipitation (C) (May-Oct)	Total Iron (P)	Geologic mapping
Temperature (C)	Calcium (P)	Fisheries research and data
Suspended Sediment (P)	Magnesium (P)	
Nitrate & Nitrite (P)	Sodium (P)	
Dissolved Solids (P)	Potassium (P)	
Non-carbonate Hardness (P)	Sulfate (P)	
Bicarbonate (P)	Chloride (P)	
Conductance (P)	Fluoride (P)	
pH (P)		
Color (P)		

Remarks: A subwatershed within Kadashan Barometer Watershed. Road construction may begin in 1977, timber harvesting may begin in 1979. Monitoring will continue through the cutting period to a point in time when impact is over.Beginning this year, a regular sampling schedule will be set up with monitoring for the following: turbidity and suspended sediment; specific conductance; pH; temperature; dissolved oxygen, color; total organic carbon; total nitrogen; total phosphorus.

WATERSHED INVENTORY FORM NW-15

Watershed identification	Name: Hook Creek Area: 8.0 sq. mi. Type:
Administering organization	Name: USDA Forest Service Address: Tongass National Forest Chatham Area, P.O. Box 757 Sitka, Alaska 99835
Location	State: Alaska Latitude: 57° 40' 22" Longitude: 135° 10' 40"
Physiographic description	Geology: Typography: Glaciated U-shaped valleys filled with till and alluvium. Steep valley walls, dissected with V-notch drainages. Rough peaks above timber. Vegetation: Hemlock-spruce Soil: Interspersed organics (muskegs) and well-drained mineral soils. Climate: Maritime
Use	Past: Dispersed recreation Present: Same
Purpose of data collection	A portion of Kadashan Barometer Watershed; streamflow and water quality characterization.
Publications	Water Resources Data for Alaska Part 1. Surface Water Records Part 2. Water Quality Records 1969-1974

Data availability To whom When Form	Collected data: Discharge and water quality data is published annually by USGS. Precipitation data available from Forest Supervisor on request. Computer printout of total daily precipitation. Supporting data: Individuals pay cost of requested printouts. Some internal written reports available.
Date collection initiated	Winter 1968
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Discharge (P)	Silica (P)	Soils Inventory
Precipitation (C) (May-Oct)	Total Iron (P)	Geologic mapping
Temperature (C)	Calcium (P)	Fisheries research and data
Suspended Sediment (P)	Magnesium (P)	
Nitrate & Nitrite (P)	Sodium (P)	
Dissolved Solids (P)	Potassium (P)	
Non-carbonate Hardness (P)	Sulfate (P)	
Bicarbonate (P)	Chloride (P)	
Conductance (P)	Fluoride (P)	
pH (P)		
Color (P)		

Remarks: A subwatershed within Kadashan Barometer Watershed. Road construction may begin in 1977, timber harvesting may begin in 1979. Monitoring will continue through the cutting period to a point in time when impact is over. Beginning this year, a regular sampling schedule will be set up with monitoring for the following: turbidity and suspended sediment; specific conductance; pH; temperature; dissolved oxygen, color; total organic carbon; total nitrogen; total phosphorus.

WATERSHED INVENTORY FORM NW-16

Watershed identification	Name: Stequaleho Crk. Area: 2526.0 ha Type: Representative
Administering organization	Name: University of Washington College of Address: Forest Resources and State of Washington Department of Natural Resources Seattle, Washington
Location	State: Washington Latitude: 47° 41' Longitude: 124° 7'
Physiographic description	Geology: Metamorphic greywacke Typography: Steep to moderate slope. Drainage runs westerly. Elevation 107m - 853m (350 ft. to 2800 ft.) Vegetation: Mixed conifer, young Douglas-fir and hemlock to old growth Pacific-Silver fir and hemlock on ridge lines. Soil: Silt to sandy loams Climate: Maritime. 381-508cm (150 to 200 inches) annual precipitation.
Use	Past: Management by clearcut logging and planting of Douglas - Fir. Present: Continuance of clearcut management.
Purpose of data collection	Primarily discharge monitoring in support of fisheries research on natural stocking and survival as related to forest management.
Publications	None

Data availability To whom When Form	Collected data: Summaries available on request. Supporting data: Thesis's
Date collection initiated	October 1972
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (C) Precipitation (C) Air Temperature (C) Relative humidity (C) Water Temperature (C) Suspended Sediment (P) Gravel Composition (P)	Fisheries information on fish populations and benthic organisms.

Remarks:

Fisheries thesis's in progress.

WATERSHED INVENTORY FORM NW-17

Watershed identification	**Name:** Clearwater River **Area:** 25,213 ha. **Type:** Representative
Administering organization	**Name:** University of Washington College of Forest **Address:** Resources and State of Washington Department of Natural Resources Seattle, Washington
Location	**State:** Washington **Latitude:** 47° 39' **Longitude:** 124° 12'
Physiographic description	**Geology:** Partially glaciated. Upper elevation metamorphic greywacke. **Typography:** Gentle to steep drainage. Elevation 61m - 1158m (200 ft. to 3800 ft.) **Vegetation:** Mixed conifer. Planted Douglas-fir to climax Pacific Silver fir and western hemlock. **Soil:** Gravelly glacial orgin to silt and sand loams. **Climate:** Maritime, 381-508cm (150 to 200 inches) annual precipitation.
Use	**Past:** Management by clearcut logging and planting of Douglas-fir. **Present:** Continuance of clearcut management.
Purpose of data collection	Primarily discharge monitoring in support of fisheries research on natural stocking and survival as related to forest management.
Publications	None

Data availability To whom When Form	Collected data: Summaries available on request. Supporting data:
Date collection initiated	October, 1973
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (C) Precipitation (C) Air Temperature (C) Relative Humidity (C) Water Temperature (C) Suspended Sediment (P) Gravil Composition (P)	

Remarks:

WATERSHED INVENTORY FORM NW-18

Watershed identification	Name: Christmas Creek Area: 1518 ha. Type: Representative
Administering organization	Name: University of Washington College of Forest Address: Resources and State of Washington Department of Natural Resources Seattle, Washington
Location	State: Washington Latitude: 47° 40' Longitude: 124° 13'
Physiographic description	Geology: Metamorphic greywacke Typography: South flowing tributary of the Clearwater River. Moderate to steep drainage Elevation 152m to 610 m (500 ft. to 2000 ft.) Vegetation: Mixed conifer. Young Douglas-fir and western hemlock to old growth Pacific Silver fir and hemlock on ridges. Soil: Silt to sandy loam. Climate: Maritime, 381-508cm (150 to 200 in.) annual precipitation.
Use	Past: Managed under a clearcut logging program. Present: Continuance of old growth clearcutting. and planting of Douglas-fir.
Purpose of data collection	Primarily monitoring in support of fisheries research on natural stocking and survival as related to forest management by clearcut.
Publications	None

Data availability To whom When Form	Collected data: Summaries available on request. Supporting data:
Date collection initiated	October 1973
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (C) Precipitation (C) Air temperature (C) Relative Humidity (C) Water Temperature (C) Suspended Sediment (P) Gravel Composition (P)	

Remarks:

Data collection will continue until 1977. Supporting information on fisheries resources will soon be available.

WATERSHED INVENTORY FORM NW-19

Watershed identification	Name: Upper Solleks River Area: 2.003 ha Type: Representative
Administering organization	Name: Univ. of Washington College of Forest Resources Address: State of Washington Department of Natural Resources Seattle, Washington
Location	State: Washington Latitude: 47° 42' Longitude: 124° 1'
Physiographic description	Geology: Greywacke Typography: Steep incised drainage. Vegetation: Climate Pacific Silver fir and Western hemlock. Soil: Silt or sandy loam Climate: Maritime, 381-508cm (150 to 200 in.) Annual precipitation
Use	Past: Undisturbed Present: Clearcut logging of climax forest.
Purpose of data collection	Primarily discharge monitoring in support of Fisheries research on natural stocking and survival as related to forest mamagement.
Publications	None

Data availability To whom When Form	Collected data: Summaries available on request. Supporting data:
Date collection initiated	October 1973
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Discharge (C) Precipitation (C) Air Temperature (C) Relative Humidity (C) Water Temperature (C) Suspended Sediment (P) Gravel Composition (P)	

Remarks:

Data collection will continue until 1977.

WATERSHED INVENTORY FORM C-1

Watershed identification	Name: Elder Crk. nr. Branscomb, Calif. (11475560) Area: 1684 ha (6.50 sq. mi.) Type: Representative
Administering organization	Name: USGS Address: Washington, D.C. 20242
Location	State: California Latitude: 39° 43' 45" Longitude: 123° 38' 40"
Physiographic description	Geology: Sedimentary, marine origin Typography: Narrow valleys, steep land slopes Vegetation: Virgin Douglas fir Soil: Those characteristic of Pacific Border province. Climate: Ave. annual precip. - 203 cm (80") Monthly mean temp. extremes - 7-24°C (45-75° F)
Use	Past: Present: Natural conservancy district control.
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	**Collected data:** All individuals Upon request Transcribed, published **Supporting data:** (Same)
Date collection initiated	Streamflow - 1967 Precipitation - 1969 Water Quality - 1967
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Calcium	Minor elements - 2 x/yr.
Precipitation (C)	Sodium	Pesticides - 2 x/yr.
Temperature (C)	Potassium	Radioactivity - 2 x/yr.
Conductance	Bicarbonate	
Dissolved Oxygen	Carbonate	
Coliform	Sulfate	
Biological Oxygen Demand	Chloride	
pH	Fluoride	
Hardness	Nitrate	
Silica	Dissolved Solids	
Phosphate	Suspended Sediment	
Iron		
Magnesium		

Remarks:

Unless noted, all data collected once per month.

Suspended sediment collected during high flow, also.

WATERSHED INVENTORY FORM C-2

Watershed identification	Name: Merced R. at Happy Isles Bridge near Yosemite, CA (11264500) Area: 46,879 ha (181 sq. mi.) Type: Representative
Administering organization	Name: U.S.G.S. Address: Washington, D.C. 20242
Location	State: California Latitude: 37^{0} 43' 54" Longitude: 119^{0} 33' 28"
Physiographic description	Geology: Granite with alluvium in valley bottoms Typography: Alpine character, glaciated valleys, steep side ridges Vegetation: Fir, pine, sequoias cover about 45% of area Soil: Those characteristic of Cascade - Sierra Mtn. Province Climate: Ave. annual precip range: 101-178 cm (40-70"), mo. mean temp. extremes, 11-22^{o}C (53^{o}-72^{o}F)
Use	Past: Present: Yosemite National Park
Purpose of data collection	Benchmark Station
Publications	

Data availability To whom When Form	Collected data: All individuals Upon request Transcribed, published Supporting data: (Same)
Date collection initiated	Streamflow - 1915 Water Quality - 1967
Date collection terminated	Ongoing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Streamflow (C)	Calcium	Minor elements, 2 x/yr.
Temperature (C)	Sodium	Pesticides, 2 x/yr.
Conductance	Potassium	Radioactivity, 2 x/yr.
Dissolved Oxygen	Bicarbonate	
Coliform	Carbonate	
Biological Oxygen Demand	Sulfate	
pH	Chloride	
Hardness	Fluoride	
Silica	Nitrate	
Phosphate	Dissolved Solids	
Iron	Suspended Sediment	
Magnesium		

Remarks:

Unless noted, all data collected once per month.

Suspended sediment collected also during high flow.

WATERSHED INVENTORY FORM C-3

Watershed identification	**Name:** Middle Fork Feather River **Area:** 275,058 ha (1,062 sq mi) **Type:** Representative
Administering organization	**Name:** U.S. Forest Service **Address:** Plumas National Forest P.O. Box 1500 Quincy, California 95971
Location	**State:** California **Latitude:** 39^{o} 42'30" **Longitude:** 121^{o} 16'10"
Physiographic description	**Geology:** Pyroclastic volcanics in upper reaches. Granitics, marine sediments, metavolcanic and volcanics in the lower reaches. **Typography:** Steep canyons to board open valley. **Vegetation:** Oak-wookland, mixed conifer, true fir, brush and range land. **Soil:** Widely variable in accordance with changes in geology, topography and climate. **Climate:** Miditerranean
Use	**Past:** Timber harvest, recreation, range, some urban. **Present:** Same with more emphasis on recreation.
Purpose of data collection	Establish water quality standards for river. Develop baseline measures.
Publications	1. USFS 1970, River Plan - Middle Fork of the Feather River. 2. USGS 1973, Water Quality in the Middle Fork Feather River, Open file reprot.

Data availability To whom When Form	Collected data: All individuals upon request (See publ. #2). Supporting data: All individuals upon request, Maps and written reports.
Date collection initiated	May 1970
Date collection terminated	September 1971. Possible renewal of programs.

Types of Data Available (P = periodic; C = continuous)

Collected Data

Discharge (C)
Turbidity (P)
Air Temp. (C)
Water temp. (C)
Dissolved Oxygen (P)
Biochemical Oxygen Demand (P)
Total organic carbon (P)
Fecal coliform (P)
Ammonia (P)
Organic Nit. (P)
Ammonia Nit. (P)
Total Kjeldahl nit. (P)
Nitrate (No3) (P)
Nitrate (N) (P)
Orthophosphate (P)
Total Orthophosphorous (P)
Phosphate (P)
Total phosphorous (P)
Color (P)
Specific conductance (P)

pH (P)
Bicarbonates (P)
Carbonate (P)
Alkalinity (P)
Sulfate (P)
Chloride (P)
MBAS (P)
Dissolved solid (P)
Suspended sediment (P)

Supporting Data

Portions of the watershed are surveyed for:

Soils(type-erod-ibility)
Vegetation type
Land use
Precipitation
Water Yield

Remarks:

Water quality data is currently being analized to determine the need for further data collection. It is expected that water quality monitoring well continue at a 5 year intervals.

WATERSHED INVENTORY FORM C-4

Watershed identification	**Name:** Putah Creek Watersheds **Area:** 18,794 ha (46,439 AC) **Type:** Representative
Administering organization	**Name:** Bureau of Land Management **Address:** UKIAH District
Location	**State:** California **Latitude:** See **Longitude:** Remarks
Physiographic description	**Geology:** Cretaceous sediments and metasediments over lain by tertiary volcanic rocks. **Typography:** Drainages are V-shaped and steep, with slopes ranging from 30-80% **Vegetation:** A variety of chaparral brush species mixed with patches of Cypress, Digger Pine and grassy glades **Soil:** Primarily Henneke Serpentive. Also present are Cibo, Dibble, Guenoc, Laughlin, Los Gatos, Montara and Maymen. **Climate:** Rainfall is the predominant form of precipitation and averages about 81.2 cm (32") (Oct.-April = 95%)
Use	**Past:** Wildlife habitat and limited recreation **Present:** increasing recreation
Purpose of data collection	Baseline data to determine the potential for a multiple use watershed management program to increase water yield, wildlife and recreation and decrease fire damage
Publications	Evaluation of Water Yield Potential in the E. Putah Creek Watershed under multiple use management. R.H. Burgy 1973

Data availability To whom When Form	**Collected data:** **Supporting data:**	Available now; USGS Publications for streamflow and water quality. U.S. Bureau of Reclamation Hydrometrologic, Univ. of Calif. at Davis; for soils, vegetation wildlife. See above
Date collectior initiated	Streamflow 1969-73 Water quality 1970	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Hydrometerological	Soils Inventories
Precipitation (C&P)	Vegetation Inventories
Temperature (C)	Geologic Inventories
Wind speed (P)	
Humidity (C)	
Runoff (C)	
Water Quality	
Major ions (P)	
Heavy metals (P)	
Neutvients (P)	
Pesticides (P)	
pH, DD, Alkalinity (P)	
Conductivity (P)	
Temperature (C)	
Sediment (P)	

Remarks: There are five (5) instrumented watersheds

	Area	Lat.	Long.	
Adams Creek		38°42'	122°17'	2072.9 ha
Cedar Creek		38°48'	122°24'	777.3 ha
Hunting Creek		38°46'	122°25'	10105.3 ha
Nevada Creek		38°42'	122°17'	1813.8 ha
Pocock Creek	2 Sq. Mi.	38°47'	122°24'	518.2 ha

WATERSHED INVENTORY FORM C-5

Watershed identification	Name: Hopland Watershed II Area: 85 ha. (210 acres) Type: Experimental
Administering organization	Name: University of California at Davis Address: Div. of Agri. Science Dept. of Water Science and Engineering Davis, California 95616
Location	State: California Latitude: 38^{0} 59' Longitude: 123^{0} 07'
Physiographic description	Geology: Mesozoic Marine (Cretaceous) Franciscan Formation Typography: Rolling - Steep Slopes Vegetation: Annual grasses & improved range species. Soil: Sandy loam, fine to coarse Climate: Coastal Zone Mountain (Interior)
Use	Past: Chaparral Range Present: Improved Rangeland
Purpose of data collection	
Publications	1. Biological Effects in the Hydrological Cycle. 2. Vegetation Management and Water Yield Relationships. Others.

Data availability To whom When Form	Collected data: All individuals on request Summarized and Raw data Supporting data: Same
Date collection initiated	1952
Date collection terminated	1972

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Soils Inventories
Runoff (C)*	Geology
Water Quality (P)	Vegetation
Cations	Wildlife
Anions	
Nutrients	
Trace Metals	
Sedimentation	

Remarks:

*Due to changes in management and resultant watershed responses there are numerous breaks in the data. High sediment yields influenced runoff measurements. There are verying levels of intensity of sampling ranging from weekly to yearly. A very large number of water quality parometers have been monitored.

WATERSHED INVENTORY FORM C-6

Watershed identification	Name: Ice Cream Creek, (Big Creek Admin. Study) Area: 435.1 ha (1075 ac.) Type: Representative
Administering organization	Name: USDA Forest Service Address: Shasta-Trinity Natl. Forest 1615 Continental Street Redding, Ca. 96001
Location	State: California Latitude: 40° 41' 30" N Longitude: 123° 08' 10" W
Physiographic description	Geology: Metavolcanic, late Paleozoic and Triassic age Typography: Mature - steep (slope avg. 50-60%), sharp ridged, and deep dissection. Vegetation: Mixed Conifer to Douglas-fir; Harser aspects with mixed conifer, hardwoods, and brush. Soil: Predominately gravelly heavy loams with moderate to high degree of fractured bedrock; 50-102 cm (20-40") depth, less on harsher aspects. Climate: Humid mesothermal (Mediterranean). Warm to hot, dry summer; winter rain and snow, fairly cool.
Use	Past: No Activity Present: Since 1972, timber harvest and assiciated road building (conventional) hi-lead system w/minor tractor).
Purpose of data collection	1. Evaluate Forest Mgt. Activity - identify and quantify sources of non-point pollution. 2. Determine if stream regimes have been measurably altered by said activities (water yield and timing). 3. Evaluate and/or improve predictive water yield increase and sediment production methods to use in comparative analysis of other systems.

Data availability To whom When Form	**Collected data:**	Anyone on request. Available on summary sheets and typed individual survey forms.
	Supporting data:	Some data analyzed. Other material to be developed. Limits: Depending on nature of request and time involvement.
Date collection initiated	November, 1969	
Date collection terminated	Continuing. Probable termination in fall, 1977	

Types of Data Available (P = periodic; C = continuous)

	Collected Data	Supporting Data
Physical:	Temperature (C) (Seasonal)	Recon Soil-Veg Survey
	Sp. Cond.(P)	Detailed S-V Survey (unpubl.)
	Turbidity (P)	Vegetation Inventory
	Susp. Solids (P)	Fishery Condition Inventory
	PH (P)	ONEROS program system
Chemical:	Nutrients (P) (Ammonia N; Organic N; Nitrate N; Otyho P; Total P)	
	Hardness-Alkalinity (P)	Surface Water Station (C) (Stage & Discharge) (C)
	Dissolved Oxygen (P)	Meteorologic: Tmeperature (C)
	Coliform, Fecal (P)	Max-Min (P)
		Soil Temp (Max) (P)
		Precipitation (C)
		Precipitation (Total) (P)

Remarks: Data collected within the Big Creek Administrative Study. This 6475 ha (25sq. Mi.) watershed contributes to the municipal water supply of Hayfork and is an anadromous and resident fishery. Ice cream Creek is one of four regularly monitored stations within the drainage. An adjacent watershed (Limestone Creek: 484 ha (1.87 sq. mi.); Sta. No. FS1409300) has been helicopter logged and is currently being monitored (Initiated 1972). Climatic data is extrapolated from nearby Ice Cream Creek; and includes one storage rain gage.

	Station No.	
Surface Water:	OWDC 27324 , FS1409400	Quality of Water: OWDC 68345

Watershed identification	Name: Dry Creek Area: 162 sq. mi. Type: Representative
Administering organization	Name: U.S. Army Corps of Engineers Address: San Francisco District 100 McAllister Street San Francisco, CA 94102
Location	State: California Latitude: $38^{o}40'$ N Longitude: 122^{o} 55' W
Physiographic description	Geology: Franciscan assemblage, sandstone, shale, greenstone, chert, limestone, schist, and conglomerate with serpentine intrusions subject to landslides. Typography: Rough and mountainous terrain surrounding narrow valleys Vegetation: Grass, brush with some remaining stands of timber Soil: Alluvium - sandy, silty gravel Climate: Cold wet winters, dry hot summers, little snow
Use	Past: Timber harvest Present: Grazing land
Purpose of data collection	Baseline survey of conditions prior to construction of Lake Sonoma Project
Publications	Preliminary Investigation of Mercury Hazard Potential, Warm Springs Dam and Lake Sonoma Project, 1971, USGS. Conservation Treatment of the Dry Creek Watershed, June 1966, Department of Agriculture.

Data availability To whom When Form	Collected data: All individuals on request after conclusion of present litigation concerning this project Supporting data:
Date collection initiated	December 1971
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Discharge (C)	Sodium (P)	Soils and Geology Data
Temperature (C)	Potassium (P)	Vegetative and Wildlife Inventory
Dissolved Oxygen (P)	Chlorides (P)	
Alkalinity (P)	Sulfate (P)	
Specific Conductance (P)	Bicarbonate (P)	
pH (P)	Fluoride (P)	
Coliform (fecal) (P)	Silica (P)	
Ammonia (P)	Boran (P)	
Nitrite and Nitrate (P)	Iron (P)	
Nitrogen (P)	Lead (P)	
Sodium (P)	Strantium (P)	
Hardness (P)	Mercury (P)	
Carbon Dioxide (P)	Dissolved Solids (P)	
Organic Carbon (P)	Evaporation (P)	
Phosphates (P)	Precipitation and Wind (P)	
Calcium (P)		
Magnesium (P)		

Remarks:

Water well levels and constituents available.

WATERSHED INVENTORY FORM C-8

Watershed identification	Name: Mineral King (East Fork Kaweah) Area: 4047.ha (10,000AC) Type: Representative
Administering organization	Name: U.S. Department of Agriculture Address: Forest Service 900 W. Grand Porterville, California 93257
Location	State: California Latitude: 36^{0} 27' Longitude: 118^{0} 37'
Physiographic description	Geology: granitic, metamorphic, sediment. glacial, colluvial and alluvial deposits Typography: steep, glaciated valley Vegetation: brush, conifers Soil: rock, sandy, stony loams Climate: continental, orographic
Use	Past: recreation Present: intensive recreation
Purpose of data collection	To determine background conditions before the construction of a ski area and support facilities.
Publications	"The Water Resource - Mineral King" "Mineral King Draft Environmental Statement"

Data availability To whom When Form	Collected data: All individuals upon request. Supporting data: All individual upon request.
Date collection initiated	1968
Date collection terminated	Continuing but deminished in magnitude

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Continuous Streamflow (C) Continuous Precipitation (C) Sporatic Temperature (P) 3 Snow Courses (perminant) (C) Nutrients (P) Water Quality, General (P) Wind Profiles (Very scattered P)	Detail Soil Survey

Remarks:

WATERSHED INVENTORY FORM

Watershed identification	Name: Small Bell Watersheds Area: 111.7 ha (276 acres) Type: Experimental
Administering organization	Name: USDA Forest Service Address: PSWF&RES 110 N. Wabash Ave. Glendora, California 91704
Location	State: California Latitude: 34^{o} 12' Longitude: 117^{o} 47'
Physiographic description	Geology: Precretaceous - Metamorphics and injected plutonics derived from Precambrian sediments. Typography: Elevation 762-1066 m (2500-3500 feet) Steep walled canyons slopes averaging 62-79%. Vegetation: Mixed on various watersheds, perennial grasses, annual grasses, chamise, chaparral, riparian woodland Soil: Coarse sandy loams, residual, immatrue mostly $<$ .91 m (3 feet) deep Climate: Mediterranean
Use	Past: Experimental since 1933 Present: Same
Purpose of data collection	Part of a long term evaluation of partial watershed conversion from brush to grass as a means to increase water yield.
Publications	1. Bailey, R.G., Soil Slips on the San Dimas Experimental Forest. 2. Corbett, E.S. et al, Soil Slippage increased by brush conversion. 3. Warne, A.H., Geology of the Bell Canyon Watersheds. 4. Bailey, R.G., et al, Soil Slippage: An indicator of slope instability on chaparral watersheds of Southern California.

Data availability To whom When Form	Collected data: All individuals on request. May require reproduction costs. Reports, raw data, analyzed. Supporting data: Cooperative research; small scale reproduction costs; available now; reports and surveys.
Date collection initiated	1938
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow Debris and sediment Precipitation	Soils and geology inventory Wildlife survey

Remarks:
The Bell Watersheds do not support perennial streams, Bell #1 and #2 flow 9-10 months, Bell #3 and #4 flow 6-9 months. Long term plans do not include any added type conversions. Bell #4 may be burned, however, by perscription using Bell #3 as a control. Bell #1 and #2 will be allowed to return to brush.

WATERSHED INVENTORY FORM C-10

Watershed identification	Name: Indian Creek Area: 226.7 ha (SGOAC) Lower,50.6 ha Upper Type: Experimental
Administering organization	Name: Department of Forestry and Conservation Address: University of California Berkeley, CA 94720
Location	State: California Latitude: 37° 47' 45" Longitude: 122° 08'
Physiographic description	Geology: Conglomerates and siltstone overlain by basalt and chert Typography: Level valley floor surrounded by moderate slopes Vegetation: Grassland, northern coastal scrub, chaparral, knobcone pine, oak-madrone woodland, riparian woodland, redwood forest Soil: Lithosol Log OSOS clay loam Climate: Mediterranean
Use	Past: Grazing, hay cutting, walnut orcharding Present: Grazing
Purpose of data collection	Baseline study to calibrate watershed to be used in a study of the impact of urbanization on water yield, flood peak, sediment load, and water quality.
Publications	Impact of Urbanization on Streamflow Periodicity (1975) California Agriculture

Data availability To whom When Form	Collected data: All individuals on request. Hydrologic year data available on or after Jan. 1 of following year. Mimeographed summaries Supporting data:
Date collectioı initiated	September 1972
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soils inventory and map
Sediment load (P)	Geologic map
Precipitation (P)	Vegetation map
pH (P)	Wildlife survey
Water temperature (P)	
Dissolved Oxygen (P)	
Nitrate (P)	
Turbidity (P)	
Alkalinity (P)	
Calcium Bicarbonate (P)	
Total phosphate (P)	
Silica (P)	
Iron (P)	
Sulfate (P)	
Sodium chloride (P)	
Copper (P)	
Microclimate (C)	
Interception (P)	
Infiltration rates (P)	

Remarks:

Data will continue through urbanization period (1985?)
Two watersheds, Upper and Lower Indian Creek.

WATERSHED INVENTORY FORM C-11

Watershed identification	Name: Grass Valley Creek Area: 226.7 ha (560 acres) Type: Representative
Administering organization	Name: Dept. of Forestry and Conservation Address: University of California Berkeley, CA 94720
Location	State: California Latitude: 37° 46' 30" Longitude: 122° 07'
Physiographic description	Geology: Sandstone and siltstone overlain by basalt and chert Typography: Level valley floor surrounded by moderate slopes Vegetation: Grassland, northern coastal scrub, oak-madrone woodland, riparian woodland Soil: Lithosol Los Osos clay loam Climate: Mediterranean
Use	Past: Grazing, hay cutting Present: Grazing
Purpose of data collection	Baseline study to calibrate watershed to be used in a study of the impact of urbanization on water yield, flood peak, sediment load, and water quality
Publications	None

Data availability To whom When Form	Collected data: All individuals on request; hydrologic year data available on or after Jan. 1 of following year. Mimeographed summaries Supporting data:
Date collection initiated	September 1972
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soils inventory and map
Sediment load (P)	Geologic map
pH (P)	Vegetation map
Water temperature (P)	Wildlife survey
Dissolved Oxygen (P)	
Nitrate (P)	
Turbidity (P)	
Alkalinity (P)	
Calcium Bicarbonate (P)	
Phosphate (P)	
Silica (P)	
Iron (P)	
Sulfate (P)	
Sodium chloride (P)	
Copper (P)	

Remarks:

Data will continue through urbanization period (1985?)

Watershed identification	Name: Aspen Quail Area Area: 529 ha. (1306 acres) Type: Representative
Administering organization	Name: U.S. Forest Service Address: Sierra National Forest 1130 "O" Street Fresno, California 93712
Location	State: California Latitude: 37^{0} 16" N Longitude: 119^{0} 18" W
Physiographic description	Geology: Granitic, glacial Typography: Moderate to steep 30% to 80% Vegetation: Mixed Conifer Soil: Corbett - Shaver - Stomp Springs Climate: Moderate
Use	Past: No Use Present: Timber harvest
Purpose of data collection	Impact of timber harvest
Publications	Study plan

Data availability To whom When Form	Collected data:	Anyone On request Reports & Data
	Supporting data:	Anyone paying costs On request Reports & Data
Date collection initiated	October 1, 1974	
Date collection terminated	Continuing	

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Stream Flow (C)	Timber Harvest
Precipitation (C)	Road Building
Temperature	
Air (C)	
Water (C)	
Turbidity (P)	
Suspended Sediment (P)	
Bedload sediment (P)	
Other (P)	

Remarks:

There are two watersheds instrumented, Aspen Creek at 243.6 ha. (602 acres) and Douglas Fir Creek at 284.9 ha. (704 acres).

WATERSHED INVENTORY FORM C-13

Watershed identification	Name: Cabin Creek Administrative Study (Non-point Pollution Abatement) Area: 764 ha. (1890 acres) Type: Representative
Administering organization	Name: USDA Forest Service Address: Shasta-Trinity National Forest 1615 Continental Street Redding, California 96001
Location	State: California Latitude: 41°8'43" Longitude: 122°10'50"
Physiographic description	Geology: Metasedimentric, Bragdon Formation and consisting of interbedded sandstones, siltstones, and shale; quartzose. Typography: Mature - steep (slope average 50-60%), sharp ridged, and deep dissection. Vegetation: Douglas-fir with minor ponderosa pine, 60%; mixed conifer with small areas of brush, remainder. Soil: Predominately gravelly heavy loams with moderate to high degree of fractured bedrock; 50-102 cm. (20-40") depth, less on harsher aspects. Climate: Humid mesothermal (Mediterranean). Warm to hot, dry summer; winter rain and snow, fairly cool.
Use	Past: Mid 50's; 40.5 ha. (100 acres); tractor logged (pvt.) 1974; 121.4 ha. (300 acres); tractor logged (pvt.) Present: None, other than 1974. Planned: 1977 Timber Sale - long-span skyline with minor tractor units.
Purpose of data collection	(see remarks)
Publications	Study Plan: Cabin Creek Administrative Study - Non-point Pollution Abatement Program. 24pp. 1975. Fisheries Habitat Survey, 1974

Data availability To whom When Form	**Collected data:** Anyone on request. Available on summary sheets and typed individual survey forms. Will be transcribed on STØRET, winter, 1975. **Supporting data:** Limits: Depending on nature of request and time involvement. Two secondary stations presently are being monitored within the Cabin Creek watershed - FS1441320 & 30.
Date collection initiated	October, 1974
Date collection terminated	Continuing. Probable termination in fall, 1986 (Also see continuation sheet)

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Physical:	Temperature (C)	Reconnaisance
	Specific Conductance (P&C)*	Soil Vegetation Survey
	Turbidity (P&C)*	Vegetation Inventory
	Suspended Solids (P&C)*	
	pH (P)	
Chemical:	Nutrients (P)	
	Ammonia Nitrogen	
	Organic Nitrogen	
	Nitrate Nitrogen	
	Orthophosphate	
	Total Phosphorus	
	Hardness-Alkalinity (P)	
	Dissolved Oxygen (P)	
Biologic:	Coliform, Fecal (P)	
Surface Water Station (C) (Stage & Discharge)		
Meteorologic:	Temperatue (C)	
	Max-Min (P)	
	Precipitation (2) (C)	
Soils-Vegetation:	Surface Erosion Transects	
	Channel Erosion Transects	

*(C) Automatic sampler triggered at selected stages and time intervals

WATERSHED INVENTORY FORM C-13

Watershed identification	Name: Cabin Creek Administrative Study (Non-point Pollution Abatement) Area: Type:
Administering organization	Name: Address:
Location	State: Latitude: Longitude:
Physiographic description	Geology: Typography: Vegetation: Soil: Climate:
Use	Past: Present:
Purpose of data collection	
Publications	

Data availability To whom When Form	**Collected data:** **Supporting data:**
Date collection initiated	<u>Station No.</u> Surface Water: OWDC (Not assigned to date) FS1441310 Quality of Water: OWDC (Not assigned)
Date collection terminated	

Types of Data Available (P = periodic; C = continuous)

<u>Collected Data</u>	<u>Supporting Data</u>

Remarks:

Purpose of data collection:

(1) Evaluate forest management actvity - identify and quantify sources of non-point pollution, especially in relation to long range programs in this province for continued long-span skyline harvesting systems.

(2) Evaluate and/or improve predictive water yield increase and sediment production methods to use in comparative analysis of other systems.

(3) To measure life cycle impacts and/or environmental changes in fisheries habitat and propagation.

(4) To develop base-line data for projection to similar physiographic areas, and eventually provide water quality criteria based on local, quantitative figures.

Watershed identification	Name: Santa Ynez Basin Area: 56,721 ha (219 sq. mi.) Type: Representative
Administering organization	Name: USDA Forest Service Address: California Region 630 Sansome Street San Francisco, CA 94111
Location	State: California Latitude: 34^{0} 35' N Longitude: 119^{0} 35' W
Physiographic description	Geology: Shale, basalt, sandstone, semi-conglomerate, limestone, and granite Typography: Steep rugged mountains extending down to foothills of moderate relief Vegetation: Mixed chaparral and woodland Soil: Lithosols, old river terraces and flood plains, deep soils on flatter slopes Climate: Relatively warm, wet winders and hot, extremely dry summers
Use	Past: Dispersed recreation, multiple use management. Burned repeatedly by wildfire. Present: Municipal watershed with active flood prevention program.
Purpose of data collection	To develop procedures for predicting and evaluating effects of alternatives management practices on the soil and water resources in other watersheds within the same hydrologic province.
Publications	Using representative watersheds to manage Forest and Range lands for improved water yield.

Data availability To whom When Form	Collected data: All individuals Takes about 2 months to deliver Summarized in table form Supporting data: All individuals paying reproduction costs.
Date collection initiated	1965
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Soils inventories
Streamflow (C)	Geologic inventories
Temperature (C) 7 ft. and 17 ft. above ground level	Vegetation inventories
Chemical quality (P) four times a year	
Radiation (C)	
Relative humidity (C)	
Suspended Sediment (C)	

Remarks:

Water quality surveillance of parameters associated with land use in the basin is the planned future activity.

WATERSHED INVENTORY FORM C-15

Watershed identification	Name: East Fork Russian River Area: 105 sq. mi. Type: Representative
Administering organization	Name: U.S. Army Engineer District,San Francisco Address: Corps of Engineers 100 McAllister Street San Francisco, CA 94102
Location	State: California Latitude: 39^{o} 10' N Longitude: 123^{o} 10' W
Physiographic description	Geology: Franciscan assemblage, conglomerate, graywacke, shale, shist, and chert. Severely weathered and subject to landslides. Typography: Rough and mountainous country surrounding alluvial valley of 12 square miles. Vegetation: Conifers and oaks with extensive growths of manzanita and chaparral Soil: Deep highly previous sandy, silts, and gravels Climate: Cold wet winter, dry hot summer, little snow
Use	Past: Intensive agricultural, grazing land Present: Same as past
Purpose of data collection	Monitor effects of existing Lake Mendocino Project on water quality.
Publications	

Data availability To whom When Form	Collected data: All individuals on request Supporting data:
Date collection initiated	March 1973
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Turbidity (P)	Boran (P)	
pH (P)	Arsenic (P)	
Specific Conductance (P)	Mercury (P)	
Temperature (C)	Lead (P)	
Discharge (C)	Zinc (P)	
Precipitation (C)	Copper (P)	
Nitrates (P)	Cadmium (P)	
Ammonia (P)	Chromium (P)	
Phosphates (P)		
Organic nitrogen (P)		
Total nitrogen (P)		
Organic carbon (P)		
Evaporation and wind (P)		

Remarks:

WATERSHED INVENTORY FORM C-16

Watershed identification	**Name:** Lights Creek **Area:** 14245 ha. (55 sq mi) **Type:** Representative
Administering organization	**Name:** U.S. Forest Service **Address:** Plumas National Forest P.O. Box 1500 Quincy, CA 95971
Location	**State:** California **Latitude:** 40^{o} 10' **Longitude:** 120^{o} 48'
Physiographic description	**Geology:** Granitic rocks, copper enriched metavolcanic rocks. **Typography:** Moderate to steep side canyons leveling to gentle ridges and crests. **Vegetation:** Mixed conifer **Soil:** Haypress, Bonta and Toiyabe from granitics Etsel, Sheetiron and others from metavolcanics. **Climate:** Mediterranean
Use	**Past:** Timber harvest, limited mining. **Present:** Timber harvest; proposed copper line.
Purpose of data collection	To establish water quality standard for Lights Cr.
Publications	1. Stender. 1971, Lights Creek Water Quality Study. - Greenville Ranger District, Plumas NF 2. Ingco,J. 1974, Situation Report. Proposed Lights Creek Copper Mine. Greenville Ranger District, Plumas National Forest.

Data availability To whom When Form	Collected data: All individual upon request: raw data. Supporting data: All individuals upon request, maps and written reports.
Date collection initiated	July, 1971
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data		Supporting Data
Discharge (P)	Fluoride (P)	Geology
Air & Water temp. (P)	Bacarbonate (P)	Land Use
Turbidity (P)		Vegetation type
Electrical conductivity (P)		Prcipitation
pH (p)		Water yield
Alkalinity (P)		
Hardness (P)		
Aluminum (P)		
Cadmium (P)		
Chromium (P)		
Cobalt (P)		
Copper (P)		
Iron (P)		
Lead (P)		
Magnesium (P)		
Mercury (P)		
Sulfate (P)		
Sulfide (P)		
Zinc (P)		

Remarks: Water quality data is presently being analized to assess the need for further data collection. It is expected that a modified water quality program will continue.

WATERSHED INVENTORY FORM C-17

Watershed identification	Name: Casper Creek Watersheds Area: 931.9 ha. (2303 acres) Type: Experimental
Administering organization	Name: PSWF & RES Address: 1550 B Street Arcata, California 95521
Location	State: California Latitude: 35^{0} 20' Longitude: 123^{0} 44'
Physiographic description	Geology: Cretaceous Marine Sedimentary (Sandstone and Shale) Typography: Hilly with moderate to Steep Slopes Vegetation: 2nd Growth Redwood and Douglas Fir. Soil: Clays and Clayloam (Hugo & Mendocino) Climate: Cool Maritime
Use	Past: Timber Harvest Present: North Fork has no development acts as a control. South Fork has Timber Harvesting
Purpose of data collection	Monitor the effects of timber harvest and associated development on Sediment yields.
Publications	1. Drammes, J.S. et al Road Construction on Casper creek Watersheds --- 10 year report on impact.

Data availability To whom When Form	Collected data: All individuals on request raw data to written summar. Supporting data: All individuals on request Written reports
Date collection initiated	1962
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Soil Survey
Streamflow (C)	Vegetation Inventory
Suspended Sediment (C)	Geology Survey
Reservoir Deposition (P)	

Remarks:
Paired Watersheds

North Fork Casper Creek - 507.9 ha. (1255 acres)
South Fork Casper Creek - 423.7 ha. (1047 acres)

WATERSHED INVENTORY FORM C-18

Watershed identification	Name: Salmon Creek Area: 210.5ha (520AC) Type: Representative
Administering organization	Name: US. D.A., Forest Service Address: 900 W. Grand Porterville, Calif. 93257
Location	State: California Latitude: 35°54' Longitude: 118°23
Physiographic description	Geology: granitic, metamorphic Typography: mountainous with steep slopes Vegetation: mixed conifer, shrubs Soil: sandy, rocky loams Climate: continental, orographic
Use	Past: logging - mild recreation Present: Same
Purpose of data collection	To determine effects of timber harvest on Kern Plateau
Publications	None

Data availability To whom When Form	Collected data: All individuals upon request Supporting data: All individuals upon request
Date collection initiated	1961
Date collection terminated	Continuing

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C) Annual Debris (C) Dam Measurement Precipitation (C) Continuous Temperature (P) Suspended Sediment (P)	Detail Soil Survey

Remarks: Three watershed tributaries are instrumented

WATERSHED INVENTORY FORM C-19

Watershed identification	**Name:** Bishop Creek, North and Middle Forks **Area:** 8032 ha (31 sq. mi.) **Type:** Representative
Administering organization	**Name:** USDA Forest Service **Address:** Inyo National Forest Bishop, California
Location	**State:** California **Latitude:** 37° 13' **Longitude:** 118° 36'
Physiographic description	**Geology:** Glacial moraines over primarily granitic bedrock with secondary metamorphic rocks **Typography:** Mountainous, alpine character **Vegetation:** Lodgepole pines, aspen, shrubs **Soil:** Largely glacial till **Climate:** Subalpine
Use	**Past:** Limited mining, recreation **Present:** Wilderness, year-round recreation, summer homes
Purpose of data collection	Establishment of wilderness water quality standards, methods; relating quality to recreation use.
Publications	(related work) "Water Quality and Recreation in the Mammoth Lakes Sierra," Environmental Science and Engineering, University of California, Los Angeles. (Current work in press.)

Data availability To whom When Form	Collected data: All reports on work available at cost from Environmental Science and Engineering, UCLA Supporting data:
Date collection initiated	June, 1974 (Discharge, precipitation histories very much older.)
Date collection terminated	Continuing in summer months, occasional year-round measurements.

Types of Data Available (P = periodic; C = continuous)

Collected Data			Supporting Data
(all periodic)	continuous		
Nitrates	Discharge	Southern CA	Cultures of native bacteria
Phosphates	Precipitation	Edison Co. &	Moderately detailed geological mapping
Sodium +		Los Angeles	Extensive survey and analysis of recreational use
Calcium ++		Dept. of Water	Application of DOSAG streamflow model
Magnesium ++		and Power	
Potassium +	Temperature	Aspendell	
TDS		Mutual Water	
pH		Co.	
Dissolved Oxygen			
Water Temperature			
Benthic Invertebrates			
Total Coliform			
Fecal Coliform			
Fecal Streptococci			
Total Bacteria			

Remarks:
Data collection largely part of continuing studies conducted by Environmental Science and Engineering, UCLA; collaboration by U.S. Forest Service.

WATERSHED INVENTORY FORM C-2C

Watershed identification	Name: East Fork (San Dimas) Area: 1419.8 ha (3507 acres) Type: Experimental
Administering organization	Name: USDA Forest Service Address: PSWF&RES 110 N. Wabash Ave. Glendora, California 91704
Location	State: California Latitude: 34° 11' Longitude: 117° 45'
Physiographic description	Geology: Metamorphia and granitics Typography: Well disected, steep walled canyons. Elevation 579-1676 m (1900-5500 feet) slopes 55-70% Vegetation: Chamise and scrub oak, chaparral, oak woodland, riparian woodland Soil: Coarse sandy loams, shallow to very deep Climate: Mediterranean
Use	Past: Experimental Present: Experimental control area Fern Canyon Research Natural Area included
Purpose of data collection	Baseline streamflow and mountain precipitation studies.
Publications	Used in part in numerous publications

Data availability To whom When Form	**Collected data:** All individuals Now on request May require reproduction costs **Supporting data:** Certain cooperative research, small scale reproduction costs
Date collection initiated	1938
Date collection terminated	1954, restarted 1972 to present

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow (C)	Soils Inventory
Water Quality (P)	Geology Inventory
*Ammonia	Vegetation Inventory
*Nitrates	
*Phosphates	
Precipitation (C)	

Remarks:

These data and other water and stream characteristics have been obtained cooperatively with the Forest Sciences Lab in Corvallis, Oregon.

The stream is perennial.

WATERSHED INVENTORY FORM C-21

Watershed identification	Name: Teakettle Creek Experimental Forest Area: 1234. ha. (3050 acres) Type: Experimental
Administering organization	Name: Pacific Southwest Forest & Range Exp. Sta. Address: U.S. Dept. of Agriculture - Forest Service 1960 Addison Street Berkeley, California 94701
Location	State: California Latitude: 36° 57' N Longitude: 119° 3' W
Physiographic description	Geology: 73% metamophic; 13% grandoiorite; 5% basalt lave; some alluvial deposits. Elevation 1920-2469M (6300' to 8100') Typography: Mountainous - steep slopes, narrow draws Vegetation: Bare slopes, grass meadows, brush areas, pine-fir Forest. Soil: Sandy loams Climate: High altitude mediterranian
Use	Past: Research, recreation, grazing Present: Research, recreation, grazing.
Purpose of data collection	Basic hydrologic data to assess the affects of forest management and land use.
Publications	

Data availability To whom When Form	Collected data: (See Remarks) Supporting data:
Date collection initiated	1939 record not continuous
Date collection terminated	1969 record not continuous

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow 1939-41 (C) 1959-69	Geologic mapping
	Soils analysis
Sediment survey (P)	Climatic data
Water Balance of Teakettle Watersheds (P)	Vegetation inventory.
Soil Moisture - Summer (P)	
Soil temperature - Summer (P)	

Remarks:

1. Streamflow published by U.S. Geological Survey

2. Other data and surveys are in raw data form in PSW files. Not in form for ready distribution.

WATERSHED INVENTORY FORM C-22

Watershed identification	Name: Onion Creek Experimental Forest Area: 1295.6 ha. (3201. acres) Type: Experimental
Administering organization	Name: Pacific Southwest Forest and Range Address: Experimental Station U.S. Forest Service 1960 Addison Street Berkeley, California 94701
Location	State: California Latitude: 39° 17' N Longitude: 120° 21' W
Physiographic description	Geology: Rhyolite lava, andesite breccia, granodiorite Typography: Mountainous - Benches, steep slopes, narrow draws and canyons, some cliff areas. Elevation 18288 - 2544.2M (6000' to 8380') Vegetation: Bare slopes, grass and Borb meadows, Brush areas, pine-fir forest. Soil: Sandy loam Climate: High altitude Mediterranian
Use	Past: Research; recreation; grazing Present: Research; recreation; grazing
Purpose of data collection	Basic hydrologic data to assess the affects of Forest management and land use.
Publications	

Data availability To whom When Form	Collected data: (See remarks) Supporting data:
Date collection initiated	1957
Date collection terminated	most by 1969

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Streamflow 1957-1974 (C)	Soil analysis
Sediment Survey (P)	Climatic data
Suspended sediment (P)	Snow Surveys
Soil temperature (P)	Evaporation from snow
Soil Moisture (P)	
Water movement in trees, soil, snow. (P)	

Remarks:

1. Streamflow for main Onion Creek published by U.S. Geological Survey.
2. Other data and surveys in raw data form in PSW files - not in form for ready distribution.

WATERSHED INVENTORY FORM C-23

Watershed identification	Name: Indian Creek Area: 9324 ha (36 sq. mi.) Type: Representative
Administering organization	Name: USDA Forest Service Address: Los Padres National Forest 42 Aero Camino Goleta, CA 93017
Location	State: California Latitude: 34^{0} 32' Longitude: 119^{0} 38'
Physiographic description	Geology: Cretaceous shales and sandy siltstones (turbidites) Typography: Rugged slopes in excess of 50% are common Vegetation: Chaparral Soil: Sandy silt loam Climate: Mediterranean
Use	Past: Watershed Present: Watershed
Purpose of data collection	Baseline water quality for undisturbed chaparral since mid - 1930's
Publications	None

Data availability To whom When Form	Collected data: All individuals On request Basic field data form Supporting data: All individuals paying reproduction costs On request Basic field data form
Date collection initiated	February 1972
Date collection terminated	August 1974

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Temperature (P)	Soils Map
Discharge (P)	Geology Map
Electrical Conductance (P)	Vegetative Map
Total Hardness (P)	Wildlife Survey
Calcium Hardness (P)	
Carbonate alkalinity (P)	
Bicarbonate alkalinity (P)	
pH (P)	

Remarks:

WATERSHED INVENTORY FORM C-24

Watershed identification	Name: Big Creek Barometer WS Area: 19,273 ha. (47,622 acres) Type: Representative
Administering organization	Name: U.S. Forest Service Address: Sierra National Forest 1130 "O" Street Fresno, California 93712
Location	State: California Latitude: 37^{o} 00' Longitude: 119^{o} 20'
Physiographic description	Geology: Granitic, some metamorphic Typography: Gentle to steep 20% to 75% Vegetation: Grasslands, brush & forest Soil: Granitic Origin Climate: Moderate
Use	Past: Grazing, timber harvest, some recreation Present: Same
Purpose of data collection	Demonstration area
Publications	None

Data availability To whom When Form	Collected data: Anyone on request Report form Supporting data: Anyone paying reproduction costs on request Report Form
Date collection initiated	1965
Date collection terminated	1974

Types of Data Available (P = periodic; C = continuous)

Collected Data	Supporting Data
Precipitation (C)	Timber harvest
Temperature (C)	Brush conversion
Stream Flow (C)	Grazing
Wind Speed (C)	
Turbidity (P)	
Suspended Sediment (P)	
Other (P)	

Remarks:

Barometer Watershed Dismantled in 1974.

LISTING OF WATER QUALITY MODELS

PHYSICAL - STREAMFLOW

NO	AUTHOR		TITLE
1 -	ANDERSON - PSWFRES -BERK	1975	HYD POT OF UNIT AREAS:BASIS FOR MAN WTR RES
2 -	ANDERSON,HOBBA-USFS-BERK-	1959	FORESTS AND FLOODS IN NORTHWESTERN US
3 -	BROWN,BAKER,ROGERS-RMFES-	1974	OPP FOR INCREASNG WTR YLDS & OTHR MU VALUES ON
4 -	BURNASH,FERRALL-NWS-SAC-	1971	THE GENERALIZED SIMULATION SYSTEM
5 -	BUSBY,HIRASHIMA-USGS-MNLPK	1972	GEN STMFLO REL OF SAN BER & E SAN GAB MTNS, CAL
6 -	DAWDY,LICHTY-USGS MNLO PK-	1968	METHODOLOGY OF HYDROLOGIC MODEL BUILDING
7 -	HOLTON,LOPEZ	1971	USDAHL70 MODEL OF WATERSHED HYDROLOGY
8 -	HUGGINS,BURNEY,KUNDU,MONKE	1973	SIM OF THE HYDROLOGY OF UNGAGED WATERSHEDS
9 -	KOHLER,RICHARDS-NOAA WASHDC	62	MULTICAPACITY BASIN ACC FOR PRED RO FM STM PRECP
10 -	LULL,SOPPER	1967	PRED AVG ANN & SEAS FLO AT PHYSGHPC UNITS IN NE
11 -	LUMB,CURRIE,HASSETT,ZORICH	1975	GTWS: GEORGIA TECH SIMULATION MODEL
12 -	NAKANO-JAPAN	1971	SOIL & WTR CONS FNS OF FOR ON MTNS LANDS, RES OF
13 -	ROCKWOOD-USCE-PORTLAND	1968	APP OF STMFLW SYNTH & RES REG-SSARR-TO LWR MEKNG
14 -	ROGERS	1973	DES OF SYS FOR PRED EFFECTS OF VEG MANIP ON WY
14A -	ROGERS	1975	ECOSYS ANAL OF FOR W/S ,DOC GEN WATR BAL MODEL

LISTING OF WATER QUALITY MODELS

PHYSICAL - STREAMFLOW

NO	AUTHOR	TITLE
15 -	SHIH,BOWLES,RILEY-UTAH ST-1973	AN APP OF UTAH ST U WTRSHD SIM MOD TO ENTIAT EXP
16 -	STAFF HYD RES LAB,NOAA- 1972	NAT WTHR SER RIVER FORECAST SYSTEM FORECAST PROC
17 -	US ARMY ENG DIST COE-SAC- 1958	LONG DURATION RUNOFF VOLUMES
18 -	US FOREST SERVICE-R1-1970-1975	HYDROLOGIC EFFECTS OF VEGETATION MANIPULATION
19 -	TODINI,WALLIS-IBM ITIALIA-1974	USING CSL FOR DAILY OR LONGER PD RNFLL-RO MONITO
20 -	WSDU-FOREST SERV-BERKELEY-1967	A WATER BALANCE PROGRAM-BURP

LISTING OF WATER QUALITY MODELS

PHYSICAL - STREAMFLOW COMPONENT

NO	AUTHOR		TITLE
21 -	AMOROCHO,ESPILDORA-	1966	MATH SIMULATION OF THE SNOW MELTING PROCESS
22 -	DOUGLASS,SWANK-SEFES-USFS-	1972	STMFLW MODIFICATION THRU MGMT OF EASTERN FORESTS
23 -	DOUGLASS,SWANK-SEFES-USFS-	1975	EFFECTS OF MGMT PRAC ON WTR QUAL & QUAN-COWEETA
24 -	GOLDSTEIN,MANKIN,LUXMOORE-	1974	DOC OF PROSPER-A MOD OF ATMOS-SOIL-PLAN WTR FLOW
25 -	LEAF,BRINK-RMFRES-USFS-	1973	COMP SIM OF SNOWMELT IN A COLO SUBALPINE WTRSHED
26 -	HELVEY-COWEETA HYD LAB-	1967	INTERCEPTION BY EASTERN WHITE PINE
27 -	LEAF,BRINK-RMFRES-USFS-	1975	HYD SIM MODEL OF COLO SUBALPINE FOREST
28 -	LUXMOORE-	1973	APP OF GREEN & COREY METH FOR COMP HYD COND IN H
29 -	SWANK,GOEBEL,HELVEY-	1972	INT LOSS IN LOBLOLLY PINE STNDS OF S CAR PIEDMNT
30 -	SWIFT,ET AL-	1973	SIM OF ET FM MAT & CLRCUT DECID FOR & YNG PINE P
31 -	SWIFT,LUXMOORE-	1973	COMP ALGRTHM FOR SOLAR RAD ON MTN SLOPES
32 -	VERRY	1975	EST WTR YLD DIFFS BET HARDWOOD & PINE FORESTS
33 -	WILLEN,SHUMWAY,REID	1971	SIM OF DAILY SNOW WATER EQUIVALENT & MELT
34 -	ZIEMER-	1964	SUMMER ET TRENDS AS RET TO TIME AFTR LOGGING OF

LISTING OF WATER QUALITY MODELS

PHYSICAL - SURFACE EROSION

NO	AUTHOR		TITLE
35 -	ANDERSON	1969	GUIDLNS FOR COMP QUANTIFIED SOIL EROS HAZ & ON-
36 -	BOSTER,DAVIS	1972	SOIL-LOSS CONSIDERATIONS IN CHAP TO GRASS CONVS
37 -	FOSTER,MEYER-USDA-ARS	1972	MATH SIM OF UPLND EROS USNG FUND EROS MECHANICS
38 -	FOSTER,MEYER-ARS-OXFORD-	1972	A CLOSED FORM SOIL EROSION EQ FOR UPLAND AREAS
39 -	LEAF-RMFRES-FT. COLLINS-	1974	A MOD FOR PRED EROS & SED YLD FM SEC FOR RD CON
39A -	MEGEHAN	1974	EROSION OVR TIME ON SVR DSTRB GRNTC SOILS. MODEL
40 -	MEEUWIG-USFS-IFRES	1971	SOIL STAB ON HI-ELEV RNGLND IN THE INTRMTN AREA
41 -	MEYER,WISCHMEIER	1969	MATH SIM OF THE PROCESS OF SOIL EROSION BY WATER
42 -	MUSGRAVE	1947	THE QUANTITATIVE EVAL OF FACTORS IN WTR EROS
43 -	ROTH,ET AT	1974	PRED OF SUBSOIL EROD USING CHEM,MIN,& PHYS FCTRS
44 -	TEW-USFS-INT REGION	1973	EST SOIL EROSION LOSSES FROM UTAH WATERSHEDS
45 -	WILLIAMS-ARS-TEMPLE TEXAS-	1972	SEDIMENT YLD PRED W/ UNIV EQ USNG RO ENRGY FACTR
46 -	WISCHMEIER-ARS-W.LAFAYETTE	1974	NEW DEVELOPMENTS IN ESTIMATING WATER EROSION
47 -	WISCHMEIER-PURDUE	1972	EST THE COVER AND MGMT FCTR FOR UNDISTURBD AREAS
48 -	WISCHMEIER,SMITH	1960	UNIVERSAL SOIL LOSS EQUATION

LISTING OF WATER QUALITY MODELS

PHYSICAL - SURFACE EROSION

NO	AUTHOR		TITLE
49 -	WSDU-USFS-BERKELEY	1972	ONEROS
50 -	WSDU-USFS-BERKELEY	1973	EROSON MODEL(ONEROS)

LISTING OF WATER QUALITY MODELS

PHYSICAL - CHANNEL

NO	AUTHOR		TITLE
51 -	PIEST,BRADFORD,SPOMER	1972	MECHANISMS OF EROS & SED MOVEMENT FROM GULLIES
52 -	ROSA,TIGERMAN-USFS-OGDEN	1951	SOME MTHDS FOR REL SED PROD TO WTRSHD CONDITIONS
53 -	LEOPOLD,MADDOCK	1953	HYD GEOM OF STRM CHNLS & SOURCE PHYSGRPHC IMPLIC
54 -	RENFRO	1972	USE OF EROS EQNS & SED DEL RAT FOR PRED SED YLD
55 -	STRAND-BUR OF REC-DENVER-	1972	PSAND(SEDIMENT MODEL)
56 -	YANG,STALL	1974	UNIT STRM PWR FOR SED TRANSPORT IN NATURAL RIVRS
57 -	THOMAS-HYD ENG CTR- DAVIS-	1974	SCOUR & DEPOSITION IN RIVERS & RESERVOIRS
58 -	WOOLHIZER,DROVI	1971	A STOCH MODEL FOR SED YLD FOR EPHEMERAL STREAMS

LISTING OF WATER QUALITY MODELS

PHYSICAL - MASS MOVEMENT

NO	AUTHOR		TITLE
59 -	BELL	1968	GENERAL SLOPE STABILITY ANALYSIS
60 -	DYRNESS	1967	MASS SOIL MVMT IN THE H.J.ANDRES EXP FOREST
61 -	GRAY	1969	EFFECT OF FOR CLEARCUTTING ON STAB OF NAT SLOPES
62 -	KHONO,NAMBA,TAKIGUCHI,ET AL	68	ROLES OF TOP,SOIL,& FOR IN LNDSLDS OF WTHRED GRA
63 -	JONES,EMBODY,PETERSON,ET AL	61	LANDSLIDES ALONG COLUMBIA RIVER,VALLEY,NE WASH
64 -	MURANO	1968	STAT STUDIES ON LNDSLDS NEAR BNDRY BET GITU &
65 -	NAKANO	1971	SOIL & WTR CONS FN OF FOREST ON MTNOUS LAND
66 -	RICE-PSWFRES	1968	EST OF ROLE OF SLIPS IN EROS FM SAN GAB MTNS
67 -	RICE-FOGGINS	1971	EFCTS OF HI INT STRMS ON SOIL SLP ON MTNS WTRSDS

LISTING OF WATER QUALITY MODELS

PHYSICAL - TOTAL OUTPUT

NO	AUTHOR		TITLE
68 -	ANDERSON-PSWFRES	1949	FLOOD FREQUENCIES & SEDIMENTATION FM FOR WTRSHDS
69 -	ANDERSON-PSWFRES	1951	PHYSICAL CHARACTERISTICS RELATED TO EROSION
70 -	ANDERSON-PSWFRES	1954	SUSP SED DISCH AS REL TO STRMFLW,TOP,SOIL,& LAND
71 -	ANDERSON-PSWFRES-BERKELEY-	1970	PRINC COMP ANLYS OF WTRSHD VARS AFF SUSP SED DIS
72 -	ANDERSON-USFS-BERKELEY	1974	SED DEP IN RES ASSOC W/ RURAL RDS,FF,& CTHMT ATT
73 -	ANDERSON,TROBITZ-USFS-BRKLY-	49	INF OF SOME WTRSHD VARIABLES ON A MAJOR FLOOD
74 -	BRANSON,OWEN	1970	PLNT COV,RO,& SED YLD RLTNSHPS ON MANCOSE SHALE
75 -	COOPER,SNYDER-TVA-TENN-	1956	EVAL EFFS OF LAND-USE CHANGES ON SEDIMENT LOAD
76 -	DISSMEYER	1971	EST THE IMPACT OF FOR MGMT ON WATER QUALITY
77 -	DISSMEYER-USFS-ATLANTA	1973	EVAL THE IMPACT OF IND FOR MGMT PRACTICES ON SS
78 -	FLAXMAN-SCS-PORTLAND	1972	PRED SEDIMENT YIELD IN WESTERN US
79 -	FLEMING	1971	SIMULATION OF WATER YLD FM DEVEGETATED PIECES
80 -	HANSON	1966	SUSP SED CONC AS REL TO WTRSHD VARS IN CTRL ARIZ
81 -	HUFF,KRUGER-U OF WIS-MAD-	1974	SIM OF THE HYD TRANSPORT OF RADIOACTIVE AEROSOLS
82 -	LEAF,BRINK	1975	LND USE SIM MOD OF THE SUBALPINE CONIFEROUS ZONE

LISTING OF WATER QUALITY MODELS

PHYSICAL - TOTAL OUTPUT

NO	AUTHOR		TITLE
83 -	NEGEU-STANFORD-	1967	A SEDIMENT MODEL ON A DIGITAL COMPUTER
84 -	PATTERSON,ET AL-OAKRIDGE-	1974	A USERS MAN FOR FTRAN4 VERS OF WIS HYD TNSPRT MO
85 -	RYAN,MORISON,BETHEL-U WASH-	74	ECOSYSTEM MODELLING OF A FORESTED RIVER BASIN
86 -	SIMONDS,LI,STEVENS-CSU-COLO-	74	DEV OF MODLS FOR PRED SED YLD FM SMALL WTRSHDS
87 -	STRIFFLER-LK STS FOR RES-	1963	SUSP SED CONC IN A MICH TROUT STRM AS REL TO WTR
88 -	TVA HYDROL RES & ALYS STAFF-	72	UPPER BEAR CREEK EXPERIMENTAL PROJECT
89 -	USDA-USFS-BERKELEY	1953	FORMULAS DEV FOR EST SED YLD IN S CALIF
90 -	WALLIS,ANDERSON-PSWFRES-	1965	AN APP OF MULTIVARIATE ANLYS TO SED NETWRK DSGN
91 -	WILLIAMS,HANN	1972	HYMO:PROB-ORIENTED COMP LANG FOR HYD MODELLING
92 -	ROSGEN-USFS-SAND PT IDAHO-	1974	PRELIM REP PROC FOR QUANTIFYING SED PRODUCTION

LISTING OF WATER QUALITY MODELS

CHEMICAL

NO		AUTHOR		TITLE
94	-	BETSON,MCMASTER-TVA-TENN-	1974	A FIRST GEN NON-PT SOURCE MINERAL WTR QUAL MOD
95	-	CHIU	1973	REP MTHDS FOR ID & EVAL NAT & EXTNT OF NP SRCS
96	-	FROST-USGS-HELENA-MONT	1974	EVAL & SIM OF CHEM WQ DATA FOR 5 MONT SMPNG STA
97	-	HALL-U OF NEW HAMPSHIRE-	1970	DIS SOLIDS-DISCH RELATIONSHIPS:1.MIXING MODELS
98	-	HYDROCOMP-PALO ALTO-CAL-	1973	HYDROCOMP SIMULATION PROGRAM(HSP)
99	-	HYDROCOMP-PALO ALTO-CAL-	1973	PESTICIDE TRANSPORT & RO MODEL(PTR)
99A	-	HYDROCOMP INC	1973	HSP-QUALITY
100	-	JOHNSON,LIKENS,ET AL-CORNEL-69		A WRKNG MOD FOR VAR IN STRM WTR CHEM AT HUBB BRK
101	-	JOHNSON,LIKENS,ET AL-DRTMTH-69		A WRKNG MOD FOR VAR IN STRM WTR CHEM AT HUBB BRK
102	-	NOUR,RAZEK-MISS ST U-	1972	STAT METH FOR PRED THE POLLUTANTS IN A RIVER
103	-	PATTERSON,ET AL-OAK RIDGE-	1974	DEVELOPMENT & APP OF THE UNIFIED TRNSPRT MODEL
104	-	STEELE-USGS-WASHINGTON DC-	1971	A STUDY OF THE CHEM QUAL OF STRMFLW IN ARKANSAS
105	-	STEELE,JENNINGS	1972	REGIONAL ANALYSIS OF STRMFLW CHEM QUAL IN TEXAS
106	-	STEELE-USGS-WASHINGTON DC-	1973	SIM OF MAJ INORG CHEM CONC & LOADS IN STREAMFLOW

LISTING OF WATER QUALITY MODELS

CHEMICAL - IN DEVELOPMENT

NO	AUTHOR		TITLE
107 -	AUBERTIN-NE FOR EXP STA-USFS		WQ VAR DUE TO GEOL-SOIL COMPLEX & ENV MODIFICATI
108 -	BROWN,SKAU-U OF NEVADA		ORG WQ & SUSP SED FM SMALL FORESTED WATERSHEDS
109 -	COWEETA HYD LAB-USFS-U OF GA		MODS OF NUTRNT CIRC IN FORESTED ECOSYSTMS AT COW
110 -	FERRIN-WH MTN NF-USFS-	1975	PRED EFFCTS OF LND MGMT ALT ON QUAL OF WTR FM FO
111 -	FORCIER,ET AL		LUBRECHT ECOSYSTEM PROJECT
112 -	GESSEL-U WASH-WARING-OSU-USFS		WESTERN CONIFEROUS FOREST BIOME
113 -	GOSZ-U OF MEXICO		HYD NUT CYC INTERACTION FOR NAT & MAN DISTRBD WT
114 -	HAUPT-USFS-IFRES-MOSCOW IDAHO		REG WQ MOD- INTRMTN REG OF THE ROCKY MOUNTAINS
115 -	HORNBECK-USFS-NEFRES-DURHAM NH		NOT INDICATED
116 -	LEDBETTER,GLOYNA	1964	PRED TECHNIQUES FOR WATER QUALITY INORGANICS
117 -	MASCH & ASSOC-TEX WTR DEV BD71		SIMULATION OF WATER QUALITY IN STREAMS & CANALS
118 -	KELLER AND BRINK		WSHD SIM MODEL FOR SELECTED ION CONS
119 -	RYAN	1972	SNOHOMISH BASINS
120 -	CHIU-MDWST RES INST-KANSAS CTY		USERS HNDBK FOR ASSMT OF WTR POLL FM NON-PT SRCS
121 -	THORNTON-USACE-WTRWAYS EXP STA		NOT FORMULATED

LISTING OF WATER QUALITY MODELS

CHEMICAL - IN DEVELOPMENT

NO	AUTHOR	TITLE
122 -	TROENDLE-TMBR & WTRSHD LB-USFS	NOT LISTED

LISTING OF WATER QUALITY MODELS

BIOLOGICAL - TEMPERATURE, PATHOGENS

NO	AUTHOR		TITLE
123 -	BROWN-OSU-CORVALLIS	1969	PREDICTING TEMPERATURES OF SMALL STREAMS
124 -	BROWN-OSU-CORVALLIS	1970	PRED THE EFFECT OF CLEARCUTTING ON STREAM TEMP
125 -	BROWN-OSU-CORVALLIS	1972	AN IMPROVED TEMP PRED MODEL FOR SMALL STREAMS
126 -	CANALE,PATTERSON,ET AL	1973	WATER QUAL MODELS FOR TOTAL COLIFORM
127 -	CANALE	1973	MODEL OF COLIFORM BACTERIA IN GRAND TRAVERSE BAY
128 -	CLEARY,MCAVOY,SHORT	1972	UNSTEADY STATE,3-DIM MOD OF THRML POLL IN RIVERS
129 -	CLUIS	1972	REL BET STREAM WTR TEMP & AMBIENT AIR TEMP
130 -	DEWALLE,KAPPEL-PENN ST U		EST EFF OF CLRCTNG ON SUMMER WTR TEMP OF SM STMS
131 -	DEWALLE-PENN ST U-	1974	EFF OF PARTL VEG & TOP SHADE ON RAD ENRGY EXCHNG
132 -	FRAZIER-USFS-MT HOOD NF	1974	BOW CR WTRSHD-STRM TEMP EFF OF A HARVEST PROPOSL
133 -	JOBSON	1973	THE DISSIPATION OF EXCESS HEAT FM WATER SYSTEMS
134 -	JOHNSON	1971	STREAM TEMPERATURES IN AN ALPINE AREA
135 -	LIU,COPP-WASH WTR RES CTR-	1971	WARMING OF SM IMPOUNDMENTS THRU NAT HEAT EXCHNGE
136 -	LOMBARDO,OTT	1974	WATER QUALITY SIMULATION & APPLICATION
137 -	AHLERT	1971	MATH DES OF BIO & PHYS PROCESSES IN HTD STREAMS

LISTING OF WATER QUALITY MODELS

BIOLOGICAL - TEMPERATURE, PATHOGENS

NO	AUTHOR		TITLE
138 -	MAHLOCH	1974	COMP ANLYS OF MOD TECH FOR COLI ORGS IN STREAMS
139 -	MCSWAIN,SWANK		BASLN VALS & SHT TRM FLUCTS OF ENTERIC BACT IN O
140 -	NAHAVANDI,MASLO,LAYENDEKER-	74	THRML LDNG OF WTR BODIES UNDER WQ CRI CONSTRNTS
141 -	NECE-WTR RES CTR-WASH-	1968	STRM TEMP STDY,NF,SNOQUALAMIE RIVER,WASHINGTON
142 -	NOVOTNY,KRENKEL	1973	SIMPLIFIED MATH MOD OF TEMP CHANGES IN RIVERS
143 -	PLUHOWSKI-USGS-PROF PA 800	C-72	CLRCTNG & ITS EFF ON WTR TEMP OF SM ST IN N VA
144 -	TASKER,BURNS	1974	MATH GENERALIZATION OF STM TEMP IN CTRL N ENGLND
145 -	WITHERSPOON,POULIN	1970	STDY OF HT LOSS OF ST LAW RVR BET KINGSTON & COR

LISTING OF WATER QUALITY MODELS

BIOLOGICAL - STREAM DISSOLVED OXYGEN

NO	AUTHOR		TITLE
146 -	BUTTS,KOTHANDARAMAN,EVANS-	1973	PRCTCL CONSDRATNS FOR ASSESSNG WASTE ASSIMILATVE
147 -	DUKE-	1974	PRACTICAL APPLICATION OF WTR QUAL MODLS-DOSAG3
148 -	DUKE-	1974	PRACTICAL APPLICATION OF WTR QUAL MODLS-QUAL-II
149 -	DUKE-	1974	PRACTICAL APPLICATION OF WTR QUAL MODLS-EPARES
150 -	GOODMAN,TUCKER	1971	TIME VARYING MATHEMATICAL MODEL FOR WTR QUALITY
151 -	HOOVER,ARNOLDI	1970	COMPUTER MODEL OF CONNECTICUT RIVER POLLUTION
152 -	LANDINE	1971	PRED OF DISLVD OXYGN LEVLS IN S SASKATCHEWAN RVR
153 -	LIN,FAN,HWANG	1973	DIGITL SIM OF EFF OF THERMAL DISCH ON STRM WQ
154 -	NOVOTNY,KRENKEL	1975	A WASTE ASSIMILATIVE CAP MOD FOR SHALW TURB STRM
155 -	OSBORN,ET AL-ST WASH WR CTR-	73	A SUMRY OF QUAN QUAL & ECNMC METHDLGY FOR EST MI
156 -	RUTHERFORD,O'SULLIVAN	1974	SIMULATION OF WATER QUALITY IN TARAWERA RIVER
157 -	SORNBERGER,KESHAVAN	1973	SIMULATION OF DISSOLVED OXYGEN PROFILE
158 -	THAYER,KRUTCHKOFF	1967	STOCHASTIC MODEL FOR BOD & DO IN STREAMS
159 -	THOMAN	1963	MATHEMATICAL MODEL FOR DISSOLVED OXYGEN
160 -	TIRABASSI	1972	A STAT BASED MATH WQ MOD FOR A NON-ESTRN RVR SYS

LISTING OF WATER QUALITY MODELS

BIOLOGICAL - STREAM DISSOLVED OXYGEN

NO	AUTHOR		TITLE
161 -	TEXAS WTR DEV BOARD	1970	QUAL-I -SIM OF WTR QUAL IN STREAMS & CANALS
162 -	WALLACE,DAGUE	1973	MODELING OF LAND RO EFFECTS ON DO
163 -	YAO	1970	GENERALIZED EQNS FOR CRITICAL OXYGED DEFICIT
164 -	YEH,SKELLY,LAWLER	1973	GENERALIZED SIM MODELS FOR MASSACHUSETTS STREAMS

LISTING OF WATER QUALITY MODELS

BIOLOGICAL - LAKE DISSOLVED OXYGEN

NO	AUTHOR		TITLE
165 -	BELLA	1970	DISSOLVED OXYGEN VARIATIONS IN STRATIFIED LAKES
166 -	NEWBOLD,LIGGETT	1974	OXYGEN DEPLETION LEVEL FOR CAYUGA LAKE

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15. SUPPLEMENTARY NOTES

Volume I contains the text portion of this report. (EPA-600/3-77-036)

16. ABSTRACT

Contained in this volume are the model evaluation forms and the watershed inventory forms compiled as the basis for the conclusions reached in the state-of-the-art assessment presented in Volume I relating wildland management activities with an inventory of monitored watersheds having data suitable for model development and testing. This report was completed by the U.S. Department of Agriculture under an interagency agreement (EPA-IAG-D5-0660) with the U.S. Environmental Protection Agency.

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