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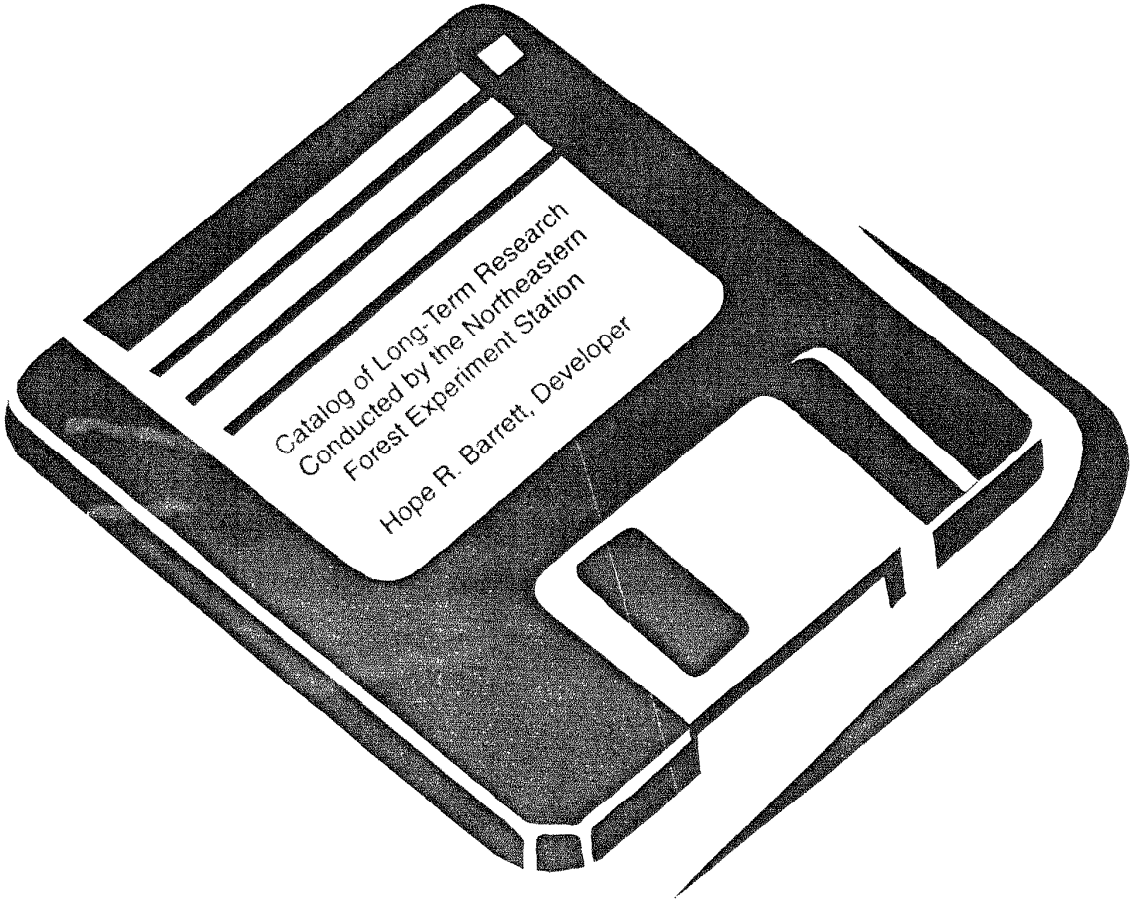
Forest Service

**Northeastern Forest
Experiment Station**

General Technical
Report NE-224

Catalog of Long-Term Research Conducted by the Northeastern Forest Experiment Station

Hope R. Barrett, developer



Abstract

Describes Northeastern Forest Experiment Station long-term research for which data have been collected for 5 years or longer. The catalog and database were developed to reduce duplication of scientific efforts and to facilitate interaction among researchers. Entries for each of the 90 long-term data sets include details such as site characteristics, variable names, year collected, sampling design, data storage method, purpose of the data, and potential application to global change research. Database entries are cataloged sequentially and further organized according to common study topics into 29 themes. Themes contain as few as one and as many as 25 entries. Some multidiscipline entries are organized under more than one theme.

The Author

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Mark Twery, Jay Homeyer, and Regina Winkler are especially recognized for their openness to discuss the concepts of sharing information about research data.

Dedication

This database is dedicated to the researchers who initiated, continued, and maintained data collections through changing times. You have given us and future generations a treasure with unlimited value.

Contents

Introduction

The catalog and database were developed to reduce duplication of scientific efforts and to encourage interaction among scientists. Ninety long-term research efforts are described as accurately and completely as possible. For purposes of this documentation, long-term research efforts include data from field sampling for 5 years or longer, regardless of data collection interval.

Initially, a survey was conducted to locate all long-term studies conducted within the USDA Forest Service, Northeastern Forest Experiment Station. Interviews with the principal scientists and documentation such as study plans, office reports, and publications were the sources of descriptive information for each entry. The descriptive information about each study was compiled into catalog entries in a database and cross-referenced by common themes. In operation, researchers identify entries of interest and read descriptions about the work before contacting the respective Forest Service scientist for more information or potential collaboration.

Updates are expected annually with a comprehensive update every 5 years. This original release is a General Technical Report with an accompanying diskette.

How to Use This Catalog

1. Contents of the Database

The database is on a computer diskette located in a pocket inside the back cover. The catalog (hard copy) contains a "How-To" section, a sample entry, and a theme index under which each entry is cross-referenced. Descriptions of 90 records (entries) are stored in five files on the diskette so the user can sort and query the information. A record represents a single research effort that has continued for more than 5 years. Generally, a record is equivalent to one study, yet some records represent several studies that have been combined as one multipurpose research effort. The 90 database entries have been sorted by theme; some multidiscipline entries are listed under more than one theme.

The five files (Table 1) on the diskette are in dBASE III (.dbf) file format and are named:

Themes.dbf
Data.dbf
Site.dbf
Publica.dbf
Contacts.dbf

Each file contains rows and columns. The 90 rows in each file corresponds with the 90 research efforts cataloged. The columns correspond with a total of 20 different fields that hold descriptive information. The number of columns vary per file. Examples of column fields are Catalog #, Site Description, Statistical Design, and Experimental Treatments. The contents of the fields are described with examples in Appendix A.

Cells are formed at the intersection of rows and columns. Cells can only store up to 256 characters of information. Information that extends beyond 256 characters is referred to as memo text. The dBASE file type requires that memo text be stored in a separate file; thus, associated with each .dbf file is a database text file (.dbt). The .dbt files are automatically read by most software packages when the .dbf files are opened; no special effort is usually required to link the .dbf and .dbt files for a single table.

2. Import File Speculations for the Database

The diskette does not contain a software package; the information on the diskette is to be used with existing software. The five files can be imported into relational database management systems and spreadsheets on a variety of computer systems (platforms). The relating, sorting, and querying capabilities of database management systems offer the most efficient use of the database. For example, the files can be queried to sort entries by geographic location and year established. Analogous to relational database management systems, spreadsheet software packages that offer a workbook mode of operation allow the files to be linked. Using the files in database management systems and spreadsheets is addressed under section 3: Loading the database onto your software.

Table 1.—Fields and sizes of files in the database

File Name	File Size (In bytes)	Fields (Column Names)
Themes.dbf + Themes.dbt	43,162 + 97,385	Catalog #, Title, Objective, Theme 1, Code 1, Theme 2, Code 2, Theme 3, Code 3 (see Section 4 and Theme Index for details on themes)
Data.dbf + Data.dbt	11,116 + 136,357	Catalog #, Relocatability, QA/QC Practices, Data Storage, Data Availability, Global Change Research Applications
Site.dbf + Site.dbt	33,712 + 298,050	Catalog #, Site Description, Statistical Design, Experimental Treatments, Sampling Methods, Variables and Sampling Frequency, Year Established, Year Completed, Notes
Publica.dbf + Publica.dbt	2,888 + 171,454	Catalog #, Publications and Reports
Contacts.dbf + Contacts.dbt	25,420 + 46,186	Catalog #, Contact, Cooperation
Total Database Size (all 5 files)	865,730	

The five .dbf files together with the .dbt files require approximately 900 kilobytes (~870,000 bytes) of computer disk space, though the size may vary once file conversions are initiated. Table 1 shows the approximate size of the individual files.

3. Loading the Database onto your Software

The five files were saved from the Microsoft Access for Windows version. 2.0. file type to the dBASE (.dbf) file type. The files can be loaded into any of the following database managing software successfully: Microsoft Access (versions 2.0 or newer), FoxPro 2.5 and 2.0, Paradox 3.x, Btrieve, dBase IV and III. The .dbf files can be loaded into Microsoft Excel, Borland Quattro Pro, and Lotus 1-2-3 (WKS and WK1) spreadsheet software successfully. Particular software packages such as Lotus 1, 2, 3 may require special procedures to assure that the memo text from the .dbt files is read into the new tables during importation.

After comprehending the README.Now document, choose the database management system or spreadsheet software with which you are most familiar. Follow the instructions for using the software to load the five files. Software commands that usually accomplish this task are "import" or "open". You are ready to access the information after properly loading the files into your software. The catalog number ("catalog #") is the unique identifier for each record in each file and should be used to cross-reference or relate the files during sorts, queries, and report writing.

Working with database management software—If you are using database management software, you can review the software manuals that explain the processes and concepts of performing searches, sorts, or queries. Appendices A (Description of Fields), B (Global Change Research Applications), and C (Abbreviations and Symbols) will be useful when designing specific sorts or queries. An example of a specific query is to search all entries for which "slope" was collected. To design this query, locate the file "site.dbf" and search the field "variables and sampling frequency" for the phrase "*slope*". All entries containing slope should be written to your new table or report as designated.

Working with spreadsheets—If you are using spreadsheet software, you can link the tables together using the workbook mode that operates on the same concept as queries in relational database management software. The workbook mode allows tables to be developed from the information in the original five dBASE files. The tables can be sorted individually or linked to combine specific information about one or several entries.

Remember that software packages often operate uniquely on a variety of platforms. If you experience difficulty working with your software package, perhaps the person who can best answer your questions is a colleague or someone on the software technical support staff. Contact the database manager if your diskette is unreadable or the files damaged.

Working with non-relational software—You can work with the five files even if your software does not allow you to relate files or tables using key fields. You can at anytime conduct a query on a single file and manually reference the "Catalog #" to another table to find more information.

Working with the Forest Service's Data General-based Oracle—If you are working on the USDA Forest Service's Data General System (DG), you can import the database into the DG's present relational database manager, ORACLE. I encourage you to analyze the costs and efforts needed to learn how to operate the DG-based ORACLE system before assuming it as your platform unless you are presently using the DG-based ORACLE system. The power and complexities of ORACLE can handle the database but are not necessary to use it.

It is expected that future versions of this database will reside on the publicly accessible Government Information Locator Service (GILS). Contact the database manager or developer for further information.

4. Tips for Running Queries on the Database

The key to conducting queries across the five files is that you MUST link or relate them. Relational database management software and workbook mode spreadsheet software offer the relate capability. The field "Catalog #" is the ONLY field that is unique to each record and is present in all five files. Table 1 lists the fields contained in each file, and descriptions of each field with examples are described in Appendix A.

Each record is placed under at least 1 and not more than 3 of 29 general themes (Theme Index, p. 5). The fields "theme 1", "theme 2", and "theme 3" include the theme codes (e.g. 1,2,3...29) for each record. Codes are ordered in the three fields according to theme applicability. That is, a record is more relevant to the theme in "theme 1" than to that in "theme 3". Users of this catalog should become familiar with the organization of the theme index and entry titles before searching the records.

To use the theme index:

1. Familiarize yourself with the themes listed in the Theme Index (p. 5).
2. Choose a theme of interest and locate the page displaying its respective research titles.
3. Familiarize yourself with the research titles found.
4. Refer to the respective catalog number in the dbf files to view the entry associated with the research title chosen. (Appendix A explains fields and shows examples.)
5. Communicate directly with the contact person who is listed in the entry.
6. Repeat steps 2 through 5 if desired.

5. Management of the Original Database

The database is stored and maintained in a personal computer-based database management system and is managed by the USDA Forest Service, Northern Stations Global Change Research Program. Updates to individual entries are expected to occur annually with a comprehensive update every 5 years. The database manager and the database developer cannot answer questions related to the content of the descriptive entries. Direct those inquiries to the contact person for the entry in question.

If you have other related questions after reading the README.NOW file or if the diskette is unreadable, contact:

Database Manager:
Global Change Program Analyst
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HBARRETT@mail.state.ky.us

Theme Index

Theme 1. Deer: Browse Impacts

Catalog #: 42
Understory Vegetation and Changes in a Virgin Forest

Objective: To describe changes in tree reproduction, shrubs, and herbs in the Tionesta Area caused by changes in overstory density, deer browsing, and other factors.

Also Theme 12. Monitoring: Vegetation in Unmanaged Forests

Catalog #: 44
Effect of Aerial Fertilization on Regeneration Stocking

Objective: 1) To provide a vivid demonstration of the effects of fertilization on growth and development of young regeneration obtained after harvest cutting.
2) To assess the impact of fertilization on production of wildlife browse and its crude protein content.
3) To assess the impact on deer day usage.
4) To determine the degree of nutrient movement into stream water and its effect on stream fauna.

Also Theme 21. Fertilization: Used to Establish Tree Growth
Also Theme 20. Fertilization: Effects on Stream Water

Catalog #: 45
Effect of Fern Competition and Deer Browsing on Allegheny Hardwood Seedlings After Shelterwood Cutting

Objective: To determine the effect of fern interference and deer browsing on the establishment survival, and growth of Allegheny hardwood seedlings under two shelterwood cutting situations: a) a previously-thinned stand now ready for the first cut (seed cut) of a shelterwood sequence; and b) a stand that has previously received the seed cut of a shelterwood sequence and is now ready for final harvest.

Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 48
Porters' Prize Study

Objective: 1) To determine whether intensive forest cutting within a compartment can reduce deer impact on forest regeneration.
2) To determine the impact of intensive forest cutting within a compartment on herbaceous plant and songbird diversity.

Also Theme 4. Birds: Habitat Relationships

Catalog #: 67
Undergrowth and Small Mammal Response to Overstory Stocking Levels.
(Undergrowth Project - Vegetation)

Objective: To describe undergrowth response to overstory thinning and deer browsing, and to describe small mammal habitat relationships.

Also Theme 3. Small Mammal: Habitat Relationships
Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 68
Undergrowth Project (Wildlife)

Objective: 1) To manage forest undergrowth for diversity and abundance of wildlife.
2) To describe undergrowth and small mammal response to overstory thinning and deer browsing.

Also Theme 3. Small Mammals: Habitat Relationships
Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 50
Effect of Deer Population Levels on Natural Regeneration of Allegheny Hardwoods.

Objective: 1) To determine the average deer density which will allow natural regeneration of desirable Allegheny hardwood timber species at adequate stocking levels in stands managed under even-aged silviculture.
2) To determine the effects of known herd-size on browse-use over a range of regeneration conditions in Allegheny Plateau cherry-maple stands.
3) To determine if average deer weight varies significantly over a range of conditions other than deer density that affect regeneration in Allegheny Plateau cherry-maple stands.

Also Theme 9. Monitoring: Specifically for Tree Regeneration in Forests

Theme 2. Deer: Management as Associated with Forest Reproduction Management

Catalog #: 39
The Effect of Deer Fencing Erected After Clearcutting on Allegheny Hardwood Reproduction

Objective: To determine the effect of fencing erected shortly after clearcutting on the development of tree reproduction in the cut areas.

Theme 3. Small Mammals: Habitat Relationships

Catalog #: 69
Gypsy Moth Project

Objective: 1) To determine the relationship between white-footed mouse abundance and gypsy moth survival and density.
2) To determine the relationship between acorn supply and white-footed mouse abundance.

Also Theme 7. Insects: Damage to Forests

Catalog #: 83
Small Mammal Study

Objective: 1) To study the relationship between gypsy moth and white-footed mouse.
2) To study the density and diversity of the white-footed mouse in relation to gypsy moth habitat.

Catalog #: 67
Undergrowth and Small Mammal Response to Overstory Stocking Levels. (Undergrowth Project - Vegetation)

Objective: To describe undergrowth response to overstory thinning and deer browsing, and to describe small mammal habitat relationships.

Also Theme 1. Deer: Browse Impacts
Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 68
Undergrowth Project (Wildlife)

Objective: 1) To manage forest undergrowth for diversity and abundance of wildlife.
2) To describe undergrowth and small mammal response to overstory thinning and deer browsing.

Also Theme 3: Small Mammals: Habitat Relationships
Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Theme 4. Birds: Habitat Relationships

Catalog #: 48
Porters' Prize Study

Objective: 1) To determine whether intensive forest cutting within a compartment can reduce deer impact on forest regeneration.
2) To determine the impact of intensive forest cutting within a compartment on herbaceous plant and songbird diversity.

Also Theme 1. Deer: Browse Impacts

Catalog #: 70
Quabbin Cavity Nesters

Objective: To study the response of cavity-nesting birds to thinning in Massachusetts oak stands.

Catalog #: 71
Breeding Birds

Objective: To examine the effects of timber size class, forest type, succession on breeding birds, especially neotropical migrants, in the White Mountains.

Theme 5. Insects: Habitat Relationships

Catalog #: 84
IPS - Intensive Plot System

Objective: To describe habitat that is suitable and resistant to gypsy moth populations.

Catalog #: 86
Central Pennsylvania Risk-Rating Plots

Objective: Initially used for short-term impacts of gypsy moth on forest and to refine hazard rating systems developed by Herrick and Gansner. Note plots were subsetted in 1986 - subset was used to monitor long-term impacts and stand recovery.

Also Theme 7. Insects: Damage to Forests

Theme 6. Insects: Population Dynamics

Catalog #: 82
IES - Gypsy Moth Plot Tree Records

Objective: To assess the role of habitat differentiation in gypsy moth population dynamics - (focal area).

Also Theme 7. Insects: Damage to Forests

Theme 7. Insects: Damage to Forests

Catalog #: 26
Growth Impact Study

Objective: To summarize mortality and growth loss caused by spruce budworm in the spruce-fir region of Maine.

Catalog #: 86
Central Pennsylvania Risk-Rating Plots

Objective: Initially used for short-term impacts of gypsy moth on forest and to refine hazard rating systems developed by Herrick and Gansner. Note plots were subsetted in 1986 - subset was used to monitor long-term impacts and stand recovery.

Also Theme 5. Insects: Habitat Relationships

Catalog #: 87
Effects of Defoliation by Gypsy Moth on Stump Sprouting of Mixed Oak Stands

Objective: To study defoliation effects on sprouting capacity and vigor and growth of sprouts.

Catalog #: 82
IES - Gypsy Moth Plot Tree Records

Objective: To assess the role of habitat differentiation in gypsy moth population dynamics - (focal area).

Also Theme 6. Insects: Population Dynamics

Catalog #: 69
Gypsy Moth Project

Objective: 1) To determine the relationship between white-footed mouse abundance and gypsy moth survival and density.
2) To determine the relationship between acorn supply and white-footed mouse abundance.

Also Theme 3. Small Mammals: Habitat Relationships

Theme 8. Insects: Effects of Forest Management Practices

Catalog #: 85
Evaluation of Silvicultural Treatments to Minimize Gypsy Moth Impact

Objective: To Evaluate the effectiveness of silvicultural treatments on gypsy moth.

Theme 9. Monitoring: Specifically for Tree Regeneration in Forests

Catalog #: 20
Regeneration Study

Objective: To determine the effects of 3 cutting and 3 seedbed treatments on white ash regeneration.

Catalog #: 25
Survival and Development of Advanced Regeneration After a Final Shelterwood Harvest

Objective: 1) To document survival and development of regeneration with various characteristics, after overstory removal.
2) To follow the survival, growth and development of individual spruce-fir.

Catalog #: 37
Environmental Factors Affecting Advance Regeneration of Allegheny Hardwoods

Objective: 1) To compare the establishment and growth of 10 species of forest plants under varying levels of light exposure and soil moisture.
2) To isolate the effects of light exposure, soil moisture, temperature and soil chemical content so that the contribution of each can be determined.

Also Theme 25. Natural Influences on Trees: Species Associated with Environmental Factors (Elevation) or Natural Disturbances (Glaze or Ice Storms)

Catalog #: 38
The Effect of Several Intensities of Cutting of Advanced Regeneration

Objective: To determine the effect of 4 levels of cutting on advanced regeneration present prior to cutting and on the establishment and growth of additional regeneration.

Catalog #: 40
Fertilization Tests with Allegheny Hardwoods.

Objective: To establish the growth response obtainable from fertilization and the duration of time that treatments affect production.

Also Theme 21. Fertilization: Used to Establish Tree Growth

Catalog #: 47
Regeneration Histories of the Allegheny Plateau

Objective: To consolidate into one study all existing regeneration records and to schedule periodic remeasurement of these plots to enable researchers to refine existing guidelines.

Catalog #: 50
Effect of Deer Population Levels on Natural Regeneration of Allegheny Hardwoods.

Objective: 1) To determine the average deer density which will allow natural regeneration of desirable Allegheny hardwood timber species at adequate stocking levels in stands managed under even-aged silviculture.
2) To determine the effects of known herd-size on browse-use over a range of regeneration conditions in Allegheny Plateau cherry-maple stands.
3) To determine if average deer weight varies significantly over a range of conditions other than deer density that affect regeneration in Allegheny Plateau cherry-maple stands.

Also Theme 1. Deer: Browse Impacts

Catalog #: 88
Effect of Overstory Density and Understory Control on the Establishment and Growth of Oak
FS numbered as Study "28" and 108

Objective: To observe long-term impacts of forest regeneration under various overstory densities.

Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 49
Management Strategies for Allegheny Hardwood Forests

Objective: 1) To determine long-term differences in the volume and value of growth and yield of Allegheny hardwood stands under different management systems.
2) To determine the effect of these management systems on the establishment of regeneration.

Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 57
Regeneration and Growth After Thinning in Hemlock-Hardwood Stands.

Objective: To characterize a) growth of residual trees and stands and b) regeneration after thinning treatments involving differing levels of felling unmerchantable hemlock.

Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 18
Clearcut Studies

Objective: To monitor regeneration of birch trees growing on clearcut areas. The data collected provide an excellent demonstration of the financial and silvicutural capabilities of the management programs.

Also Theme 17. Forest Management Practices: Financial Costs and Returns

Theme 10. Monitoring: Meteorological Data in the Appalachian Forest

Catalog #: 74
Long-Term Monitoring of Meteorological Data

Objective: To continuously monitor data as recorded by automated weather stations placed in forests of West Virginia.

Theme 11. Monitoring: Precipitation or Air Quality in Unmanaged Forests

Catalog #: 75
Long -Term Monitoring of Precipitation Chemistry

Objective: Substudy 1: To identify factors affecting precipitation pH.

Substudy 2: A) To determine the effects of a dense road network on stream chemistry from a 150-acre watershed. B) To determine the effects of a dense road network plus an intensive

harvest operation on stream chemistry. C) To determine changes in watershed hydrology including annual water yield, peakflow rates, and stormflow volumes.

Substudy 3: To determine changes in soil chemistry, soil leachate chemistry, and streamflow chemistry resulting from increased application of nitrogen and sulfur.

Substudy 4: To investigate changes in selected chemical properties of water as it passes through the land phase of the hydrologic cycle and to determine the dynamic changes in stream water quality during storm events.

Also Theme 20. Fertilization: Effects on Stream Water

Catalog #: 76
Air Quality Monitoring

Objective: To continually measure ambient air quality in forested areas of West Virginia based upon parameters measured by the National Dry Deposition Network.

Catalog #: 77
A Study of Forest Influences on Streamflow in the Ridge and Valley Province of Pennsylvania

Objective: This is a part of cooperative research program evaluating "Best Management Practices", atmospheric deposition impacts on water quality, hydrologic response, nutrient cycling, and water yields from forested and managed watersheds.

Also Theme 19. Forest Management Practices: Relationships with Stream Water

Catalog #: 80
A Study of Forest Influences on Streamflow in the Ridge and Valley Province of Pennsylvania

Objective: This is a part of cooperative research program evaluating "Best Management Practices", atmospheric deposition impacts on water quality, hydrologic response, nutrient cycling, and water yields from forested and managed watersheds.

Also Theme 19. Forest Management Practices: Relationships with Stream Water

Catalog #: 81
Source of the Brook Database

Objective: To continually monitor forest hydrology parameters at the Hubbard Brook Experimental Forest

Also Theme 19. Forest Management Practices: Relationships with Stream Water

Theme 12. Monitoring: Vegetation in Unmanaged Forests

Catalog #: 24
Permanent Sample Plots for Baseline Vegetation Monitoring Plots in New Hampshire and Vermont.

Objective: To study seral changes in vegetation.

Catalog #: 46
Kane R-Series Yield Plots

Objective: To determine natural (unmanaged) growth rates and yields.

Also Theme 27. Forest Growth and Yield: Estimates and Models

Catalog #: 63
Hilt's Control Plots

Objective: To determine weather effects on growth and yield of mature oak stands.

Catalog #: 64
Economic Control Plots

Objective: To monitor growth and quality changes in mature oak-hickory stands.

Catalog #: 42
Understory Vegetation and Changes in a Virgin Forest

Objective: To describe changes in tree reproduction, shrubs, and herbs in the Tionesta Area caused by changes in overstory density, deer browsing, and other factors.

Also Theme 1. Deer: Browse Impacts

Catalog #: 55
Evaluation of Allegheny Hardwood Site Quality

Objective: To identify the soil, stand, and environmental variables that affect 1) the capacity of Allegheny hardwood stands to produce wood, 2) the quantity of advanced regeneration in normally stocked stands, and 3) the quantity of ferns and grasses present in uncut stands.

Also Theme 25. Natural Influences on Trees: Species Associated with Environmental Factors (Elevation) or Natural Disturbances (Glaze or Ice Storms)

Theme 13. Forest Regeneration: Potential Failures in Natural Forest Regeneration

Catalog #: 36
Identification of Potential Failures in Natural Regeneration

Objective: To identify, prior to cutting, the locations where reproduction of commercial tree species does not become established after cutting.

Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 88
Effect of Overstory Density and Understory Control on the Establishment and Growth of Oak
FS numbered as Study "28" and 108

Objective: To observe long-term impacts of forest regeneration under various overstory densities.

Also Theme 9. Monitoring: Specifically for Tree Regeneration in Forests

Catalog #: 1
Large Area Comparisons of Forest Management Practices in Appalachian Forest Types

Objective: To determine the effects of different forest management systems on the following for different site quality classes: a) yield and growth of the stands in terms of board feet, cubic feet, and basal area, b) species composition, and c) timber quality.

Catalog #: 2
Large Area Comparisons of Different Intensities of Even-Aged Management in Appalachian Hardwood Forests

Objective: To determine the effects of 3 levels of even-aged silvicultural treatment on reproduction, development, growth, and quality of northern Appalachian hardwood stands for 3 site classes.

Catalog #: 4
Strip Selection Cuttings in Mountainous Appalachian Hardwoods.

Objective: To explore the feasibility of using the strip-selection cutting method in central Appalachian mixed hardwoods and to include aspects of yield, growth, stand development, aesthetics, cultural practices, road location, and logging control.

Catalog #: 9
Permanent Growth Plots on the Fernow Experimental Forest

Objective: 1) To evaluate the effect of 3 cutting treatments on the diameter growth, height growth, length of clear stem and butt-log grade of several individual Appalachian hardwood trees.
2) To provide permanently numbered study trees for other research such as the measurement of crown characteristics, height/d.b.h. relationships and stand value.

Catalog #: 11
Individual Tree Deferment Cutting Practice - Monongahela National Forest and Fernow Experimental Forest

Objective: To demonstrate and evaluate individual tree response for different species and sites and stand response including regeneration establishment and stand development.

Catalog #: 12
Application of the Shelterwood System in Central Appalachian Hardwood Stands

Objective: To determine how, when, and where the shelterwood system can be used to regenerate central Appalachian hardwood stands.

Catalog #: 13
Planting Hardwood Seedlings on Forested Sites

Objective: To develop a practical method to establish hardwood seedlings in clearcuts.

Catalog #: 15
Crop Tree Release (Two-Age Management) in Mature Appalachian Hardwood Stands

Objective: To evaluate individual tree and stand response when applying a crown release to 80- to 85-year-old co-dominant crop trees growing on an excellent Appalachian hardwood site.

Catalog #: 16
Applying Group Selection in Central Appalachian Hardwoods.

Objective: To develop practical guidelines for using the group selection practice on a sustained yield basis.

Catalog #: 19
Compartment Managed Selection System Study

Objective: To provide financial and silvicultural capabilities of different silvicultural management programs.

Also Theme 17. Forest Management Practices: Financial Costs and Returns

Catalog #: 33
Stand Improvement, Semi-Permanent Tally Strip, Orzetti Sale

Objective: To determine the rate of recovery of the residual stand following a heavy glaze salvage thinning and the effects of future wind or glaze storms on this reserved growing stock.

Also Theme 25. Natural Influences on Trees: Species Associated with Environmental Factors (Elevation) or Natural Disturbances (Glaze or Ice Storms)

Catalog #: 34
Kane Experimental Forest Weeding Study

Objective: To study the effect of silvicultural treatment on the growth of selected crop trees.

Catalog #: 35
Study of Partial Cuttings of Sawlogs on Bear Tree Plots

Objective: 1) To determine the response of the chief species of species groups in the residual stand in terms of growth in diameter and yield in volume.
2) To determine the loss of growing stock due to logging and natural mortality following cutting.
3) To determine the amount, species and quality of ingrowth of sapling regeneration following sawlog cuttings.

Catalog #: 41
The Effects of Cutting Methods on the Regeneration of Allegheny Hardwoods

Objective: 1) To determine the effect of cutting method on the survival and growth of advance regeneration.
2) To determine the effect of cutting method on the establishment, survival, and growth of new regeneration.
3) To compare the total regeneration obtained from each of the cutting methods.

Catalog #: 43
Thinning in Allegheny Hardwood Stands.

Objective: To determine diameter growth and mortality rates by species and diameter class for major Allegheny hardwood species as influenced by density of residual stocking, stand structure, and other factors.

Catalog #: 49
Management Strategies for Allegheny Hardwood Forests

Objective: 1) To determine long-term differences in the volume and value of growth and yield of Allegheny hardwood stands under different management systems.
2) To determine the effect of these management systems on the establishment of regeneration.

Also Theme 9. Monitoring: Forest Specifically for Tree Regeneration

Catalog #: 52
Methods of Cutting Allegheny Hardwoods, Little Arnot Plots 1-4

Objective: To determine the effect of method of cutting on growth of the remaining stand and on subsequent reproduction in the Allegheny Hardwoods.

Catalog #: 53
Shelterwood Removal and Mowing Study

Objective: 1) To determine the amount of damage to the understory caused by the removal of a hold-over stand.

2) To determine the effect of complete exposure on the survival of various species in the understory.

3) To determine the effect of cutting back the understory in order to produce a seedling sprout stand and to influence stand composition.

4) To serve as a roadside demonstration of shelterwood and the cutting back of advance growth.

Catalog #: 54
Herbicide-Shelterwood Trials

Objective: To 1) test herbicide-shelterwood sequence on a semicommercial scale on a variety of sites, 2) gather information on cost of herbicide application, and 3) gain experience with mechanized ground application technique.

Also Theme 17. Forest Management Practices: Financial Costs and Returns
Also Theme 23. Herbicides: Effectiveness in Controlling Forest Ground Cover

Catalog #: 57
Regeneration and Growth After Thinning in Hemlock-Hardwood Stands

Objective: To characterize a) growth of residual trees and stands and b) regeneration after thinning treatments involving differing levels of felling unmerchantable hemlock.

Also Theme 9. Monitoring: Forest Specifically for Tree Regeneration

Catalog #: 62
Georgia Growth and Yield Study

Objective: 1) To study upland oak in its southern-most range.
2) To demonstrate the proper techniques in thinning southern Appalachian hardwoods.
3) To demonstrate real world tests of existing growth and yield predictors.

Also Theme 27. Forest Growth and Yield: Estimates and Models

Catalog #: 67
Undergrowth and Small Mammal Response to Overstory Stocking Levels.
(Undergrowth Project - Vegetation)

Objective: To describe undergrowth response to overstory thinning and deer browsing, and to describe small mammal habitat relationships.

Also Theme 3. Small Mammals: Habitat Relationships
Also Theme 1. Deer: Browse Impacts

Catalog #: 68
Undergrowth Project (Wildlife)

Objective: 1) To manage forest undergrowth for diversity and abundance of wildlife.
2) To describe undergrowth and small mammal response to overstory thinning and deer browsing.

Also Theme 3. Small Mammals: Habitat Relationships
Also Theme 1. Deer: Browse Impacts

Catalog #: 45
Effect of Fern Competition and Deer Browsing on Allegheny hardwood Seedlings After Shelterwood Cutting

Objective: To determine the effect of fern interference and deer browsing on the establishment survival, and growth of Allegheny hardwood seedlings under two shelterwood cutting situations: a) a previously-thinned stand now ready for the first cut (seed cut) of a shelterwood sequence; and b) a stand that has previously received the seed cut of a shelterwood sequence and is now ready for final harvest.

Also Theme 1. Deer: Browse Impacts

Theme 15. Forest Management Practices: Effects on Northern Hardwood Forest Types

Catalog #: 23
Compartment Managed Group Selection Study

Objective: To study the development of a stand following clear cutting in small patches.

Catalog #: 27
Density Study

Objective: To evaluate tree growth response to different silvicultural treatments and varying stand structure.

Catalog #: 29
Compartment Management Studies

Objective: To Determine the effects of silvicultural systems and or management programs on:
1) growth and yield in cubic feet and basal area,
2) species composition in percent,
3) quality of growing stock as related to volume in cull trees,
4) stand structure as expressed by diameter-class distribution, and
5) regeneration by stocking percent and numbers per acre.

Catalog #: 31
Cultural Treatments Designed to Reduce Spruce Sawlog Rotation Age

Objective: To determine whether cultural treatments can reduce spruce sawlog rotation age.

Theme 16. Forest Management Practices: Effects on Upland Forest Types

Catalog #: 61
Upland Oak Stand Density

Objective: To study the effect of thinning and stand density upon: 1) total wood production per unit area, 2) growth of residual trees and stands, 3) quality of trees in the residual stands, and 4) the range of basal areas over which total production is substantially the same.

Catalog #: 58
Crop Tree Versus Area-Wide Thinning

Objective: 1) To compare the effects of growth and yield of various crop tree treatments with standard area-wide thinning.
2) To define the optimum number of crop trees per acre to maximize the value yield of non-crop trees.
3) To determine whether or not regulation of stand density is important and if so how to achieve it under the crop-tree approach to gain maximum growth and yield.

Also Theme 27. Forest Growth and Yield: Estimates and Models

Catalog #: 59
Silvalqual Study

Objective: To study the effects of thinning and stand density upon: 1) total wood production per unit area, 2) growth of residual trees and stands and 3) quality of trees in the residual stand.

Catalog #: 66
Group Selection for Uneven-Aged Management

Objective: 1) To determine the effect of the size of the group selection harvesting techniques on: A) growth and yield, B) quality, and C) regeneration in mixed oak-hickory stands.

2) To relate the effect of the size of the group selection opening to: A) species composition, quality, growth and yield within openings, B) the effect on trees bordering the opening and C) stand growth as a whole.

Catalog #: 60
Individual Tree Selection Study

Objective: To determine the effect of individual tree selection cutting on stand growth and yield, species composition, and economics of even-aged mixed oak forests of southeastern Ohio.

Also Theme 17. Forest Management Practices: Financial Costs and Returns
Also Theme 27. Forest Growth and Yield: Estimates and Models

Catalog #: 65
Cutting Practices Demonstration

Objective: To demonstrate various harvest cutting methods used in the upland oak forest type.

Also Theme 18. Forest Management Practices: Demonstration Areas

Theme 17. Forest Management Practices: Financial Costs and Returns

Catalog #: 17
Thinning Study

Objective: To determine and demonstrate costs and returns of selective alternative management programs in northern hardwoods.

Catalog #: 18
Clearcut Studies

Objective: To monitor regeneration of birch trees growing on clearcut areas. The data collected provide an excellent demonstration of the financial and silvicutural capabilities of the management programs.

Also Theme 9. Monitoring: Forest Specifically for Tree Regeneration

Catalog #: 5
Financial Rate of Return Cut Areas of the Fernow Experimental Forest

Objective: To determine the effects of financial rate of return cuttings on: a) yield and growth of hardwood stands in terms of board feet, cubic feet, and basal area values, b) species composition, c) hardwood stand quality.

Catalog #: 60
Individual Tree Selection Study

Objective: To determine the effect of individual tree selection cutting on stand growth and yield, species composition, and economics of even-aged mixed oak forests of southeastern Ohio.

Also Theme 16. Forest Management Practices: Effects on Upland Forest Types
Also Theme 27. Forest Growth and Yield: Estimates and Models

Catalog #: 19
Compartment Managed Selection System Study

Objective: To provide financial and silvicultural capabilities of different silvicultural management programs.

Also Theme 14: Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 54
Herbicide-Shelterwood Trials.

Objective: To 1) test herbicide-shelterwood sequence on a semicommercial scale on a variety of sites, 2) gather information on cost of herbicide application, and 3) gain experience with mechanized ground application technique.

Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types
Also Theme 23. Herbicides: Effectiveness in Controlling Forest Ground Cover

Theme 18. Forest Management Practices: Demonstration Areas

Catalog #: 14
Crop Tree Demonstration Areas

Objective: To provide several crop tree demonstration areas for a variety of stands and landowner objectives.

Catalog #: 28
Management Intensity Demonstrations

Objective: To develop stocking and stand tables and growth and yield estimates per silvicultural program.

Also Theme 25. Natural Influences on Trees: Species Associated with Environmental Factors (Elevation) or Natural Disturbances (Glaze or Ice Storms)
Also Theme 27. Forest Growth and Yield: Estimates and Models

Catalog #: 65
Cutting Practices Demonstration

Objective: To demonstrate various harvest cutting methods used in the upland oak forest type.

Also Theme 16. Forest Management Practices: Effects on Upland Forest Types

Theme 19. Forest Management Practices: Relationships with Stream Water

Catalog #: 78
Water Yield Costs of Planting Abandoned Land on the Baltimore Municipal Watershed

Objective: 1) To evaluate the cost to a municipality of reduced water yield from reforesting abandoned land.
2) To quantify the hydrologic impacts of forest management techniques applied during the development of planted stands.

Catalog #: 79
Watershed Study on the Dilldown Unit of the Delaware-Lehigh Experimental Forest

Objective: 1) To test methods of establishing commercial forest stands on the brush-covered lands.
2) To determine the effects of the conversion on water yields.
3) To evaluate basic relationships between vegetative growth and streamflow.

Catalog #: 80
A Study of Forest Influences on Streamflow in the Ridge and Valley Province of Pennsylvania

Objective: This is a part of cooperative research program evaluating "Best Management Practices", atmospheric deposition impacts on water quality, hydrologic response, nutrient cycling, and water yields from forested and managed watersheds.

Also Theme 11. Monitoring: Precipitation or Air Quality in Unmanaged Forests

Catalog #: 81
Source of the Brook Database

Objective: To continually monitor forest hydrology parameters at the Hubbard Brook Experimental Forest

Also Theme 11. Monitoring: Precipitation or Air Quality in Unmanaged Forests

Catalog #: 73
Long -Term Monitoring of Stream Chemistry

Objective: Substudy 1: To evaluate the effects of converting a hardwood stand to Norway spruce on quality, quantity, and timing of streamflow.

Substudy 2: To determine the effect of each cutting-practice level on water quality and quantity

Substudy 3: A) To provide biomass information and to study plant succession and hydrologic

performance under natural revegetation of an area recovering from intensive use of herbicides. B) To measure the effects of managing portions of a watershed with a selective herbicide on the quality, quantity, and timing of streamflow

Substudy 4: A) To determine the effects of a dense road network on stream chemistry from a 150-acre watershed. B) To determine the effects of a dense road network plus an intensive harvest operation on stream chemistry. C) To determine changes in watershed hydrology including annual water yield, peakflow rates, and stormflow volumes.

Substudy 5: To determine changes in soil chemistry, soil leachate chemistry, and streamflow chemistry resulting from increased application of nitrogen and sulfur.

Substudy 6: A) To determine the effects of intensive mechanical site preparation on the quality, quantity, and timing of streamflow. B) To evaluate the effectiveness of mechanical site preparation on the growth and survival of planted Japanese Larch. C) To obtain information on the effects of mechanical site preparation in modifying acid deposition effects.

Substudy 7: To measure the effects of fertilization on the quantity, timing and quality of streamflow from a forest watershed.

Substudy 8: To investigate changes in selected chemical properties of water as it passes through the land phase of the hydrologic cycle and to determine the dynamic changes in stream water quality during storm events.

Substudy 9: A) To evaluate the effects of applying agriculture ground limestone to the riparian zone of a forested watershed on streamwater and soil chemistry. B) To obtain invertebrate populations data to evaluate biological change that may occur as a result of the liming treatment.

Substudy 10: To determine the effect of forest fertilization on the water quality and the hydrologic balance of a forested basin.

Substudy 11: To determine what influences non-research timber harvesting methods (particularly clearcutting) have on water quality and to compare these influences to experimental results from the Fernow Experimental Forest and elsewhere.

Substudy 12: To provide quantitative information on natural water quality characteristics from an undisturbed forested watershed in order to provide benchmark data against which water quality data from treated areas can be compared.

Also Theme 22. Herbicides: Effects on Stream Water
Also Theme 20. Fertilization: Effects on Stream Water

Catalog #: 77
A Study of Forest Influence on Streamflow in the Pequannock Watershed of Northern New Jersey

Objective: To determine the effects of forest management practices on water quality and quantity.

Also Theme 22. Herbicides: Effects on Stream Water

Catalog #: 90
Berea Water Laboratory Studies

Objective: To monitor rainfall, streamflow and chemical composition of water from several sites in Kentucky.

Theme 20. Fertilization: Effects on Stream Water

Catalog #: 73
Long -Term Monitoring of Stream Chemistry

Objective: Substudy 1: To evaluate the effects of converting a hardwood stand to Norway spruce on quality, quantity, and timing of streamflow.

Substudy 2: To determine the effect of each cutting-practice level on water quality and quantity

Substudy 3: A) To provide biomass information and to study plant succession and hydrologic performance under natural revegetation of an area recovering from intensive use of herbicides. B) To measure the effects of managing portions of a watershed with a selective herbicide on the quality, quantity, and timing of streamflow.

Substudy 4: A) To determine the effects of a dense road network on stream chemistry from a 150-acre watershed. B) To determine the effects of a dense road network plus an intensive harvest operation on stream chemistry. C) To determine changes in watershed hydrology including annual water yield, peakflow rates, and stormflow volumes.

Substudy 5: To determine changes in soil chemistry, soil leachate chemistry, and streamflow chemistry resulting from increased application of nitrogen and sulfur.

Substudy 6: A) To determine the effects of intensive mechanical site preparation on the quality, quantity, and timing of streamflow. B) To evaluate the effectiveness of mechanical site preparation on the growth and survival of planted Japanese Larch. C) To obtain information on the effects of mechanical site preparation in modifying acid deposition effects.

Substudy 7: To measure the effects of fertilization on the quantity, timing and quality of streamflow from a forest watershed.

Substudy 8: To investigate changes in selected chemical properties of water as it passes through the land phase of the hydrologic cycle and to determine the dynamic changes in stream water quality during storm events.

Substudy 9: A) To evaluate the effects of applying agriculture ground limestone to the riparian zone of a forested watershed on streamwater and soil chemistry. B) To obtain invertebrate populations data to evaluate biological change that may occur as a result of the liming treatment.

Substudy 10: To determine the effect of forest fertilization on the water quality and the hydrologic balance of a forested basin.

Substudy 11: To determine what influences non-research timber harvesting methods (particularly clearcutting) have on water quality and to compare these influences to experimental results from the Fernow Experimental Forest and elsewhere.

Substudy 12: To provide quantitative information on natural water quality characteristics from an undisturbed forested watershed in order to provide benchmark data against which water quality data from treated areas can be compared.

Also Theme 22. Herbicides: Effects on Stream Water
Also Theme 19. Forest Management Practices: Relationships with Stream Water

Catalog #: 44
Effect of Aerial Fertilization on Regeneration Stocking

Objective: 1) To provide a vivid demonstration of the effects of fertilization on growth and development of young regeneration obtained after harvest cutting.
2) To assess the impact of fertilization on production of wildlife browse and its crude protein content.
3) To assess the impact on deer day usage.

4) To determine the degree of nutrient movement into stream water and its effect on stream fauna.

Also Theme 1. Deer: Browse Impacts
Also Theme 21. Fertilization: Used to Establish Tree Growth

Catalog #: 75
Long-Term Monitoring of Precipitation Chemistry

Objective: Substudy 1: To identify factors affecting precipitation pH.

Substudy 2: A) To determine the effects of a dense road network on stream chemistry from a 150-acre watershed. B) To determine the effects of a dense road network plus an intensive harvest operation on stream chemistry. C) To determine changes in watershed hydrology including annual water yield, peakflow rates, and stormflow volumes.

Substudy 3: To determine changes in soil chemistry, soil leachate chemistry, and streamflow chemistry resulting from increased application of nitrogen and sulfur.

Substudy 4: To investigate changes in selected chemical properties of water as it passes through the land phase of the hydrologic cycle and to determine the dynamic changes in stream water quality during storm events.

Also Theme 11. Monitoring: Precipitation or Air Quality in Unmanaged Forests

Theme 21. Fertilization: Used to Establish Tree Growth

Catalog #: 56
Effect of Lime, Fencing, and Herbicides on Establishment and Growth of Regeneration on Problem Sites

Objective: To Determine: 1) if soil aluminum, deer, and/or shade/allelopathy are affecting development of forest regeneration;
2) the effect of lime on growth rates of seedlings and residual trees; and
3) the effect of lime on soil aluminum and the availability of soil nitrogen and phosphorous.

Also Theme 23. Herbicides: Effectiveness in Controlling Forest Ground Cover

Catalog #: 44
Effect of Aerial Fertilization on Regeneration Stocking

Objective: 1) To provide a vivid demonstration of the effects of fertilization on growth and development of young regeneration obtained after harvest cutting.
2) To assess the impact of fertilization on production of wildlife browse and its crude protein content.
3) To assess the impact on deer day usage.
4) To determine the degree of nutrient movement into stream water and its effect on stream fauna.

Also Theme 1. Deer: Browse Impacts
Also Theme 20. Fertilization: Effects on Stream Water

Catalog #: 40
Fertilization Tests with Allegheny Hardwoods

Objective: To establish the growth response obtainable from fertilization and the duration of time that treatments affect production.

Also Theme 9. Monitoring: Forest Specifically for Tree Regeneration

Theme 22. Herbicides: Effects on Stream Water

Catalog #: 72
Long-Term Monitoring of Stream Discharge

Objective: Substudy 1: To evaluate the effects of converting a hardwood stand to Norway spruce on quality, quantity, and timing of streamflow.

Substudy 2: A) To provide basic biomass information and to study plant succession and hydrologic performance under natural revegetation of an area recovering from intensive use of herbicides. B) To measure the effects of managing portions of a watershed with a selective herbicide on the quality, quantity, and timing of streamflow.

Substudy 3: A) To determine the effects of intensive mechanical site preparation on the quality, quantity, and timing of streamflow. B) To evaluate the effectiveness of mechanical site preparation on the growth and survival of planted Japanese Larch. C) To obtain information on the effects of mechanical site preparation in modifying acid deposition effects.

Substudy 4: To measure the effects of fertilization n the quantity, timing and quality of streamflow from a forest watershed.

Substudy 5: To evaluate if there is a difference in soil moisture content of north- and south-facing basins.

Substudy 6: To harvest the present timber stand by practical, even-aged methods and to observe the effects of this harvest on quantity, timing, and quality of streamflow.

Substudy 7: A) To predict the dependable yield, both annual and seasonal, of the Princeton watershed. B) To improve the basic understanding, methods, and procedures for problems of this kind. C) To estimate the effect of different forest practices on the water yield of the Princeton watershed.

Substudy 8: To determine the effects of clearcutting and silviciding watersheds 6 and 7 on water quality, including turbidity, water temperature, pH, methyl orange alkalinity, specific conductance, and taste and odor (silvicides).

Substudy 9: A) To determine the effect of complete vegetation removal upon the quantity of streamflow annually, by seasons, during high and low flows of two forested watersheds. B) To determine for the two watersheds the effect of vegetation removal on the upper slope as compared to the lower slope. C) To obtain as full an understanding as possible of the hydrology of the two watersheds.

Substudy 10: To measure effects of careful road building and of diameter-limit cutting on quantity and quality of forest streamflow.

Also Theme 19. Forest Management Practices: Relationships with Stream Water

Catalog #: 77
A Study of Forest Influence on Streamflow in the Pequannock Watershed of Northern New Jersey

Objective: To determine the effects of forest management practices on water quality and quantity.

Also Theme 19. Forest Management Practices: Relationships with Stream Water

Catalog #: 73
Long -Term Monitoring of Stream Chemistry

Objective: Substudy 1: To evaluate the effects of converting a hardwood stand to Norway spruce on quality, quantity, and timing of streamflow.

Substudy 2: To determine the effect of each cutting-practice level on water quality and quantity

Substudy 3: A) To provide biomass information and to study plant succession and hydrologic performance under natural revegetation of an area recovering from intensive use of herbicides. B) To measure the effects of managing portions of a watershed with a selective herbicide on the quality, quantity, and timing of streamflow.

Substudy 4: A) To determine the effects of a dense road network on stream chemistry from a 150-acre watershed. B) To determine the effects of a dense road network plus an intensive harvest operation on stream chemistry. C) To determine changes in watershed hydrology including annual water yield, peakflow rates, and stormflow volumes.

Substudy 5: To determine changes in soil chemistry, soil leachate chemistry, and streamflow chemistry resulting from increased application of nitrogen and sulfur.

Substudy 6: A) To determine the effects of intensive mechanical site preparation on the quality, quantity, and timing of streamflow. B) To evaluate the effectiveness of mechanical site preparation on the growth and survival of planted Japanese Larch. C) To obtain information on the effects of mechanical site preparation in modifying acid deposition effects.

Substudy 7: To measure the effects of fertilization on the quantity, timing and quality of streamflow from a forest watershed.

Substudy 8: To investigate changes in selected chemical properties of water as it passes through the land phase of the hydrologic cycle and to determine the dynamic changes in stream water quality during storm events.

Substudy 9: A) To evaluate the effects of applying agriculture ground limestone to the riparian zone of a forested watershed on streamwater and soil chemistry. B) To obtain invertebrate populations data to evaluate biological change that may occur as a result of the liming treatment.

Substudy 10: To determine the effect of forest fertilization on the water quality and the hydrologic balance of a forested basin.

Substudy 11: To determine what influences non-research timber harvesting methods (particularly clearcutting) have on water quality and to compare these influences to experimental results from the Fernow Experimental Forest and elsewhere.

Substudy 12: To provide quantitative information on natural water quality characteristics from an undisturbed forested watershed in order to provide benchmark data against which water quality data from treated areas can be compared.

Also Theme 19. Forest Management Practices: Relationships with Stream Water
Also Theme 20. Fertilization: Effects on Stream Water

Theme 23. Herbicides: Effectiveness in Controlling Forest Ground Cover

Catalog #: 54
Herbicide-Shelterwood Trials

Objective: To 1) test herbicide-shelterwood sequence on a semicommercial scale on a variety of sites, 2) gather information on cost of herbicide application, and 3) gain experience with mechanized ground application technique.

Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types
Also Theme 17. Forest Management Practices: Financial Costs and Returns

Catalog #: 56
Effect of Lime, Fencing, and Herbicides on Establishment and Growth of Regeneration on Problem Sites

Objective: To determine: 1) if soil aluminum, deer, and/or shade/allelopathy are affecting development of forest regeneration;
2) the effect of lime on growth rates of seedlings and residual trees; and
3) the effect of lime on soil aluminum and the availability of soil nitrogen and phosphorous.

Also Theme 21. Fertilization: Used to Establish Tree Growth

Theme 24. Prescribed Fire: Effects on Forest Stands

Catalog #: 32
Plant Composition and Production following Fire and Clear-Cutting for Salvage in Budworm-Defoliated Stands.

Objective: To determine the effect of prescribed fire and clear-cutting for salvage on tree regeneration, plant composition, production and quality in spruce-fir and mixed-wood stands defoliated by spruce budworm.

Theme 25. Natural Influences on Trees: Species Associated with Environmental Factors (Elevation) or Natural Disturbances (Ice Storms)

Catalog #: 21
Bartlet Cruise Plots

Objective: 1) To observe how changes in species composition over time relate to environmental factors.
2) To determine the effects of soils and elevation on species change with particular emphasis on trends in shade-tolerant species.

Also Theme 28. Soils: Association with Forest Plants

Catalog #: 55
Evaluation of Allegheny Hardwood Site Quality

Objective: To identify the soil, stand, and environmental variables that affect 1) the capacity of Allegheny hardwood stands to produce wood, 2) the quantity of advanced regeneration in normally stocked stands, and 3) the quantity of ferns and grasses present in uncut stands.

Also Theme 12. Monitoring: Vegetation in Unmanaged Forests

Catalog #: 33
Stand Improvement, Semi-Permanent Tally Strip, Orzetti Sale

Objective: To determine the rate of recovery of the residual stand following a heavy glaze salvage thinning and the effects of future wind or glaze storms on this reserved growing stock.

Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 28
Management Intensity Demonstrations

Objective: To develop stocking and stand tables and growth and yield estimates per silvicultural program.

Also Theme 27. Forest Growth and Yield: Estimates and Models
Also Theme 18. Forest Management Practices: Demonstration Areas

Catalog #: 37
Environmental Factors Affecting Advance Regeneration of Allegheny Hardwoods

Objective: 1) To compare the establishment and growth of 10 species of forest plants under varying levels of light exposure and soil moisture.
2) To isolate the effects of light exposure, soil moisture, temperature and soil chemical content so that the contribution of each can be determined.

Also Theme 9. Monitoring: Forest Specifically for Tree Regeneration

Theme 26. Seed Source: Association with Tree Growth or Production

Catalog #: 3
Southern Appalachian White Pine Seed Source Study

Objective: 1) To determine the sources of white pine that are best adapted to growing on poor hardwood sites in West Virginia (WV).
2) To determine the possible existence and nature of genetic variation in Southern Appalachian eastern white pine.

Catalog #: 6
Black Walnut Seed Orchard/Progeny Test for National Forests in the Eastern Region

Objective: 1) To evaluate growth and survival of black walnut collection from 34 families.
2) To produce genetically-improved walnut seed suited to growing in conditions on the Shawnee, Hoosier, Wayne, and Monongahela National Forests.

Catalog #: 7
Genotypic Variation in White Ash

Objective: To evaluate growth and survival of white ash collected from 45 geographic sources.

Catalog #: 8
Range-Wide Sugar Maple Provenance Study

Objective: 1) To determine the nature and extent of genetic variation within and between provenances throughout the range of sugar maple.
2) To compare juvenile and mature performance within provenances.

Catalog #: 10
Black Cherry Progeny Test #624 Buzzard Ridge

Objective: To compare survival, height growth, d.b.h. growth, and other stem characteristics of half-sib black cherry seedlings originating from "good", "average", and "poor" phenotypes.

Catalog #: 22
Seed Rain Study

Objective: To determine the total viable seed rain falling over a range of conditions in the northern hardwood forest.

Theme 27. Forest Growth and Yield: Estimates and Models

Catalog #: 30
Timber Management Units

Objective: To develop stocking and stand tables and to develop growth and yield estimates for spruce-fir dominated areas of the compartment management study.

Catalog #: 51
Maintenance of Growth and Yield Measurement Plots.

Objective: 1) To identify studies which have had growth data collected and determine their suitability for use in development or verification of growth prediction models.
2) To organize and summarize the data to insure compatibility among studies.
3) To schedule maintenance of stand records which may be of further value.

Catalog #: 62
Georgia Growth and Yield Study

Objective: 1) To study upland oak in its southern-most range.
2) To demonstrate the proper techniques in thinning southern Appalachian hardwoods.
3) To demonstrate real world tests of existing growth and yield predictors.

Also Theme 14. Forest Management Practices: Effects on Appalachian Forest Types

Catalog #: 58
Crop Tree Versus Area-Wide Thinning

Objective: 1) To compare the effects of growth and yield of various crop tree treatments with standard area-wide thinning.
2) To define the optimum number of crop trees per acre, how to maximize the value yield of non-crop trees.
3) To determine whether or not regulation of stand density is important and if so how to achieve it under the crop-tree approach to gain maximum growth and yield.

Also Theme 16. Forest Management Practices: Effects on Upland Forest Types

Catalog #: 60
Individual Tree Selection Study

Objective: To determine the effect of individual tree selection cutting on stand growth and yield, species composition, and economics of even-aged mixed oak forests of southeastern Ohio.

Also Theme 17. Forest Management Practices: Financial Costs and Returns
Also Theme 16. Forest Management Practices: Effects on Upland Forest Types

Catalog #: 28
Management Intensity Demonstrations

Objective: To develop stocking and stand tables and growth and yield estimates per silvicultural program.

Also Theme 25. Natural Influences on Trees: Species Associated with Environmental Factors (Elevation) or Natural Disturbances (Glaze or Ice Storms)
Also Theme 18. Forest Management Practices: Demonstration Areas

Catalog #: 46
Kane R-Series Yield Plots

Objective: To determine natural (unmanaged) growth rates and yields.

Also Theme 12. Monitoring: Vegetation in Unmanaged Forests

Theme 28. Soils: Association with Forest Plants

Catalog #: 21
Bartlet Cruise Plots

Objective: 1) To observe how changes in species composition over time relate to environmental factors.
2) To determine the effects of soils and elevation on species change with particular emphasis on trends in shade-tolerant species.

Also Theme 25. Natural Influences on Trees: Species Associated with Environmental Factors (Elevation) or Natural Disturbances (Glaze or Ice Storms)

Theme 29. Urbanization: Effects on Forest Ecosystem Structure and Function

Catalog #: 89
Urban-Rural Gradient Ecology Program (URGE)

Objective: To study the long-term influences of urbanization on forest ecosystem structure and function.

Sample Entry

Catalog #: 74

Title: Long -Term Monitoring of Meteorological Data

Objective: To continuously monitor data as recorded by automated weather stations placed in forests of West Virginia.

Year Established: 1951

Year Completed: expected to continue

Site Description: Fernow Experimental Forest, WV.; Monongahela National Forest, WV.; Clover Run and South Haddix.; USDA Forest Service Timber and Watershed Research Lab, Parsons, WV.

Statistical Design: Paired watershed approach with 4 weather recording stations at separate locations. NOTE: substudies may include more or fewer weather recording stations.

% Likelihood of Locating Study Areas: 100

Experimental Treatments: Substudies include varying degrees of treatment to the forests located on the monitored watersheds.

Sampling Methods: Recorders at weather stations continuously monitor the parameters. Charts on the recorders are changed weekly. Hygrothermographs and recording rain gages are special equipment used.

Variables and Sampling Frequency: Data were collected weekly on the following sites:

Fernow Camp Hollow Station
- Daily precipitation (inches): 1951 to present
- Continuous air temperature (deg F): 1951 to present
- Continuous relative humidity (%): 1951 to present

Clover Run Station
- Daily precipitation (inches): 1951 to present
- Continuous air temperature (deg F): 1959 to 1971
- Continuous relative humidity (%): 1959 to 1971

South Haddix Station
- Daily precipitation (inches): 1984 to 1993
- Continuous air temperature (deg F): 1983 to 1993
- Continuous relative humidity (%): 1983 to 1993

Timber and Watershed Laboratory
National Weather Service Station
- Daily precipitation (inches)
- Continuous air temperature (deg F)
- Continuous relative humidity (%)

QA/QC Practices: USDA and USGS protocols are followed.

Data Storage: Current raw and summarized data are stored on 9-track tape. The DG which can output to ASCII is used as backup.

Global Change Research Applications: Studies of Ecosystem Processes, Model Development and Application

Data Availability: 1994

Publications and Reports: Fowler, W.B.; Helvey, J.D.; Felix, E.N. 1987. Hydrologic and cimatic changes in three small watersheds after timber harvest. Res. Paper PNW-379. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 13 p.

Helvey, J.D.; Patric, J.H. 1983. Sampling accuracy of pit vs. standard rain gages on the Fernow Experimental Forest. Water Resources Bulletin. 19(1): 87-89.

Leonard, R.; Reinhart, K.G. 1963. Some observations on precipitation measurements of forested experimental watersheds. Res. Note NE-6. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

Nik, A.R.H.; Lee, R.; Helvey, J.D. 1983. Climatological watershed calibration. Water Resources Bulletin. 19(1): 47-50.

Patric, J.H. 1979. What happens to rain before and after a forest is cut? West Virginia Tree Farm News. Issue #3, March. 4 p.

Patric, J.H.; Studenmund, R.W. 1975. Some seldom-reported statistics on precipitation at Elkins, West Virginia. West Virginia Agriculture and Forestry 6(2): 14-16.

Trimble Jr., G.R.; Weitzman, S.1954. Effect of a hardwood forest canopy on rainfall intensities. American Geophysical Union Transactions 35(2): 226-234.

Contact: Mary Beth Adams, USDA Forest Service, Box 404, Parsons, WV. 26287. (304) 478-2000.

Cooperation: none

Appendix A—Description of Fields

Catalog #: Database entry number. Record number assigned in the database.
For example, 005.

(TITLE) = Title: Title of the study that is associated with the data set.
For example, Application of the Shelterwood System in Central Appalachian Hardwood Stands.
For example, Newark Data Set.

(OBJECTIVE) = Objective: Objectives for data collection.
For example, 1) To manage forest undergrowth for diversity and abundance of wildlife, 2) To evaluate undergrowth and small mammal response to overstory thinning and deer browsing.

(YR_ESTABLI) = Year Established: Year plots were established for data collection.
For example, 1950.

(YR_COMPLET) = Year Completed: Year data collection ends for the particular data set. Enter "unknown" if there is a final year of data collection although the year is unknown and "expected to continue" if the data set will continue to be developed for new objectives.
For example, 1985.
For example, 2010.

(SITE_DESCR) = Site Description: Specific description of the whole study area. Include details such as latitude/longitude coordinates of study area, forest types, forest densities, species composition, soil series, slope, aspect, elevation range, geologic formations, moisture index, reference to experimental forest or national forest, and any additional notes.
For example, McGowan Mtn. Rd. ~1/2 mile south of junction with Main Fernow Loop Rd. on the Fernow Experimental Forest; lat: N39deg 02min 02sec, long: W79 deg 41 min 08 sec; elevation in feet is documented for each seedling source; soil is mapped as Mechesville silt loam with limestone influence; 8-15% slope; elevation ~2720'; 5-tree plots planted 10' X 10' spacing; cleared 8.5 acres of previously 70-yr.-old mixed hardwoods including black cherry, northern red oak, yellow-poplar, sugar maple, and white ash.

(DESIGN) = Statistical Design: Name and description of the statistical design used in establishing the study. Enter best description possible if no formal statistical design was followed.
For example, Randomized paired block; 16 stands at 20 acres each.
For example, 2 adjacent forest compartments, 10.5 acres divided into 30 patches, 0.1 to 0.7 acres in size, randomly scattered over 114 acres.

(RELOCATE) = Likelihood of Locating Study Areas: Enter the percentage (or a close estimate) of blocks, plots, or subplots (described in the "Statistical Design" field or the "Sampling Methods" field) that can be located and revisited today.
For example, 0% - no site can be located.
For example, 45%.
For example, more than 80%.

(TREATMENTS) = Experimental Treatments: Description of treatments made in preparation, during, or after the study was established. Description includes specific names of chemicals used, cutting practices applied, and frequency of application.
For example, Watershed 1: Vegetation that dropped leaves into the stream were cut and removed or deadened by herbicide within a strip 20' wide on each side of the feeder streams. All trees >1" diameter at ground surface within a zone 20' on each side of the storm channel were injected with ANSAR™ 160 herbicide during May 1965. Remaining vegetation was sprayed with Weedone™ herbicide by a portable mistblower. All trees were felled by spring 1967 and a vigorous ground cover had developed. 1967: trees 5' above the stream channel were injected with herbicide. This widened the treatment area to approximately 40' on each side of the channel. After 1968 growing season, all trees in the expanded treatment zone were felled and the slash was burned.

(SAMPLING) = Sampling Methods: Specific detail of data collection methods. Details include noting unique methodologies followed and standard operations cited.
For example, Trees <1.5" (3.8 cm) d.b.h. were tallied by 1" (2.54 cm) classes and tree species. Each plot was classified by elevation and habitat (recognized by soil materials, tree species composition, and topography). For example, seedling counts were computed by species and height classes.

(VARIABLES) = Variables and Sampling Frequency: List of variable names and definitions with note of whether variables are independent or dependent. List frequency of collection for each variable.

For example, Independent: parent phenotype (good, average, poor). Dependent: Height growth, survival, d.b.h. growth, stem form forking.
Total Height (meters): 1972, 1973, 1976, 1977, 1982, 1987.
Survival: 1973, 1977, 1982, 1987.
Flowering: 1973.
Height to Stem Fork (decimeters): 1973, 1976, 1977.
Height to Stem Fork (meters): 1982.
Diameter at Breast Height (d.b.h.): 1976, 1977, 1982, 1987.
Insect Damage: 1977.
Animal and Mechanical Damage: 1977, 1982, 1987.
Remeasurements were made every 5 years after 1987 for Total Height, Height to Stem Fork, d.b.h., Survival, Insect Damage, Animal and Mechanical Damage.
For example, 1958 to present (streamflow, precipitation, climate); 1972 to present (water quality = turbidity, temperature, acidity, selected nutrients, and atmospheric deposition). Measurements were taken weekly and on an event basis when needed - turbidity, water temperature, and nutrient concentration were taken after storm events and forest harvesting.

(QA/QC) = QA/QC Practices: List of quality control practices used in any aspect of the data set development (choice of site, data collection, data analysis, or data storage).

For example, Visual check of raw data during computer data entry followed by the use of error-checking software programs; accuracy assessments are completed during each data collection period; permanent and more experienced employee consistently supervised temporary employees; observer and instruments are checked periodically; compilation of climate data are spot checked; control water samples were taken before during and after herbicide spraying. Safety regulations are followed with all herbicide use.

(D_STORAGE) = Data Storage: Explain the practice used to store the actual data and note if the data is raw, derived, or summarized.

For example, Raw data are in ASCII (sys.dat) files in dBASE III™; all cleaned raw are on floppies and some on hard drive as permanent data files (pdf). Tally sheets are kept in file cabinets. Analyses are generated in dBASE and sometimes SAS™.

(GC_APPLICA) = Global Change Research Applications: Potential use of the data set for global change research. See global change research categories (Appendix B).

For example, Studies of Ecosystem Processes; Model Application.

(D_AVAILABL) = Data Availability: The first year that the scientist believes the actual data will be completely collected, analyzed, and published. Enter "unknown" if the year is unknown.

For example, 1988.

(PUBLICAT) = Publications: Citation of any publication that is a direct result of the data set.

For example, Healy, W. M.; Brooks, R. T.; DeGraaf, R. M. 1989. Cavity trees in sawtimber-size oak stands in central Massachusetts. Northern Journal of Applied Forestry. 6(2):61-65.

(CONTACT) = Contact Person: Name, organization, address, and phone number of the Forest Service scientist most knowledgeable of the data set.

For example, William Leak; USDA Forest Service; P.O. Box 64; Durham, NH 03820. (603)768-5652.

(COOPERAT) = Cooperation: Name and organization of persons or groups listed by the scientist as cooperators in the development of the data set.

For example, Richard Pouyat; Institute of Ecosystems Studies; Millbrook, NY.

(THEMES) = Themes: Enter 1 to 3 themes from a field of 29 general themes.

(THEME 1) = Theme One: One of three possible themes used to reference an entry.

For example, Monitoring for Forest Regeneration.

(THEME 2) = Themes Two: Second theme used to reference an entry.

For example, Monitoring for Forest Regeneration.

(THEME 3) = Theme Three: Third theme used to reference an entry.

For example, Monitoring for Forest Regeneration

Appendix B—Global Change Research Applications

The following are categories of global change research efforts conducted within the Northern Station's Global Climate Change Research Program (NSGCRP). When applicable, categories were listed in the field Global Climate Change Program Research Applications.

Mechanistic Studies of Physiological Processes of Trees as Affected by Multiple Stresses

The objective of physiological research under global change is to understand the mechanisms of multiple-stress effects on the physiological processes of northern forest trees. Research in this area is exceedingly complex due to a large number of stressor variables and their interactions. Stresses of particular interest include ozone and acid deposition, temperature, moisture, increased CO_2, UV-B, nitrogen deficiency, insects, and diseases. In nature, these stresses occur together and research studies involve as many of the interactions as the facilities and statistical analysis can accommodate. Physiological processes of interest include growth processes (photosynthesis and respiration), carbon allocation, nutrient uptake and efficiency, foliar anatomy and health, hydraulic conductivity, stress tolerance, phenological and reproductive characteristics, and gene/environment interactions. The general research strategy is to scale up experiments from highly controlled greenhouse or small chamber studies of seedling responses, to larger, more realistic experiments on mature trees using large open-top chambers and branch chambers set up in field conditions.

Studies of Ecosystem Processes

Integrated ecosystem studies are conducted in major forest types (ecoregions) within the region and, collectively, cover the important ecological and environmental gradients. This is the broadest area of research within the NSGCRP with strong linkages and overlap with the other major research areas. Research will lead to understanding the effects of environmental stress on forest health and the productivity of forest lands, including prospective changes in growth and biomass, species composition, pest outbreaks and mortality, carbon allocation and storage, water yield and habitat. Where possible, studies take advantage of opportunities to remeasure established permanent plots that can provide estimates covering time periods that are sufficiently long to detect changes with some degree of certainty. Results of observational studies will also increase our understanding and predictions of atmosphere/biosphere gas exchanges, and lead to a better representation of terrestrial ecosystems in global climate models through scaling up to landscape and regional levels.

Experimental studies focus on prospective changes in nutrient cycling, which will lead to predictions of changes in the reproduction, distribution, and relative abundance of important forest tree species. Experimental studies will also increase our understanding and predictive capabilities regarding expected changes in productivity and forest health. Experimental research emphasizes soil and detrital processes as affected by changes in temperature and precipitation, changes in the chemical environment due to acidic deposition, changes in microbial activity, and changes in root vitality.

Landscape Scale Studies

Landscape-scale studies have an important integrating function in the NSGCRP, especially for bridging the gap between research at smaller scales and (1) national and global scale climate models, and (2) social interactions, economics, and policy research. Research is directed at understanding how changes in the physical and chemical climate affect the abundance, distribution, and dynamics of species, populations, and communities throughout the Northeast and Midwest United States. To achieve this understanding, predictions of climate changes at the global and national scales must be linked to predictions of weather changes at regional and local scales, and to the driving variables of models describing changes in forests. Other research in this area builds on existing data sets that describe forest composition and dynamics and important environmental and site parameters. The subtle effects of global change on forests could be accelerated and amplified by disturbance phenomena, both biotic and abiotic. As the NSGCRP develops, existing and new data will be incorporated into data bases and information systems (such as GIS) suitable for analyses of spatial and temporal relationships between forest parameters and environmental and site factors.

Social Interactions and Economics

This area of research is directed at use of trees and forests by people and how this use will be influenced by potential changes in forest ecosystems due to global change (adaptation), and human activity as a critical element for initiating or altering processes of change (migration). Research will lead to projecting changes in land use that could result from global change, identification of potential changes in human communities, and the implications of prospective climate changes for management decisions. Research methods involve econometric model, case studies, and the process of decisionmaking by landowners and managers.

Assessment and Policy

The Forest Service Global Change Research Program is a policy-oriented initiative and as such must ensure that results are efficiently and thoroughly synthesized and integrated into assessments, transferred to sound management practices, and interpreted into policy options. Assessments will represent a compilation of global change research and monitoring efforts in which the work of meteorological, biological, physical, and social scientists are unified to create a picture of present and possible future global conditions. Assessments will present a description of current conditions and basic trends, projections of trends within the context of a changing environment, outlines of potential response strategies to these projections, definitions of the uncertainties associated with all aspects of the assessment, and simulation of prospective changes in resource trends associated with various response strategies. An issue of particular concern involves emissions of CO_2 to the atmosphere, and the role of forests in mitigating or offsetting emissions from other sources. Much of the research in assessment and policy will involve synthesizing research results from physiology, ecosystem, and landscape-scale studies through modeling and linkages with existing socio-economic models of the forest sector.

Model Development and Application

Modelling is used in all research program areas to integrate study results, to provide understanding and prediction of global change effects on forest ecosystems, and along with landscape-scale studies, to provide an important bridge to assessment, resource management, and policy efforts. Research in all areas is designed to explain and model responses mechanistically to provide more robust applications than provided by empirical approaches. The modelling effort is designed to cut across the physiological, ecosystem, and landscape-level studies, and to be the focal point for integration of the studies. Development, validation, and application of models will also provide the primary interface with the atmospheric science community. This effort will provide better forest ecosystem information to climate models and relate climate models to ecological research.

Appendix C—Abbreviations and Symbols

Abbreviations

CT	Connecticut
d.b.h.	diameter at breast height
deg F	degrees Fahrenheit
DG	Data General computer system presently utilized by the Forest Service
ea	each
Gen Tech Rep	General Technical Report
KY	Kentucky
Lat	latitude
Long	longitude
PA	Pennsylvania
PC	personal computer
MA	Massachussets
MD	Maryland
ME	Maine
NH	New Hampshire
NY	New York
OH	Ohio
QA/QC	quality assurance/quality control
Rd	road
Res Pap	Research Paper
Rpt	report
S.I.	site index
USDA FS	United States Department of Agriculture, Forest Service
WV	West Virginia
et al	and others

Symbols

~	approximately
'	foot or feet
"	inch or inches
>	greater than
<	less than
=	equal to or same as
@	at