

# **Quality Assurance Plan**

## **USDA Forest Service Research & Development**

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## INTRODUCTION

This Quality Assurance (QA) Plan gives direction to implement the *USDA Forest Service Research and Development Quality Assurance Policy* (Appendix A). This direction is intended to ensure consistency of research standards and procedures and explain review processes essential to producing quality research results. The QA Plan establishes standards and procedures for all organizational units and personnel within Forest Service Research and Development (FS R&D), including Forest Inventory and Analysis (FIA). Units may specify and implement additional direction to that in the QA Plan.

This QA Plan was developed by a task team (the ‘QA/QC Team’) of scientists, statisticians and research professionals from each Forest Service R&D unit. The national R&D Assistant Director’s (AD) Team provided guidance, oversight, and final content agreement. A draft of the QA Plan was sent to all Forest Service R&D scientists for review and comment. Comments were incorporated and a final draft QA Plan was presented to the Forest Service Research Executive Team (FSRET) for review and comment, with final approval by the Forest Service Research and Development Deputy Chief.

The Designated Responsible Official and supervisors of science personnel have key roles to oversee and successfully execute this QA Plan. Because organizational structure and titles vary among FS R&D units, a convention is used in this plan to simplify communication. The term *Designated Responsible Official*, or DRO, is used to represent Assistant Directors, Program Managers, and Project Leaders. DROs are identified by the Station Director. The term “supervisor” is used to represent Team Leaders and similar supervisory positions. The duties and obligations of Principal Investigators (PI) are also identified within this document. Local units may adapt this plan to local conventions in titles, chain of command, and organizational structure to ensure the intent of the Plan is fully implemented.

Other documents provide important supplemental information to this QA Plan, and are identified where appropriate. Common reference documents include the Forest Service *Code of Scientific Ethics* (FS-686, August 2000), Forest Service Manual 4080, OMB Guidelines (2002) to implement Section 515, Public Law 106-554 (Data Quality Act), OMB Final Information Quality Bulletin for Peer Review (December 2004), and Office of Science and Technology Policy (OSTP) Memorandum on Science Integrity (2010). In addition, this document is cross-walked with the Performance Accountability System (PAS) metrics for accomplishment reporting (Appendix B).

### Scope

This QA Plan covers study plans, measurement quality objectives, manuscript reviews, and research data management. The Plan also covers cooperative programs and extramural research funded by Forest Service R&D or involving work done by Forest Service scientists.

## STUDY PLANS

### Study Plan Requirements

Study plans are covered in FSM 4072.3. Study plans are required for all individual studies except for exploratory work of limited scope and cost, such as pilot studies. These may proceed without a study plan if approved by the DRO. “Limited cost and scope” generally means less than \$25,000 expended and less than one year in duration. A study plan is not required if duplicative of study plan information associated with competitive funding awards, cooperative agreements, or similar formal research agreements, provided complete documentation is included in the Study File.

### Study Plan Content

A study plan must provide sufficient detail to: (1) enable scientific and statistical review, including details of data collection and analysis; (2) enable the study to be completed without the PI; and (3) demonstrate compliance with regulations such as those concerning safety or NEPA projects. Appendix C, Study Plan Outline, displays the information expected in a study plan.

### Study Plan Review and Approval

Study plans are potentially subject to two types of review and approvals: a technical review by a PI’s supervisor, and an independent statistical review by a qualified and impartial statistician recognized as having knowledge and skills relevant to the study design.

**Statistical Review.** A statistical review of research study plans provides the best means to ensure that the study design is statistically sound prior to committing time and resources to the project, and to prevent costly modifications when statistical deficiencies are not uncovered until manuscript review. A statistical review checks that the statistical design will properly test the proposed hypotheses and ensure the study conclusions are scientifically defensible. An independent statistical review of study plans is required unless waived and documented by the unit DRO – most commonly justified when no statistics are involved in the study.

**Supervisor’s Technical Review.** A supervisor’s technical review and approval is required for all study plans. It is intended to ensure the overall completeness, quality, and relevance of the research described in the study plan. Supervisors will ensure the proposed study conforms to the Research Work Unit Description, Program Charter Problem Area, and Personal Research Assignment. Study plans for research outside of the Problem Area Description must be approved by the unit DRO or Station Director; to be determined locally. PIs will update study plans as needed to reflect changes made during the study.

## Disclosure of Study Plans

Study Plans under this QA Plan are not required to be publically accessible. However, to avoid redundant research within Forest Service R&D, scientists are required to post a research summary statement in RITS sufficiently informative that other Forest Service researchers can reasonably determine that their prospective research hypotheses do not duplicate ongoing research.

## Study File

A Study File will be created and maintained to document study activities for both formal studies and pilot studies. This QA Plan specifies several requirements to record information or include documents in a study file, including the study plan. The Study file should include documentation that these requirements have been met (Study Plan Approval Form). Except as required in this QA Plan, protocols for storage, accessibility and availability of study files will be established by local units.

## MEASUREMENT QUALITY OBJECTIVES

### Definition and Purpose

A Measurement Quality Objective, or MQO, describes an acceptable level of error, i.e., the deviation between a true and a measured value. MQOs are expected to provide levels of accuracy and precision sufficient to meet study objectives. An MQO establishes the permissible error threshold associated with a measurement, usually expressed as an absolute or a percentage. In cases where observations fail to meet an MQO, either reduce the measurement error by improving instrumentation, techniques, or training, or adjust the MQO to reflect the actual level of measurement error, and account for this change in the study plan. Some examples of MQOs for commonly measured observations include:

Variable	Measurement Unit	MQO
Diameter	1 cm	± 1 cm of true value, 95% of the time.
Crown cover	5% classes	± two 5% classes, 95% of the time
Height	1 foot	± 10%, 90% of the time
Species	Scientific name	No errors, 99% of the time
Tree grade	Tree grade	No errors, 95% of the time
Product yield	% recovery	± 0.5%, 95% of the time

Measurement Quality Objectives may also specify degree of precision in measurement and associated significant figure adherence. MQOs may be developed to specify acceptable loss in a network of automated collectors or the accuracy of data assembled or downloaded from data loggers, environmental sensors, and similar sources.

### Establishing MQOs

Establishment of MQOs is most useful for research that involves repeated measurements over long periods of time and/or measurements made by multiple researchers. In laboratory research,

MQOs can be achieved by proper instrument calibration. When a suitable MQO is not available,

it can be substituted with a procedure that reasonably mitigates measurement error. MQOs and substitute procedures must be documented in the study file.

## **Competency**

It is the scientist's responsibility to ensure that persons performing data collection, laboratory functions and other tasks associated with conducting the experiment have the demonstrated competency required to comply with MQO's. Competency can be achieved through formal training, informal instruction, or verified experience achieving MQO's associated with the research. The study file shall include by reference all applicable Laboratory Operating Plans, with the expectation that Laboratory Operating Plans document competency requirements and are renewed annually. Absent a Laboratory Operating Plan, the scientist shall document in the study file that personnel competency was verified, including records of formal training, documented experience and/or personally observed demonstration of proper practices. If any special training or reference materials are developed, such as field manuals or notes, scientists will include a sample or reference in the study file.

## **Standard Operating Procedures**

Standard Operating Procedures (SOPs) or published consensus-based standards, such as the American Society for Testing Materials (ASTM) or International Organization for Standardization (ISO) will be used where applicable and referenced in the study file for all data collection and testing activities. When a technique or procedure is to be repeated in follow-up or comparison studies, performed at a later date or by a different study team, SOPs must be developed. PIs are responsible to ensure that research staff or laboratory managers record deviations from procedures or methods in the study file. If SOPs and consensus-based standards do not exist and will not be developed, experimental procedures and data collection details must be documented in the study file so that the work can be repeated using the same experimental criteria.

## **Laboratory and Field Equipment Calibration and Maintenance**

The ability to meet established MQO's for studies that employ laboratory or field testing and measurement equipment depends on proper equipment calibration and maintenance. Applicable information related to equipment calibration and maintenance shall be included in the respective annual Laboratory Operating Plan, and referenced as part of the study file. In the absence of an Operating Plan, recommendations for equipment maintenance and calibration shall be included in the SOP documentation. Any deviation from recommended instrumentation tolerance will be documented in the study file. Performance of equipment maintenance and calibration should be recorded in the study file to verify adherence to applicable maintenance and calibration requirements and schedules. Equipment that is regularly or excessively out-of-calibration shall be rendered inoperative until the equipment is examined, repaired and certified. Routine equipment calibration training should be provided to all operators.

## MANUSCRIPT REVIEWS

Manuscript reviews are important to produce quality research. This QA Plan requires different types of reviews depending on the circumstances. Descriptions of the types of reviews applicable to this QA Plan are described in Appendix G.

### Forest Service Authors

Research papers, trade or mass media articles, or editorials that include Forest Service R&D authors are required to receive a minimum of two technical reviews (one external, one internal), a policy review, and may require a statistical review. This requirement applies regardless of the publication outlet. It includes all publications considered part of annual attainment reporting and to some research products not counted as publications (see Appendix E). For manuscripts that will be published by the Forest Service or in non-refereed outlets (informally refereed publications in PAS), the scientist is responsible for recruiting qualified reviewers. The review sequence generally consists of statistical review (if needed), technical review, policy review, and then final editing. Describe each manuscript's review history in the study file.

Scientists generally rely on or are required to use in-house manuscript editorial support, but may bypass in-house editing if waived by the DRO, usually when submitted to peer-refereed outlets (formally refereed publications in PAS). The *Manuscript Review and Approval* form will be used to document whether the author responded appropriately to the points raised in review, or whether a review has been waived and why.

### External Authors

Research products published by the Forest Service, but without a Forest Service author, must meet the same requirements specified in this QA Plan for research products that include a Forest Service author. For publications funded by the Forest Service but published in external outlets without a Forest Service author, the following statement shall be included at the beginning of the publication:

*“The research, analysis and other work documented in this publication was fully or partially funded by the USDA Forest Service through Agreement # [insert number]; however the findings, conclusions, and views expressed are those of the author(s) and do not necessarily represent the views of the USDA Forest Service.”*

To ensure compliance with this requirement, all research cooperative agreements and other funding instruments involving the USDA Forest Service shall include a requirement to insert the preceding language in publications produced without a Forest Service author.

### Journal Publications

In general, manuscripts submitted to refereed journals (formally refereed publications in PAS) will receive technical review as part of the journal's peer review process. Additional Forest Service technical review is not needed, though the unit DRO can request an internal review prior to submitting to a journal.



## **Policy Review**

A Policy Review (see Appendix G) looks for manuscript content that compromises scientific integrity, credibility and objectivity. When multiple authors come from multiple Forest Service units, the first Forest Service author will arrange for the policy review from their unit. When manuscripts have potential policy implications, the DRO and author(s) will decide if and how to address the matter. Manuscripts judged likely to include influential scientific information (ISI) or highly influential scientific assessment (HISA) warrant additional scrutiny by the unit DRO prior to submission to a refereed outlet. For additional information, see USDA's Peer Review Guidelines, which adheres to the requirements set forth in OMB's *Final Information Quality Bulletin for Peer Review*, issued on December 16, 2004.

## **Statistical Review**

In the event that due diligence was overlooked during development of the study plan and experimental design, the manuscript review provides a last opportunity for a statistical review. The need for a statistical review of a manuscript is determined by the unit DRO. A statistical review of the manuscript is needed when: 1) there is no approved study plan; 2) the study has deviated substantially from the approved study plan without documented approval; 3) there is no evidence in the study file of pre-data analysis consultation with a qualified statistician; or 4) the study file does not include a completed Scientist Statistical Checklist. In any case, a unit DRO may request a statistical review if they feel the scientific content of the manuscript may be highly influential or controversial.

## **Technology Transfer Product Review**

Research products other than scientific research publications (formally and informally refereed publications in PAS) are listed in Appendix E. This type of product may be developed by scientific or non-scientific administrative staff. Review of these products will include a policy review and a technical review. Reviews will give particular attention to products that include interpretation, synthesis, or integration of findings that may exceed the scope of the individual contributing studies.

Book reviews and letters to editors (science delivery products in PAS) that are personal communications must be identified as such in the publication. The author must not self-identify as a Forest Service employee to avoid implied agency representation or authorization. When author affiliation is required by the publisher, the review, letter or other communication that will be published shall undergo a policy review and approval by the DRO or Station Director.

## **Software Review**

Software development represents a particular use and application of scientific knowledge, either as a means to conduct a scientific study, or as a tool to organize and deliver scientific knowledge to practitioners through a computer application. Like other science products, software and software documentation developed or funded by Forest Service R&D and intended for distribution must receive appropriate review and approval. This QA Plan recommends that software products intended for distribution receive review and approval equivalent to what is

required for scientific manuscripts.

Software created to address a specific problem or data requirement or analyze a specific dataset should be stored with the dataset and study file and do not require a separate review. For example, the statistical analysis of data usually requires the data to be read into SAS, R, Excel or SPSS, analyzed, and results reported to the PI or other member of a research team. Though technically software, these programs apply only to a specific research problem. Computable document format and similar formats with embedded software or code will be reviewed as standard manuscript submissions along with the text. Software that is developed as a result of a published or unpublished manuscript but that is not part of that manuscript will be considered a separate Science Delivery Product in PAS, and reporting of the software in the Research Information Tracking System (RITS) will have a link to the publication to show the relationship.

### **Forest Service Publications**

In the absence of external peer review associated with a journal or similar outlet, Forest Service-authored and published manuscripts, including General Technical Reports (GTR), Research Bulletins, and Proceedings, must include at least one external technical review, one internal technical review (may also be external), and a policy review by a unit DRO. These research products may also require a statistical review under conditions as described in this QA Plan under “Statistical Review.” Additional reviews may be conducted at the discretion of the unit DRO or if required by local policy.

If a manuscript has been rejected by outside publishers due to unfavorable reviews, a station may publish it only after approval by the unit DRO based on a written justification from the scientist and assessment of the unfavorable reviews and subsequent resolution. This same direction applies to manuscripts submitted for Forest Service publication but written by non-Forest Service scientists. It is the responsibility of the outside author to secure technical and statistical reviews, seek editorial assistance, document the review process, and provide contact information for the reviewers.

Technical editors and “compilers” of station publications and proceedings are responsible to obtain technical review and approval from a DRO. The editors must provide advance notice to production services, obtain documentation of technical review for all submitted papers, and assemble papers within nine months after the conference. Station authors are not required to have editorial review prior to submission. Publication Services staff will provide the compiler with guidance and instructions as to the proper file format to be used to collect papers from the participants and to establish the timeline for publication.

### **Finalizing**

Approval requirements for research products listed in Appendix E shall comply with direction in this QA Plan plus supplemental local unit direction, as applicable. The final package submitted to the DRO for approval will include the manuscript, the unit’s *Manuscript Review and Approval Form* (Manuscript Approval and Processing Form), and the recommendation of the originating

unit supervisor. Only properly reviewed, approved and published manuscripts identified as Scientific Research Publications can be included in annual unit attainment reporting. The following documentation is required when submitting a manuscript for approval:

- Manuscript Review and Approval Form

- Final submitted manuscript

- Technical reviewer comments and author responses

- Pesticide clearance

Adherence to Animal Welfare procedure.  
Paperwork Reduction Act clearance for survey research

## RESEARCH DATA MANAGEMENT

### **Purpose**

Scientists are responsible to protect, maintain, store and document their research data, samples, and specimens to verify quality or provide a record of evidence of research. This information must be of sufficient detail to accurately and completely represent all elements of the research design, including data definitions, codes, procedures, instrumentation, and other information needed to accurately archive and/or complete the research in the absence of the PI or after a period of inactivity. Data sets should be cross-referenced with documentation describing how and by whom the data were collected.

### **Data Management Plans**

Research quality depends on properly managing research data during and after a study, therefore a stand-alone data management plan will either be included in the study plan or reference made to a formal data archiving plan adopted by the local unit. Data management plans describe how data will be managed during the course of a study, commonly addressing topics of data management roles and responsibilities, data security in regard to access, storage, and backup, and version control.

Data management plans also describe how research data will be archived and shared after concluding research study and whether there will be special access or distribution needs. Scientists should plan for most data to be permanently archived and available for eventual public use (see the data archiving section below). The FS R&D *Code of Scientific Ethics* (2000) states that the minimum allowable data retention period is five years.

### **Archiving**

Forest Service R&D is legally responsible for preserving and sharing research data developed at government expense. Forest Service R&D requires that data supporting research be electronically archived according to agency standards and protocols. Scientists may use the Forest Service R&D National Archive, Station archives, or reputable external archives (e.g., ClimDB, HydroDB, LTER) to house their data, but scientists are required to submit the associated metadata to the FS R&D Archive to ensure that the FS R&D Archive has a complete inventory of data products, including those stored elsewhere.

### **Disclosure**

To protect the intellectual assets of Forest Service scientists and cooperators for limited time exclusive use, unpublished research data posted in the Forest Service or other recognized archive may remain confidential for up to: a) three years after the first publication of a paper based on a portion of that data, or b) five years after the completion of the collection of the data, whichever

occurs first. Public disclosure of data prior to expiration of confidentiality requires the permission of the PI who authored the study plan. Data generated under a Cooperative Research and Development Agreement (CRADA) will remain confidential until expiration of the Agreement (up to five years).

## APPENDICES

APPENDIX A –USDA Forest Service Research and Development Quality Assurance Policy

APPENDIX B- Crosswalk of Terms in the QA Plan and Performance Accountability System

APPENDIX C – Study Plan Outline

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## APPENDIX A

### USDA Forest Service Research and Development Quality Assurance Policy

#### 1. **Background**

Forest Service research data and information are being used to formulate management and policy decisions on a local, regional, and international scale. To support such decisions, research data and results must be of known quality. Quality Assurance must be an integral component of the Forest Service R&D mission to develop and communicate scientific and technical information.

#### 2. **Policy and Goals**

It is the policy of Forest Service Research and Development that appropriate Quality Assurance procedures will be an integral part of all research activities, including the synthesis, integration, and communication of scientific knowledge.

The goal of the Forest Service's Quality Assurance Program is to ensure that all research data collected, synthesized, utilized, and reported by or for the Forest Service are scientifically sound, of known quality, and thoroughly documented.

#### 3. **Definitions**

- A. Quality Assurance. Quality Assurance (QA) is a process to produce research data and results with known precision, completeness, representativeness, comparability, and, where appropriate, accuracy. QA encompasses the planning, design, implementation, analysis, and reporting of data to ensure that the data meets the users' requirements for data quality.
- B. Quality Control. Quality Control (QC) is the routine application of prescribed field or laboratory procedures (e.g., periodic calibration, instrument maintenance) to reduce random and systematic errors and ensure that data are generated, analyzed and interpreted, synthesized, communicated, and utilized within known and acceptable performance limits. Quality Control also involves use of qualified personnel, appropriate laboratory practices, and adherence to recommended operating procedures.

#### 4. **Responsibilities and Authorities**

- A. The Deputy Chief for Research and Development has the overall responsibility for establishing policy, goals, and direction for Quality Assurance in Forest Service R&D. Responsibilities include:
  - (1) Establish Forest Service Quality Assurance national policies;
  - (2) Provide guidance and assistance to Stations, the Forest Products Laboratory, and IITF concerning implementation of Forest Service Quality Assurance policies;

- (3) Ensure the development of Quality Assurance Plans in research programs that involve national and regional issues within the Forest Service or for cooperative programs involving other agencies and groups;
  - (4) Institute Quality Assurance training programs to assure the implementation of Quality Assurance policies and goals;
  - (5) Identify and resolve national Quality Assurance issues; and
  - (6) Review and concur with Stations, IITF, and FPL Director Approval of Quality Assurance plans from Stations, the Forest Products Laboratory, and IITF.
- B. The Deputy Chief for Research and Development will appoint a national, R&D Quality Assurance Advisory Team. The Quality Assurance Advisory Team will consist of a cross-section of scientists, technicians, and administrative personnel from each Station, the Forest Products Laboratory, IITF, and national research programs. Responsibilities include:
- (1) Advise the Deputy Chief for Research and Development on the development and implementation of national Quality Assurance policies;
  - (2) Provide guidance and assistance, where appropriate, to Stations, the Forest Products Laboratory, and IITF in the development and implementation of the Quality Assurance Policy;
  - (3) Assist, where appropriate, in the review and evaluation of the Quality Assurance Policy implementation; and
  - (4) Identify regional and national Quality Assurance issues and advise the Deputy Chief for Research.
- C. The Stations, the Forest Products Laboratory, and IITF will have the following responsibilities:
- (1) Develop and implement a Quality Assurance Plan consistent with policies and guidelines established by the Deputy Chief for Research and Development;
  - (2) Incorporate Quality Assurance into performance reviews; and
  - (3) Identify and conduct, where needed, Quality Assurance training to implement the Forest Service Research Quality Assurance policy and goals.
- D. National Research and Development Program Managers and Coordinators have the following responsibility: ensure development and coordination of a Quality Assurance Plan for national programs consistent with the policies established by the Deputy Chief for Research and Development.
- E. Stations, FPL, and IITF Program and Project Leaders have the following responsibility:
- Ensure that Quality Assurance and Quality Control policies are implemented for the research and/or data collection efforts of the unit consistent with the Station Quality Assurance Plan.



**APPENDIX B**  
**Crosswalk of Terms in the QA Plan and Performance Accountability System (PAS)**

<b>QA Plan</b>		<b>R&amp;D PAS metrics</b>
Technology Transfer	=	Science Delivery
Technology Transfer Products	=	Science Delivery Product (SDP)
Peer –refereed or refereed publication	=	Formally Refereed Publication (FRP)
Non-refereed Publication	=	Informally Refereed Publication (IRP)
Forest Service Publications	⊂	FRP or IRP depending on review
Software	⊂	SDP
Oral or Poster Presentations	⊂	Science delivery activity (SDA)
Proceedings of conference	⊂	FRP or IRP
Reports to funding organization		
Supervisory Reviews, program reviews		
Published books and book chapters	⊂	FRP or IRP depending on review
Ph.D. or Master’s thesis or dissertation	⊂	IRP or science delivery product
Published scientific encyclopedia	⊂	FRP or IRP depending on review
Research Maps	⊂	SDP
DVDs/Videos	⊂	SDP
Science Talks	⊂	SDA
Abstracts for invited presentations	⊂	SDP
Book reviews or letters to editor	⊂	SDP if published in journal
Bulletins, newsletter articles, editorials,	⊂	SDP
Information brochures, handouts	⊂	SDP
Web page content	⊂	SDP
Research summaries/highlights	⊂	SDP, or SDA if not published

## APPENDIX C

### Study Plan Outline

#### 1. Project Identification

Title, PI(s), Study Plan number, Research Work Unit RWU or Program problem area, signature lines for PI and PL. If multiple RWUs/Programs are involved, then a signature line must be added for each PL.

#### 2. Objectives

State simply and clearly the objectives of the research. If these are formulated as testable statistical hypotheses, state them. If the objectives are model development, literature synthesis, or exploratory analysis, then state so. This section should run from one sentence to one page as needed.

#### 3. Review of Literature

Describe what related work has been done on the subject both to help sharpen the objectives and methods, as well as to avoid duplication of effort. The literature should be pertinent and applicable.

#### 4. Methods

State simply and clearly how you will conduct the research: what will be measured, how will you measure it, and how will it be evaluated with respect to the objectives stated above. If the study is an experiment, describe the experimental design, treatments, and population of interest, sampling method, sample size justification (including a power analysis), analytical method, and all other information needed to assess design quality. For modeling studies, describe how you anticipate developing, verifying, and validating the model. If the study is a literature review or synthesis, describe the research topic to be reviewed and synthesized, the time period over from which literature will be reviewed, and the literature sources expected to be the focus of the review and synthesis.

#### 5. Quality Assurance/Quality Control Procedures

List measurement quality objectives in the study plan, as appropriate. Describe training needs and plans, if training is needed. Give references to proposed laboratory standards and equipment calibration routines. Describe any proposed audits or quality control sampling schemes or other methods used to assess the degree to which collected data will meet the stated measurement quality objectives of accuracy and precision of activities and measurements, including qualitative analysis measurements, and subsample remeasurement and data entry verification. Provide data dictionary information and detail how data gathered in the study will comply with the RWU/Program's data management and archival plan.

#### 6. Personnel Assignments and Costs

Estimate the research study's personnel requirements in terms of the number of hours that will be required in each personnel category. Estimate travel and training costs that will be required for the study. Also, estimate supply and equipment costs. If the study will span multiple fiscal years, estimate the timing of the expenses to assist the PL in planning the optimal allocation of the unit's budget.

## **7. Application of Research Results**

How might the research study's results be used? Who are the practitioners and how might the results impact practice?

## **8. Presentation of Expected Results**

Example --- "Results from this study will be disseminated through publications in scientific journals, oral and poster presentations, and proceedings of national or international conferences on [...]. All papers and presentations resulting from this study will be posted on [station and/or lab website]."

## **9. Health and Safety**

Describe any potential or unique safety implications of the research; for example contact with pesticides, radioactive substances, venomous reptiles, etc. Assess costs and methods of hazardous waste disposal. If there are no unusual risks, simply state so. Refer to the Health and Safety Handbook as appropriate.

## **10. NEPA Compliance**

Station Directors are delegated responsibility for conducting environmental analyses, preparing environmental documents, and making decisions related to proposed actions under their jurisdiction. Station Directors can delegate this responsibility to subordinates. The study plan is the most useful place to include analysis and documentation (FSM 2950 and FSM 4072.32) required when research activities must comply with the National Environmental Policy Act (NEPA). The most up-to-date information to address NEPA requirements can be found on the internal website for the national Forest Service Ecosystem Management Coordination (EMC) staff. This site also includes links to the FSH 1909.15 NEPA Handbook and the FSM 1950 Environmental Policy and Procedures.

## **11. Literature Cited**

## APPENDIX D

### Study Files

Scientists shall maintain a study file for each active study (including small-scale investigations and pilot studies for which study plans have not been produced). Study file components may be informal “notes to the file” or more formal documentation. These elements are included in a study file.

1. Study Plan and Study Initiation Report (for all formal studies) or informal statement of study objectives and methods (for exempted small-scale and pilot studies).
2. Documentation of the study plan reviews and approvals required in this QA Plan, plus any documentation required by local requirements. Also include PI responses to and/or reconciliation with review comments.
3. Documentation of methodology development tests or pilot studies done as a part of the research study.
4. Study plan revisions including an explanation of the rationale for the revision.
5. Field procedure manuals developed specifically for the program.
6. References to standard operating procedures used in carrying out the study.
7. Documentation of any special training of measurement crews or technicians.
8. Where appropriate, documentation from a post project debriefing of data collectors (field crews, lab technicians, etc.).
9. Copies or references to collected data sets, including data and metadata documentation (variable definitions, codes, formats, etc.). Statistical analysis reports and written interpretations of critical tests that were performed on the data.
10. Any correspondence or notes to the files that the scientist feels may be appropriate to complete the record, including manuscripts and copies of comments from manuscript reviewers along with scientist responses.
11. Record results of Post-data collection or pre-analysis consultation with a statistician

## APPENDIX E

### Publications Counted for Annual Attainment Reporting

1) Definition of a Research Publication: Scientific information that is published with a Forest Service (FS) co-author and that has met the FS standard for minimum peer review, or is FS funded and has received peer review. (*Formally and informally refereed publications in PAS*).

2) These are qualifying scientific research products counted for attainment reporting:

Published research papers in refereed scientific or technical journals (print or electronic) (*formally refereed publications in PAS*)

Published research or science delivery papers in non-refereed outlets (print or electronic) (*informally refereed publications in PAS*).

Research papers published in conference proceedings (print or electronic) (*informally refereed publications in PAS*)

USDA and Forest Service Station publications including General Technical Reports, Research Papers, Research Notes, Proceedings, Resource Bulletins. (*informally refereed publication in PAS*)

Reports to funding organizations (*not considered a research product in PAS*)

Published books and scientific encyclopedias (print or electronic) (*informally or formally refereed publication in PAS, depending on type of review*)

Published book chapters (print or electronic) (*informally or formally refereed publication in PAS, depending on type of review*)

PhD or Master theses or dissertations (*If published, informally refereed publication in PAS. If not published, a Science Delivery Product in PAS*)

US Patent and Trademark Office Issued patents (*Patents issued in PAS*)

Research maps (*science delivery product in PAS*)

3) These are not research publications, but may be technology transfer products that are based on research results:

Non-scientific or science based DVDs/videos and video scripts (reviewed or not) (*science delivery products in PAS*)

Letters to the Editor (*science delivery product in PAS*)

Bulletins or newsletter articles/features (*science delivery products in PAS*)

Newspaper articles and editorials (*science delivery products in PAS*)

Informational brochures, handouts and summaries (*science delivery products in PAS*)

Peer reviewed web pages and web page content (either new material or previously published) (*science delivery products in PAS*)

Scientific talks and graphics used for scientific talks (*science delivery activities in PAS*)

Presentations at scientific or technical meetings, workshops, guest lectures, symposia, (*science delivery activities in PAS*) Supervisory reviews, periodic Forest Service program reviews, etc. (*no metric in PAS*).

Published abstracts in conference and symposia proceedings for invited or offered research presentations (print or electronic) (*science delivery activities in PAS*)  
Research Summaries and Research Highlights (*science delivery product in PAS*)  
Posters and Poster Abstracts (*science delivery activity in PAS*).

4) These are neither research publications nor technology transfer products:

Reports prepared for Cooperative Research and Development Agreements (CRADAs)  
other cooperative agreements that are not publications  
Research funding proposals  
Statistical tables  
Book reviews (*If published in journal, science delivery product in PAS*)  
Research work unit descriptions and problem analyses  
Study plans  
Research-in-Progress summaries  
Archived data sets

## APPENDIX F

### Scientist Statistical Review Checklist

Forest Service Research and Development statistician's guidelines can be found at:  
<http://statistics.fs.fed.us/guidelines.html>

- 1) **Introduction:** The introduction is an overview of the study containing detailed information on the objectives, justification statement, and review of literature.

The population is defined such that the scope of inference is apparent.

Differences between the target and sampled population are identified.

The study's objectives are completely and clearly specified.

Objectives identify the information to be produced from the study and presented in the manuscript.

- 2) **Methods:** The methods describe the experimental design, experimental techniques or apparatus used to acquire the data and analysis procedures.

Statistical methods are accurately and clearly described.

Statistical method descriptions provide the information necessary to satisfy the reader of the appropriateness of the analysis technique to address the stated objectives.

The statistical study methods used to generate the results are clearly described so that the layout of the sampling or experimental design is apparent.

Critical assumptions or qualifications necessary for the application of the statistical methods are specified and addressed.

Methods should be provided in enough detail to allow the reader to judge the adequacy of the study relative to the objectives.

Variables used in the study are clearly described and defined and symbols to be used are defined.

Suggestions for improving the application of current methods or for using a better alternative method in the future may be discussed here.

- 3) **Results:** The results section presents all of the statistical and descriptive results. Frequently results are presented along with the conclusions.

Estimates, results of hypothesis testing, comparisons etc., reflect back directly on the objectives. Results that don't reflect on the study objectives appear in an implications section.

Estimates are accompanied by estimates of precision.

Tables and Figures of data results clearly parallel the objective and the approaches described in the methods sections and represent valid estimates with estimates of precision. The legends clearly describe the information contained in the table or figure. References to data tables and figures are clear and it is easy to identify the result being described.

The distinction between scientific results and personal observations is clear to the reader.

- 4) **Conclusions:** The conclusions are scientific statements derived directly from the results. There should be no room for misinterpretation.

Conclusions are defensible based on the scientific evidence established in the manuscript itself or in conjunction with reference material in other published work. Other published work is adequately described to support the conclusions being drawn.

Conclusions are limited to the sampled population that was identified in the introduction section.

Statistical conclusions are correctly stated. The interpretation of hypothesis testing and making statistical inference relate to the sampled population and the objectives. It is often necessary to remind the audience of critical assumptions or qualifications that may limit conclusions.

- 5) **Implications:** The implications are only partially based on scientific results.

A great convenience for the audience is to clearly distinguish between conclusions and implications, or how the conclusions of the study fit into a broader context. It is often helpful to place implications in a separate section. Implications are only partially based on scientific results. They are essentially a combination of scientific results, judgment, and experience.



## APPENDIX G

### Types of Reviews

**Technical Review.** Technical reviews can cover a wide range of purposes, including reviewing the use of statistics, research design, implementing experimental methods, thoroughness of literature review, presentation of findings, interpretation of results, and other technical aspects of the research to ensure maximum “quality, objectivity, utility, and integrity of information” (OMB Guidelines, Section 515, Public Law 106-554, Data Quality Act). A technical review can be internal or external, will generally be regarded as a “peer review,” and may be done through a refereed or non-refereed process.

**Statistical Review.** A statistical review is a form of technical review, but is often identified specifically as a statistical review because the focus is on statistical appropriateness and rigor, and the review is conducted by a professional statistician.

**Refereed Review.** Refereed reviews are facilitated by a neutral third party who acts as an intermediary between the author(s) and the reviewer and makes the decision to accept or reject the manuscript. Refereed reviews can be blind (reviewer is unknown to the author) or double-blind (reviewer and author are unknown to each other). Scientific journals use a refereed review process. Forest Service-published products generally do not.

**Internal/External Review.** Internal and external reviews are generally technical reviews. An internal review is generally considered to be within the author’s RWU, facility (lab), or organization (research station). An external review is generally considered to be outside this circle of peers, including another research station or outside of Forest Service R&D. Internal and external reviews are usually conducted as peer reviews. An external review may be refereed, if through journal, or not refereed if a Forest Service publication. An internal review is usually not refereed.

**Policy Review.** A policy review looks for manuscript content that compromises scientific integrity, credibility and objectivity. The reviewer looks for opinions on laws or policy, speculation without peer-reviewed experimental data and citations, and provocative statements inappropriate for scientific publication. The policy review will ensure that discussion of management implications, considerations, and potential outcomes are objective and do not advocate for or discriminate against particular management approaches. Reviews are generally conducted by the senior Forest Service author’s DRO, but may be delegated to a similarly qualified senior manager.

**Editorial Review.** An editorial review is primarily concerned with ensuring quality writing, formatting and presentation. Editorial review may also be the final compliance step in a manuscript approval process for Forest Service publications.