Northern Research Station Author Guidelines for Preparing Proceedings Papers

I. BASIC SUBMISSION GUIDELINES

- The Northern Research Station will publish proceedings as a General Technical Report.
- Manuscripts are not to exceed 10 pages including figures, tables, and literature cited.
- Each paper will undergo a single-blind review by two or more reviewers.
- Revised papers will receive an editorial review after submission to the Northern Research Station Production Services.

II. FILE NAMING CONVENTION

- Name files using the last name of the first author and second author (if any).
- Add F1, F2, T1, T2, etc. to author names to indicate figure files or separate table files.
- If the same author/pair submits more than one paper, label files 1 and 2. For example:
    - Green_1; Green_2; Green_2_T1.; Green_Smith; Green_Smith_F1; Green_Smith_F2.

III. GENERAL FORMAT

- Prepare manuscript in Microsoft Word and save as a .docx or .doc file.
- Use Times New Roman 11 pt.
- Single space and align flush left, ragged right.
- Use a 1 inch margin on all sides.
- Place page numbers at bottom center; number pages consecutively throughout the manuscript.
- Wrap around text to next line and use only one space after periods at the end of a sentence.
- Do not indent paragraphs. Instead use a hard return at the end of the paragraph and insert a blank line between paragraphs.
- Format headings as follows to distinguish between heading types:
    - **FIRST-LEVEL HEADING** (flush left, all caps, bold)
    - **Second-Leveling Heading** (flush left, initial caps, bold)
    - <u>Third-Level Heading</u> (flush left, initial caps, underlined)
- Use a minimal amount of formatting (i.e., bold, underline, centered text) except as indicated in this document.

IV. ORGANIZATION OF TEXT

- Manuscript should cover the research discussed during your presentation and should be assembled in the following order:
    A. Title
    B. Authors and affiliations

C. Abstract
D. Body of paper (break into sections using headings appropriate to the presentation)
E. Acknowledgments
F. Literature Cited
G. Appendix
H. Tables
I. Figure Captions
J. Figures

V. TEXT SECTIONS

A. Title

- Use title case.
- If title is longer than one line, allow it to wrap. Do not use a hard return to separate into lines.

B. Authors list and affiliations

- Provide list of authors using first name, middle initial, and last name.
- For corresponding author, provide job title, organization, full mailing address, phone number, and email address. For all other authors, provide a job title and organization.
- See format in sample document.

C. Abstract

- Begin the abstract by typing Abstract.– (the word Abstract followed by a period and an em dash or two dashes) immediately followed by the text.
- Emphasize the purpose of the study, results, and conclusions.
- Limit length to approximately 150 words.

D. Body of Paper

Use headings that are appropriate for the type of presentation (introduction, methods, results, conclusions, etc.). See Section III for proper formatting of headings.

E. Acknowledgments

- Place acknowledgements after the final section of the paper (conclusions, summary, etc.).
- Acknowledge technicians or others who helped with the research, and acknowledge external sources of funding by grant number and agency.

F. Literature Cited

- Label section Literature Cited and place it following the Acknowledgments section.
- Arrange citations in alphabetical order.
- Type each citation as a paragraph, allowing text to wrap at the end of a line. Only use a hard return at the end of the citation. Do not indent.
- Separate citations with a blank line.
- See sample document for citation style for different types of literature.

- Only include published material in the literature cited section. This includes manuscripts that have been accepted for publication. Date for accepted manuscripts is written as [In press].
- Unpublished information and personal communications should be included in footnotes. Provide enough information including name and address of location where information is on file so the reader can locate the material.
- Be sure that all references cited in the text are included in the Literature Cited section and that all citations listed in the Literature Cited section are referenced somewhere in the text.
- When citing another paper within the proceedings, put authors name followed by (in this proceedings). No information is needed in the Literature Cited section.
- Spell out full journal names.

G. Appendix

- Not commonly used in proceeding papers, but can be used if explanations not essential to the text, lists of common and scientific names of species, questionnaires, or forms will be helpful to the reader.
- Number appendices using Arabic numbers only if there is more than one appendix.
- In the text, appendix is not capitalized unless it starts a sentence. Abbreviate it if used parenthetically (app. 3).

H. Tables

- Use Microsoft Word or Excel to create tables. Tables should be in an editable format, not saved as a graphic or pdf file.
- Use the table function or tabs, not spaces, to separate columns.
- Do not use spaces or hard returns in cells. The layout person will determine the table format and align data as needed.
- All columns should have headings. Capitalize only the first word and proper nouns.
- Type table title directly above the table in the following format: Table 1.—Title of Table.
- Number tables consecutively in the order they are referred to in the text.
- Limit table size to 6-6.5 inches wide. If table is much larger, break it into two separately numbered tables or two parts. In the text, refer to a table as Table 1 or (Table 1).
- Please do not embed tables in the body of the paper.
- Do not use font smaller than 9 pt for tables.
- In general, use lower case letters for footnotes (starting with "a" for each table) and place the footnotes at the end of the table. However, use symbols for footnotes in tables where letters are used to indicate statistical significance.

I. Figure Captions

- List figure captions on a separate page.
- Use the following format: Figure 1.— Figure caption.

J. Figures

- Figures include charts, graphs, maps, photographs, and other drawings and illustrations.
- All types of figures should be numbered in the order they are mentioned in the text.

- Make sure that each figure is referenced in the text.
- Refer to figures as Figure 1 (Fig. 1) or Figures 1 and 2 (Figs. 1 and 2) in the text.
- Place figure captions on a separate page at the end of the paper.
- Submit figures as separate files using the naming convention previously described.

J.1. Charts and Graphs

- Submit as Microsoft Excel files (XLS or XLSX) and include original data.
- Multiple figures can be in the same file with each tab of the Excel spreadsheet named with the figure number.
- Graphs will likely be reduced to fit into a 3.4 inch width, so keep this in mind when selecting font size, line weights, etc.
- Do not use 3-D effects, drop shadows, or backgrounds.

J.2. Maps

- Submit as EPS file or high quality PDF, TIFF or JPEG.
- Maps should be readable at a single column size of 3.4 inches.
- Contact proceedings compiler for more specific instructions for maps.

J.3. Photos

- High resolution (300 dpi at desired picture size) JPG or TIFF files are preferred. Contact proceedings compiler for more specific information.
- Permission is needed for photos that are not in the public domain.
  - Photos taken by federal employees as part of his/her employment are in the public domain.
  - Photos by coauthors who are not Forest Service employees or who are local or state employees are not in the public domain and require that permission be obtained to use the photo. Submit written permission with paper.
  - Many photos from Web sites such as Bugwood.org and forestryimages.org are in the public domain, but verify if permission is needed before using the photo.
- Provide a description and credit line for each photo, and include statement of permission if needed. For example:
  - Figure 24.—Common buckthorn with fruit. Photo by Cassandra Kurtz, U.S. Forest Service.
  - Figure 18.—Common reed infestation. Photo by John M. Randall, The Nature Conservancy, Bugwood.org.
  - Figure 3.—Northern long-eared myotis bat (*Myotis septentrionalis*). Photo used with permission by Tim Carter, Ball State University.

VI. STYLE ISSUES

Abbreviations and Acronyms

- If acronyms are used, spell out the full name followed by the acronym in parentheses the first time it is mentioned.
- Use the U.S. Postal Service two letter code for a state when mentioned with the name of a town. Spell out the state name when standing alone.
- U.S. is used in the adjective position but is spelled out when used as a noun (e.g., U.S. greenhouse gas emissions; forests in the United States, *not* forest in the U.S.)

Hyphenation

- Follow the Government Printing Office's advice to omit a hyphen when words appear in regular order and the omission causes no ambiguity.
- Hyphenate when adding prefix results in a double letter (e.g., pretreatment but post-treatment)

Lists

- Use bullets unless an order is needed, then use numbers.
- Use the bullet function in Microsoft Word rather than using spaces or indents to create the list.

Nomenclature

- The scientific name (with authorities if commonly used) is required the first time the common name is mentioned in the abstract and then again in the text.
- Genus, species, and variety should be italicized
- Include authority if commonly used (e.g., *Quercus rubrus* L.).
- If a large number of species are referred to, scientific names can be included in a table or appendix.

Numbers and Units of Measure

- Spell out the numbers one through nine except when used with a unit of measure or time.
- Use numerals for 10 through 999,999 except when the number is the first word of the sentence.
- Spell out the word "million" using decimals where appropriate (1 million trees; 2.45 million people).
- When two or more numbers appear in a sentence within a category of information, if one number is 10 or greater, use figures for all numbers unless they are a unit of measurement or time.
    - Correct: Samples included leaves from 12 white ash trees and 7 green ash trees.
    - Incorrect: Samples included leaves from 12 white ash trees and seven green ash trees.
- 1990s (not 1990's).
- Within each paper, use either English or metric units consistently throughout.

Symbols and Equations

- Spell out the word "percent" in the text and captions.
- The % symbol can be used in tables and graphs or parenthetical comments.
- Display an equation on its own line, numbered at the right margin, with a blank line above and below and followed by a list of the components and their meanings.
- Use the equation function in Word.

Terms

- Web site (two words)
- Internet
- email (one word)
- forest land (two words)
- landowner
- nonnative (*not* non-native)
- database
- decisionmaker (*but* policy maker)
- 100 °C (*not* 100° C)
- d.b.h. (*not* DBH or dbh)

SAMPLE DOCUMENT

Strategies for Assessing Inter- and Intra-Specific Variation in Tree Biomass in the Interior West

David L.R. Affleck, John M. Goodburn, and John D. Shaw[1]

Abstract.—Wildfire hazard mitigation and bioenergy harvesting have emerged as forest management priorities throughout the Interior West. Regional forest inventory and forecasting applications are therefore increasingly focused on tree biomass, including biomass in traditionally non-merchantable components. Yet accurate biomass equations for the latter components are typically lacking, even for major commercial species, because previous assessment efforts have focused on distinct components, have used inconsistent methodologies, or have relied on data with limited spatial or biophysical extents. Here we review and contrast the current state of knowledge of a widely distributed and commercially important species, ponderosa pine (*Pinus ponderosa*), and a locally important species of the southwest, two-needle pinyon (*Pinus edulis*). Owing to high levels of inter- and intra-specific variation in biomass allometry and to the high costs of collecting biomass data, an important element of new data collection efforts will be the development of standardized and accurate subsampling procedures. We describe these subsampling strategies and discuss potential adaptations for two-needle pinyon in the southwest.

INTRODUCTION

Across the Interior West (IW) of the United States, the management of federally administered forest lands is increasingly being shaped by policies related to wildfire hazard mitigation, bioenergy development, and ecological restoration. At the same time, on private lands there is heightened interest in regeneration and the growth dynamics of young stands. As such, there are growing needs for reliable inventory information on submerchantable trees and on forest biomass pools such as foliage, branchwood, and tops. These emerging needs stand in contrast to the considerable biometric knowledge concerning mature tree bole volume and taper that has been developed. Even for commercial species, few biomass models suitable for regional or subregional analyses are available, and many of these are incomplete or inconsistent with one another.

In this paper we review the current state of knowledge concerning tree biomass allometries, focusing on two IW species: the widely distributed ponderosa pine (*Pinus ponderosa*) and the locally important southwestern two-needle pinyon (*Pinus edulis*). We also consider the advantages and limitations of model assisted subsampling strategies that can be used to augment tree biomass datasets and refine regional allometric models.

CURRENT STATE OF KNOWLEDGE CONCERNING BIOMASS ALLOMETRIES

Ponderosa Pine

Ponderosa pine is found from northern Mexico to southern British Columbia and from California to Nebraska and is a commercially important species over much of the northern reaches of its range. It generally occupies relatively dry sites from the northern Sierras to the adjacent Great Basin and is found over a broad climatic envelope, growing on sites with annual precipitation ranging from approximately 1800 mm/yr to 200 mm/yr (Callaway et al. 1994).

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Most of our understanding of the biomass allometries of ponderosa pine comes from studies conducted in the northern portion of the species' range. Yet even the relatively intensive field work by authors such as Brown (1978) and Standish et al. (1985) had limited geographic support relative to the species' overall distribution. Moreover, past studies often employed different (and varying) tree biomass measurement protocols and partitioned totals into distinct biomass components. Though not irresolvable, the latter issues do make it challenging to use previously collected data or previously developed models to inform regional or subregional analyses. From smaller-scale studies such as Callaway et al. (1994) and Bouffier et al. (2003), it is evident that this species' biomass allocation patterns and wood density vary within the region owing to environmental and genetic differences. Differences in data collection protocols complicate the detection and description of such variations.

Two-Needle Pinyon

In the southwestern United States, two-needle pinyon is a locally important species in terms of forest cover and secondary forest products. This woodland species is found mostly in Utah, Colorado, New Mexico, and Arizona. Two-needle pinyon grows on warmer and drier sites than ponderosa pine and exhibits two different forms with a single-stem, excurrent form more common on better sites and spreading crowns with multiple stems more typical at lower elevations.

Compared to ponderosa pine, little has been published on the biomass allometries of two-needle pinyon or on its genetic variation or wood density characteristics. The few biomass studies that have been conducted are highly localized in terms of geographic extent and have been based on small sample sizes (i.e., 10 to 15 trees) (Darling 1967, Grier et al. 1992).

BIOMASS SUBSAMPLING

Motivations and Challenges

Field assessment of tree biomass is an expensive undertaking in the mountainous and remote regions of the western United States. Besides access costs there are often difficulties associated with the destructive nature of the sampling (e.g., if large diameter at breast height [d.b.h.] trees must be felled or if standard log lengths cannot be maintained). Materials processing costs are also significant, with defoliation of branches being particularly time consuming (e.g., defoliation of first-order branches can take more than one person per day for some coniferous species). At the same time, there is a multitude of site and stand factors that can influence the accumulation and apportionment of biomass, emphasizing the need for relatively large samples of trees for any given species. To collect a large sample in the face of high per tree costs requires consideration of subsampling strategies and potential sources of auxiliary (nonbiomass) information.

The disadvantage of subsampling for tree biomass is that within-tree sampling errors become confounded with among-tree variation. Put differently, residual among-tree variation is inflated by subsampling error, making it more difficult to identify and detect systematic variation in biomass attributable to tree, stand, or site factors. Thus, effective subsampling strategies must allow the size of the sample (i.e., the number of independently selected trees) to increase faster than tree-level uncertainty adds to the overall variance. Specifically, if the subsampling strategy is unbiased then the sample size under subsampling should be greater than the sample size under full measurement by a factor of at least $1 + (\sigma e/\sigma t)2$, where σe is the standard deviation associated with the subsampling procedure and σt is the conditional standard deviation in biomass across trees with similar characteristics.

Development and Application

Fundamental principles of tree allometry and past empirical work can be used to devise efficient and practical tree biomass subsampling strategies. As one example, for a given d.b.h. and height, much of the tree-to-tree variation in bole biomass can be attributed to differences in bole taper. This suggests using previous taper modeling efforts to minimize costs associated with biomass measurements specific to the bole. Multiple taper studies have been conducted for ponderosa pine in the northwest; particularly noteworthy are multipoint equations such as those developed by Flewelling and Ernst[2]. Though parameterized for specific subregions of the northwest, the latter equations allow for fine calibration of predicted profiles to actual tree taper via the input of multiple upper stem height-diameter pairs that are easily measured on the downed tree. Point-level predictions (inside bark and outside bark) from the taper profile together with integrated volumes can then be used as control variates, allowing for accurate estimation of bole biomass components from a random or systematic sample of discs.

As a second example, numerous field studies (e.g., Monserud and Marshall 1999) have shown strong relationships between branch basal area and branch mass for many coniferous species. Less strong are relationships between branch basal area and branch foliar mass or branch woody biomass. Nonetheless, such relationships form an important basis for biomass subsampling strategies because branch basal areas are more easily measured than branch masses (green or dry; whole or by component). Subsampling procedures can draw on these relationships via unequal probability designs (e.g., list sampling or randomized branch sampling [RBS]) and at the estimation stage through the use of generalized ratio or regression estimators. Such strategies avoid the need to measure full crown weights in the field, a task that is both time-consuming and difficult due to the prevalence of broken and buried branches. As part of an ongoing ponderosa pine biomass study in the northwest (Affleck and Turnquist 2012), RBS of first-order branches has been used to capitalize on the strong quadratic relationship between branch diameter and branch mass while carrying out the crown sampling in a single pass up the stem. The use of generalized regression estimators with RBS is also being studied as initial results have indicated that a number of conifer species do not exhibit area-preserving branching at the first-order level, a characteristic implicitly assumed in RBS.

In developing biomass sampling strategies for two-needle pinyon, there is considerably less mensurational knowledge to draw on. While volume equations have been developed for this species, we are aware of no work on taper. Flexible taper equations for other species might be substituted and used for control variate sampling, though the procedure would need to be modified for multistemmed growth forms. Because the multistemmed growth form is common, it is anticipated that crown subsampling strategies based on branch scaling relationships will be more useful for this species. In particular, RBS strategies could be applied in different ways to estimate crown characteristics on single stems or across multiple stems.

ACKNOWLEDGMENTS

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Additional Examples of Literature Citations

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