Forestry Core Curriculum Style Manual for Reports

As natural resource professionals you will be responsible for communicating with a diverse group of individuals, from landowners to industry personnel to state and federal employees. The ability to clearly and concisely convey complex information in an interpretable and respectful manner will be important to your success in almost any career you choose. To practice and further develop your written technical communication skills, reports in FOR 111: Introduction to Forestry, FOR 205: Forest Biometrics, FOR 209: Forest Ecology, FOR 240: Wood Science, FOR 251: Intro to Recreation and Human Dimensions, FOR 310/325: Field Silviculture / Timber Cruising, FOR 323: Land Management, FOR 329: Harvesting and Processing, FOR 347: Silviculture, FOR 409: Forest Hydrology, and GIS 390: GIS in Natural Resources may follow a number of common document formats that you will encounter in your career. The purpose of this manual is to give you guidance in proper formatting of these documents. Grading of reports in any of these courses may focus on improving your ability to communicate via writing to a number of different target audiences. The following pages contain formats and examples for:

Memo

A memo is a brief technical document that addresses a specific subject. Memos are often used by industry, university, and state and federal agency employees to communicate both within their organization and between organizations.

Letter

A letter is a signed document that can be used to communicate almost anything. Letters are often used by professionals to communicate with landowners or other non-professional audiences.

Technical Report

A technical report is an often lengthy document that more thoroughly analyzes and describes solutions to a specific problem based on data. Technical reports are used by industry, university, and state and federal agency employees to describe a problem, synthesize relevant background material, explain methods used to generate solutions, and explain proposed solutions. Technical reports are prepared to meet specific legal requirements by many agency personnel (i.e. NEPA EIS reports).

Tables, Graphs, and Maps

Natural resource professionals commonly need to communicate technical and spatial data. The ability to summarize and report such data within any of the above document formats can greatly improve your ability to communicate complex results concisely. This manual also includes formatting guidelines and examples of tables, graphs, and maps.

A word on page limits: In your professional career you will find that there are often no hard and fast rules on page limits, or that page limits may vary depending on what type of document you are writing and its intended purpose. As a general rule, always try to be as clear and concise as possible. Professionals are busy, and don't want to waste time reading unnecessary material. In your courses, always check with the professor to determine if there are specific page limits for assignments.

MEMO FORMAT

(OPTIONAL: Logo)

MEMORANDUM

TO: Who is the report to, may include contact info
FROM: Your name here (sign your INITIALS), may include contact info
DATE: Today's date here with month written out
SUBJECT: Brief description of content (a title basically)

Paragraph 1 content

Paragraph 2 if needed content

Paragraph 3 if needed content

MEMO EXAMPLE

MEMORANDUM

TO: Dr. Jeremy Stovall, Ph.D.;
Assistant Professor of Silviculture, ATCoFA, Stephen F. Austin State University

FROM: Penny Whisenant, *PW*
Research Biologist, Timber Monkey Inc.
Office: (512) 965-9688; Email: whisenanpl@titan.sfasu.edu

DATE: March 4, 2011

SUBJECT: Intermediate Treatments: Herbicide and Thinning

Thinning and herbicide applications are important intermediate operations for maintaining the health of a forested stand. Thinning is used to capture mortality, increase the value of remaining trees, earn profits in between harvests, improve the overall health of the stand, and to reduce the risk of insects and disease. Herbicides are also used to maintain the health of a forested stand by providing site prep before a planting and reducing the amount of unwanted competing vegetation midrotation.

Timber companies like the Campbell Group use thinning to promote growth of remaining trees and reduce the number of less desirable trees in a stand. This creates more space and allocates site resources for the remaining trees, which often improves diameter growth rates versus unthinned stands. Thinning also can release trees from lower canopy classes and allows them to grow. Types of thinning include, low, crown, selection, geometric, and free. The Campbell group using selection thinning for bottomland hardwood stands. This type of thinning is usually used for stands with a high density of poorly formed trees and for stands with a mixture of desirable and undesirable species.

Herbicides are used to control weeds without disturbing soil, for the control of roots below the root collar, and to increase the growth of desirable species. Some different types of herbicide include but are not limited to, Velpar L, Accord XRT, and Arsenal AC. Herbicides may be applied over a large area through broadcast or banded applications, to an individual stem, through the soil, or by foliar application. Application of correct rates as described on the label is critical to affordably obtain desired vegetation control and minimize any potential negative side effects that can result from over or under application.

If applied correctly, thinning and herbicides can have a positive effect on a stand. There are a variety of different methods possible for each technique. The silviculturalist should decide which technique is most suitable for the stand according to stand density and other structural characteristics.

LETTER FORMAT

(OPTIONAL: Logo) Your Contact Info

Date with month written out

Person you are sending it to w/ title

Their address information

Dear Mr. / Mrs. / Ms. / Dr. Landowner:

Paragraph 1 content

Paragraph 2 if needed content

Paragraph 3 if needed content

Salutation (e.g. Sincerely,),

PHYSICALLY SIGN YOUR NAME

YOUR NAME

YOUR TITLE

cc: Names of anyone your sending a copy to. Omit if none

Enclosure (include only if you are enclosing something else)

LETTER EXAMPLE

STEPHEN F. AUSTIN STATE UNIVERSITY

Arthur Temple College of Forestry and Agriculture
P. O. Box 6109 SFA Station • Nacogdoches, TX 75962-6109
Phone (936) 468-3301 • Fax (936) 468-2489

July 29, 2011

Mr. John Q. Landowner
123 FM 1000
Nacogdoches, TX 75965

Dear Mr. Landowner:

On July 18 a field crew from SFA cruised the timber on your property at 123 FM 1000 in Nacogdoches County as we previously discussed. Based on these data we created a silvicultural prescription designed to assist you in managing your forest. Please find this prescription including stand and stock tables for your timber enclosed.

I would recommend that you contact Mr. John Boyette at the Texas Forest Service to work with you on developing a forest stewardship plan. He can also assist you with obtaining Tree Farm Certification.

Please feel free to contact me if any questions arise regarding the prescription or cruise data.

Sincerely,

J Stovall

Jeremy Stovall, Ph.D.
Assistant Professor of Silviculture

cc: Mr. John Boyette, Texas Forest Service

Enclosure

TECHNICAL REPORT FORMAT

(Title of Report)

By

(Your Name)

Presented to (Instructor Name)

In Partial Fulfillment of the Requirements for

FOR (XXX)

(Date)

**This is a cover page. It may or may not be required in some of your courses for technical reports. Check with the instructor.*

TECHNICAL REPORT FORMAT

(OPTIONAL: Logo)

TO: Who is the report to, may include contact info

FROM: Your name here (sign your INITIALS), may include contact info

DATE: Today's date here with month written out

SUBJECT: Brief description of content (a title basically)

*If a cover page is included, exclude the above information, as it would be redundant.

Introduction

The introduction should contain:

1. Relevant background material to give the reader context and justify the report.
2. Any goals, objectives, or hypotheses that the report is addressing. Tell the reader why are you writing this report.

Methods

The methods section should contain enough information so that a reader familiar with the discipline could reproduce what was done. It also gives the reader all the necessary information to place the results in appropriate context. This includes information on the

Where: Where was the work done, and what are the characteristics of the study sites? What are the forest cover types and soil series? Adequately describe locations (including latitude and longitude if available) and include relevant maps.

When: When was it done? Be specific. Many of the data we work with vary yearly, seasonally, and even diurnally.

What: What was done? The reader needs just enough information to be able to reproduce what you did. For example, stating that you measured a 1/100 acre plot is sufficient. You do not need to indicate the radius or how you calculated it, since the reader presumably is familiar with forestry and can do this.

How: How did you do what was done? Were there any specific methods used? Use terminology you learned in biometry for any data collection. Reference any relevant publications that describe methods you used.

Who: Who did the work? This is often implicit from the FROM line at the beginning, but you may wish to indicate the size of the field crew who assisted with data collection.

Results

Describe what was learned, using data whenever possible. Use tables and graphs as appropriate. The results section describes the data, but does not make any inferences based upon your data. Only include what the data actually say, not what they mean. What they mean goes in the discussion section.

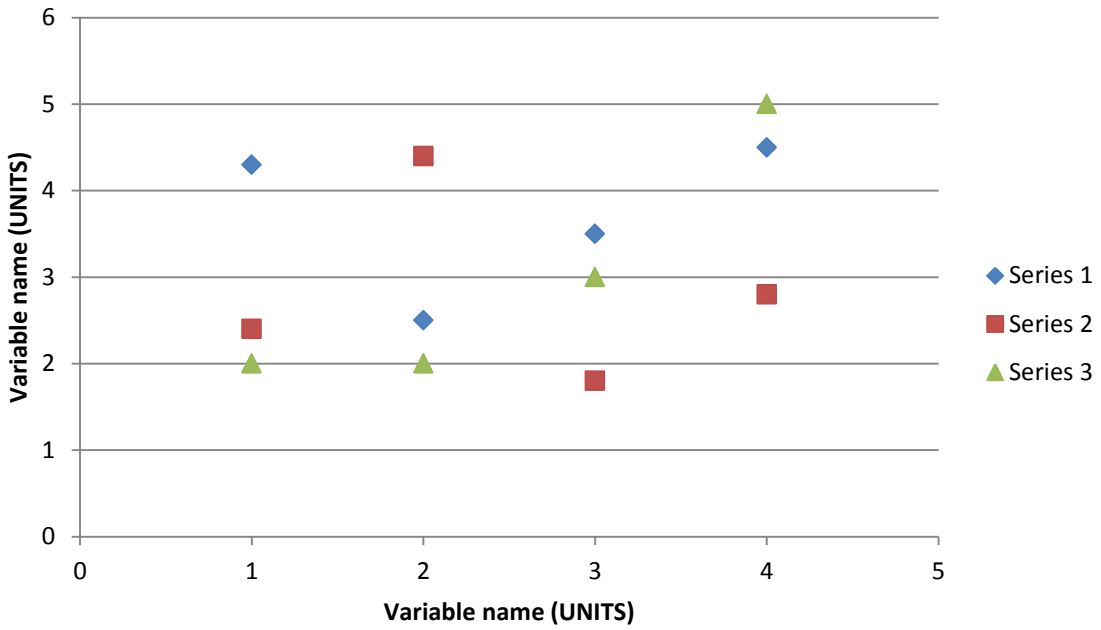


Figure 1. Include a complete caption with enough detail that the figure can stand alone. If someone picks up your figure and caption on a scrap of paper, they should have enough details to get a sense of what the figure means. Make sure that a figure, like this example, can be easily interpreted even if printed in black and white. Figure captions always go below the figure. Each figure always cited in the text in numbered order (i.e. figure 1 is mentioned before figure 2).

Table 1. Include a complete caption with enough detail that the table can stand alone. If someone picks up your table and caption on a scrap of paper, they should have enough details to get a sense of what the table means. Tables almost always include only 3 lines: one above the table, one below the table, and one beneath the header row(s). Do not add more lines except in the rare situation where doing so dramatically improves the clarity of the information presented in the table. Table captions always go above a table. Each table always cited in the text in numbered order (i.e. table 1 is cited before table 2).

Sites	**Variable 1** (Units)	**Variable 2** (Units)	**Variable 3** (Units)	**Variable 4** (Units)
Site 1	w.www	x.xx	y.yy	z.z
Site 2	w.www	x.xx	y.yy	z.z
Site 3	w.www	x.xx	y.yy	z.z

Discussion

Here you describe what the data mean and include any inferences or recommendations that emerge from your data. Put the results in the context of what has been done previously. Tell the reader why the results are important, and what parts of the results they should focus on the most.

Conclusion (optional)

Wrap it up in one or two paragraphs with a brief synopsis that highlights any key findings or recommendations.

Literature Cited

Use APA format to list any sources you cited in the text in alphabetical order. Cite sources in the text as follows:

Sentence here (Oliver and Larson 1996).	According to Oliver and Larson, content content (1996).
Sentence here (Sayer 2006).	Content content as described in Sayer (2006).
Sentence here (Adams et al. 1994).	This differs from descriptions in Adams et al. (1994).

Book Examples:

Oliver, C. D., and B. C. Larson. 1996. Forest Stand Dynamics, update edition. John Wiley and Sons Inc., New York, NY. pp: 520.

Pickett, S. T. A., and P. S. White, editors. 1985. The Ecology of Natural Disturbance and Patch Dynamics. Academic Press, Inc., Orlando, FL. pp: 472.

Journal Article Examples:

Hubbard, W. G., and R. C. Abt. 1989. The effect of timber sale assistance on returns to landowners. Resource Management and Optimization **6**:225-234.

Sayer, E. J. 2006. Using experimental manipulation to assess the roles of leaf litter in the functioning of forest ecosystems. Biological Reviews **81**:1-31. http://dx.doi.org/10.1017/S1464793105006846

Website Examples:

Adams, D. L., J. D. Hodges, D. L. Loftis, J. N. Long, R. S. Seymour, and J. A. Helms. 1994. Silviculture Terminology with Appendix of Draft Ecosystem Management Terms. Silviculture Instructors Subgroup of the Silviculture Working Group of the Society of American Foresters. Located at: http://oak.snr.missouri.edu/silviculture/silviculture_terminology.htm Accessed on: 7/29/2011.

TFS. 2011. Current Texas wildfire situation. Texas Forest Service, Texas A&M University System. Located at: http://txforestservice.tamu.edu/main/article.aspx?id=12888 Accessed on: 7/20/2011.

TECHNICAL REPORT EXAMPLE

TO: Dr. Jeremy Stovall
FROM: David Jamar
DATE: March 8, 2011
SUBJECT: Drift potential of herbicides and managing bottomland hardwoods.

Introduction

The previous two labs consisted of a lesson in herbicide drift and the field observation of a bottomland hardwood stand at various stages of intermediate thinning. Herbicide is an important tool for foresters to use in controlling undesirable or competing vegetation. When applied correctly, herbicides can provide a cost efficient, safe, and target specific means of controlling or encouraging advanced regeneration in hardwood and pine stands. Bottomland hardwoods require advanced regeneration which is achieved through the intermediate operation of thinning designed to allow more light to penetrate the canopy and reach young stems. This particular method of thinning can also be referred to as release operation and can be accomplished with many different techniques depending on the landowners' objectives.

Methods

The herbicide lab took place on a small pine plantation northeast of Nacogdoches. The purpose was to demonstrate the importance of proper sprayer calibration as well as observe drift from the sprayers. For the calibration exercise, a 100 foot path was measured out and marked with flags. Each student attempted to walk the length of the path with a backpack sprayer in 34 seconds, which was the time needed to apply the desired rate over a given distance. The student was also applying water from the sprayer while walking so that the spraying pattern and drift could be observed by the other students.

The bottomland hardwoods observed were located southeast of Lufkin in the Shawnee Creek bottom and were managed by The Campbell Group LLC. Mr. Rob Hughes, the hardwood manager, explained the methods used when deciding how to manage bottomland hardwoods. The common guide used was the *Management and Inventory of Southern Hardwoods* by Putnam et al. (1960) and revised by Meadows (1996). There was a newer classification system by Meadows and Skojac that was also being used with this management and inventory guide (2008). At the Shawnee creek site, hardwood stems between 1 and 3 feet high with a basal diameter of .5 to 1 inch were considered advanced regeneration. If no regeneration was present then thinning using a selection method may be needed to remove approximately 50% of the current basal area. The target DBH removed during thinning was between 6-10 inches which was completed over a period of about 3 years leaving desired species such as cherrybark oak (*Quercus pagoda*), ash (*Fraxinus spp.*), and sweetgum (*Liquidambar styraciflua*).

Results

The results of the 100 foot walk showed the difficulties in being consistent with a backpack sprayer, at least for beginners. The demonstration also showed, when applied to many acres, that inconsistencies could result in not applying enough herbicide or applying too much herbicide. This could lead to a loss of profit from using more chemicals than estimated or having to do another application from lack of sufficient coverage. Drift was noted from both of the sprayers which could cause damage to non-target species on the site and other landowners' properties as well. However, less drift was noted from the

sprayer using a larger spray tip with less pressure which created larger droplets that were less likely to be carried by the wind.

In the first hardwood stand observed, intermediate thinning was in the early stages of regeneration. Suckering was noticed on some small trees and would probably be removed in the next thinning. Some smaller suckering trees may also be left to shade the bole of desirable trees to prevent epicormic branching. The second stand showed how over 30 years of thinning resulted in an open stand with advanced regeneration, no mid-story, and hardwoods with large clear boles which is desired. Sweetgums were left as trainer trees to limit the spreading crowns and epicormic of the oak trees.

Discussion

Most problems with herbicide treatments occur in the form of hysteria on the part of the public, and heedlessness of complacent or ignorant users (Smith et al. 1997). Educating the public and applicators is important for having a successful herbicide program. Herbicide treatments are usually more effective and efficient when done during specific periods during a rotation such as at stand initiation or during a thinning operation (Smith et al. 1997). One should also know the target species, site conditions, and weather conditions when applying herbicides. This is just one of many silvicultural tools available for a landowner to use to help a plantation reach its full potential.

Hardwood management, including management of advanced regeneration, requires different expertise than managing a typical even-aged pine plantation. Spacing is not as important as in pine plantations as long as light penetration is adequate to achieve regeneration. After the first thinning, a clean-cut may be needed to help release the advanced regeneration. Stand quality often is compromised through the strict adherence to stand density management (Meadows and Skojac 2008). Guides for hardwood management are useful, but many times experience, field observations, weather, and the timber markets constrain the management of bottomland hardwoods.

Literature Cited

Meadows, J.S. 1996. Thinning guidelines for southern bottomland hardwood forest. P. 98-101 in *Proc. of the Southern forested wetlands ecology and management conference*. Flynn, K.M. (ed.). Clemson Univ., Clemson, SC.

Meadows, J.S. and D.A. Skojac Jr. 2008. A new tree classification system for Southern hardwoods. South. J. Appl. For. 32(2):69-79.

Putnam, J.A., G.M. Furnival, and J.S. McKnight. 1960. *Management and inventory of southern hardwoods.* Agriculture Handbook 181, US For. Serv., Washington, DC. 102p.

Smith, D.M., B.C. Larson, M.J. Kelty, and M.S. Ashton. 9th ed. 1997. *Release operations and herbicides.* The Practice of Silviculture: Applied Forest Ecology. P. 134.

EVERY DATA TABLE should have 1) **LABELED VARIABLES** and 2) **UNITS**.

Table 1. Include a complete caption with enough detail that the table can stand alone. If someone picks up your table and caption on a scrap of paper, they should have enough details to get a sense of what the table means. Tables almost always include only 3 lines: one above the table, one below the table, and one beneath the header row(s). Do not add more lines except in the rare situation where doing so dramatically improves the clarity of the information presented in the table. Table captions always go above a table. Each table always cited in the text in numbered order (i.e. table 1 is cited before table 2).

	Variable 1	**Variable 2**	**Variable 3**	**Variable 4**
Sites	(Units)	(Units)	(Units)	(Units)
Site 1	w.www	x.xx	y.yy	z.z
Site 2	w.www	x.xx	y.yy	z.z
Site 3	w.www	x.xx	y.yy	z.z

Table 2. Product classes and stumpage price in East Texas in Nov-Dec 2010 from Timber Mart-South.

Product Class	Minimum DBH (inches)	Pine Value ($/ton)	Hardwood Value ($/ton)
Pulpwood	4.6	$6.22	$7.56
Chip-N-Saw	7.6	$10.44	---
Sawtimber	9.6 Pine, 11.6 Hdwd	$24.46	$23.37
Poles*	> 12 with specific taper	$54.86	---

*No pole data was available from East Texas. Data is from same time period in northwestern Louisiana.

Tables can also contain text or other information. Depending on the information, you may not need variables or units.

Table 3. Texas Forest Service volume conversion factors

Sawlogs - Veneer Logs
MBF-International-1/4" X 0.74 = MBF-Doyle
MBF-Scribner X 0.78 = MBF-Doyle
MBF-USFS Scribner X 0.814 = MBF-Doyle
Pine - 8 Tons = 1 MBF-Doyle
Hardwood - 9 Tons = 1 MBF-Doyle
2.37 Pine Cunits = 1 MBF-Doyle
1 Cunit = 100 Cu.Ft.
Pine CNS 2.7 tons =1 cord

Pulpwood
Pine 2.7 tons = 1 cord
Hdwd 2.8 tons = 1 cord

EVERY GRAPH should have 1) **LABELED VARIABLES** and 2) **UNITS**.

In general the independent variable goes on the x-axis and the dependent variable goes on the y-axis. The independent variable is the variable that is unaffected by the other variable. The dependent variable depends on the value of the independent variable. Usually the independent variable is the variable we have some control over, and the dependent variable is out of our control. An example of this is the relationship of tree height to stand density. We can control stand density (through planting or thinning). We cannot control tree height. Tree height is a function of available site resources and the age of the stand. Therefore stand density is our independent variable that goes on the x-axis, while tree height is the dependent variable that goes on the y-axis.

Rules to remember:

1. Never use a fancy 3D figure when a simple 2D figure clearly displays your data.
2. Always remember that your figure may be printed in black and white. Make sure it will be easy to interpret in black and white.
3. Always label the variables and units on each figure.
4. Always include a complete caption beneath each figure.

Graphs can be of a variety of different forms intended to display different kinds of data.

Point or Line Graph: These are typically used to display the relationship between two variables.

Bar Graph: These are typically used to show the value of data grouped into a number of categories.

Pie Graph: These are only used to show how a sample population is broken down into discrete categories. Remember, if your data does not sum to 100%, then you should use a bar graph, not a pie graph. For example, percent cover data would not be appropriate to show on a pie graph, since it can sum to more or less than 100%.

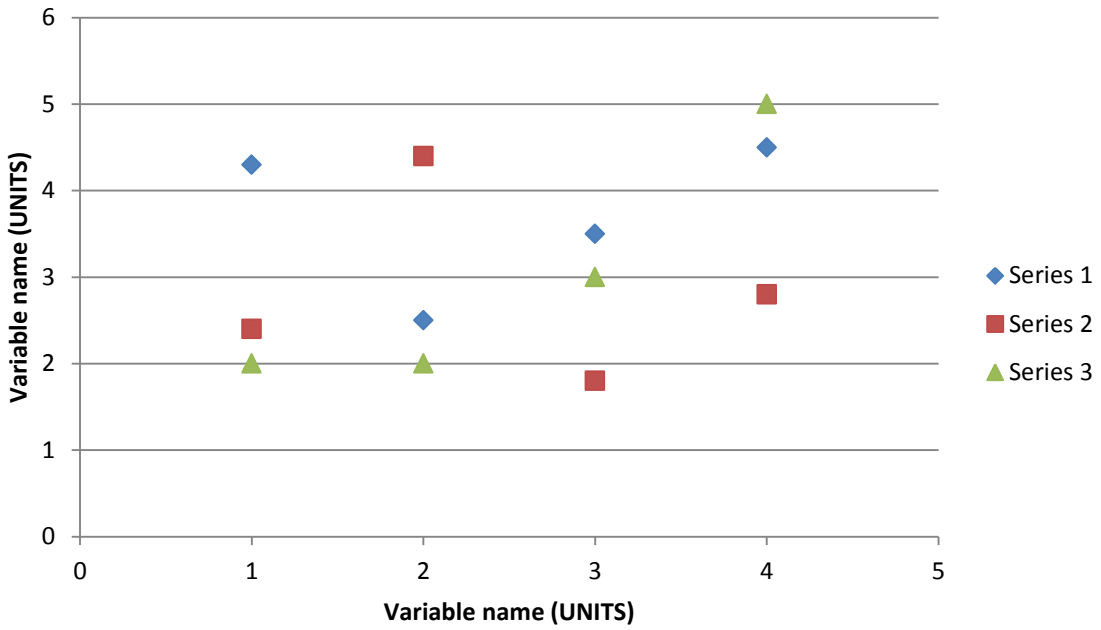


Figure 1. Point graph showing content content content…. Include a complete caption with enough detail that the figure can stand alone. If someone picks up your figure and caption on a scrap of paper, they should have enough details to get a sense of what the figure means. Make sure that a figure, like this example, can be easily interpreted even if printed in black and white. Figure captions always go below the figure. Each figure always cited in the text in numbered order (i.e. figure 1 is mentioned before figure 2).

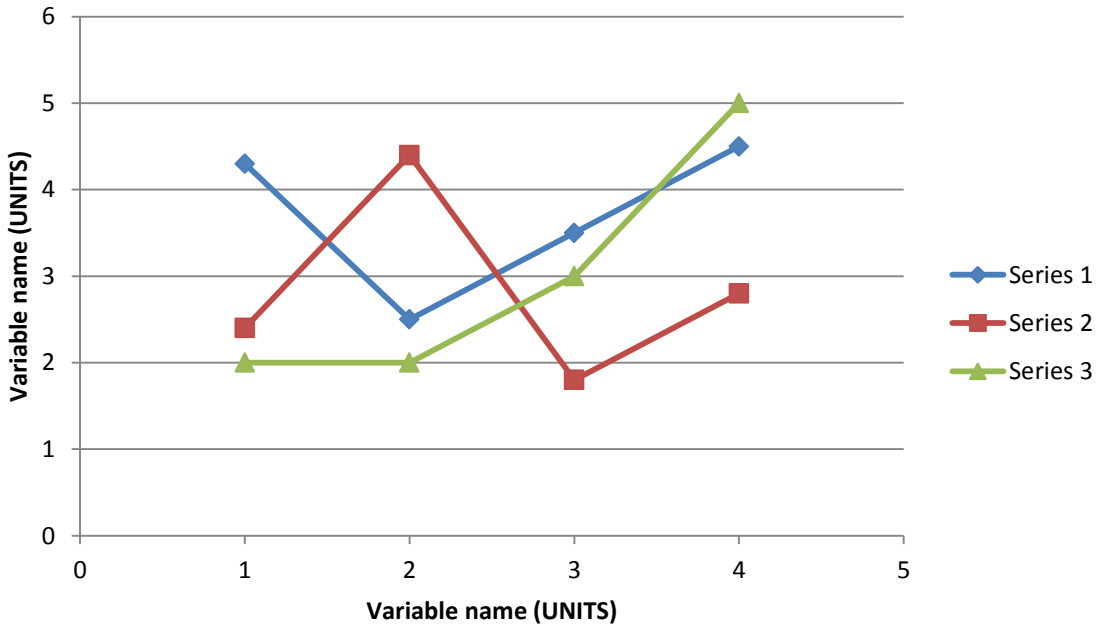


Figure 2. Line graph showing content content content…

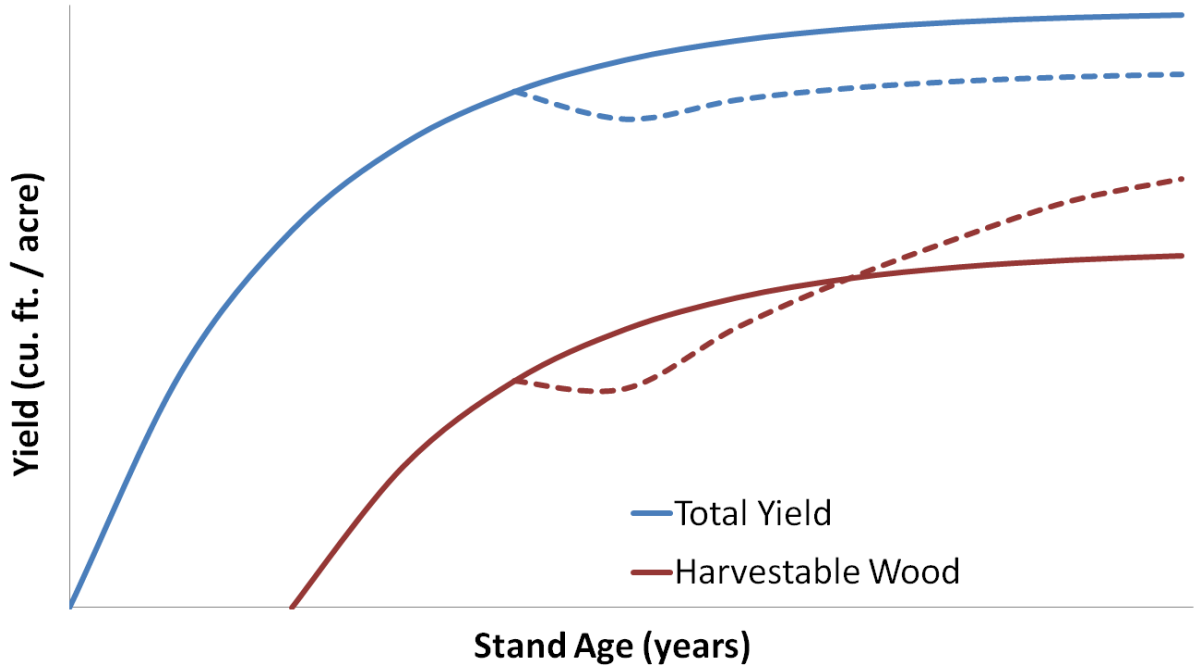


Figure 3. The effect of thinning on total yield and harvestable wood of an average stand. The solid lines show how the stand would continue to grow without thinning, while the dashed lines show how the stand would grow following thinning. (Note: since this graph shows trends that occur at different time scales in different forest cover types there are no numbers on the axes. This is appropriate for this figure given its objective, which is to illustrate generically how thinning affects stand growth.)

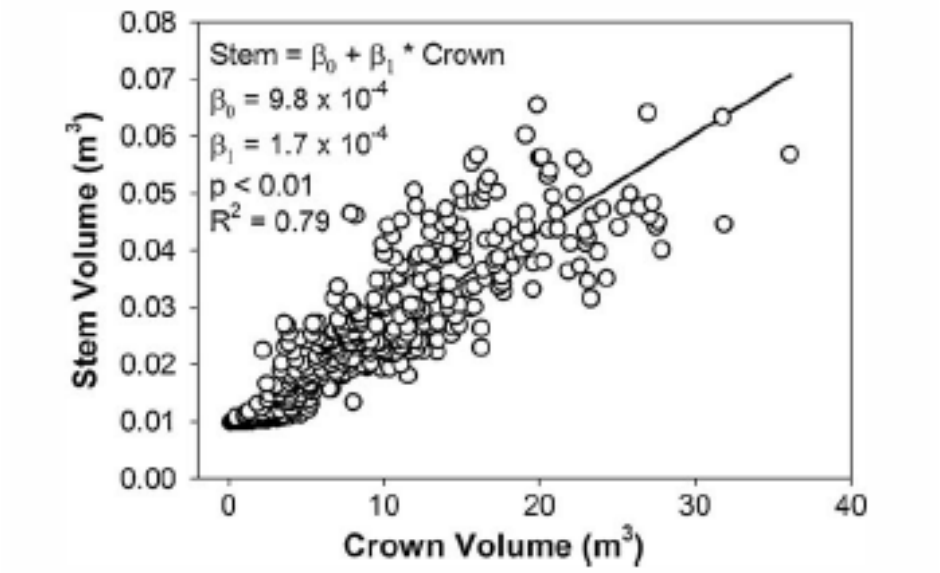


Fig. 8. Simple linear regression of crown volume to stem volume of individual trees with data from three different years from 21 clones of fertilized and unfertilized ramets of *P. taeda*, $N = 468$, regression statistics are shown.

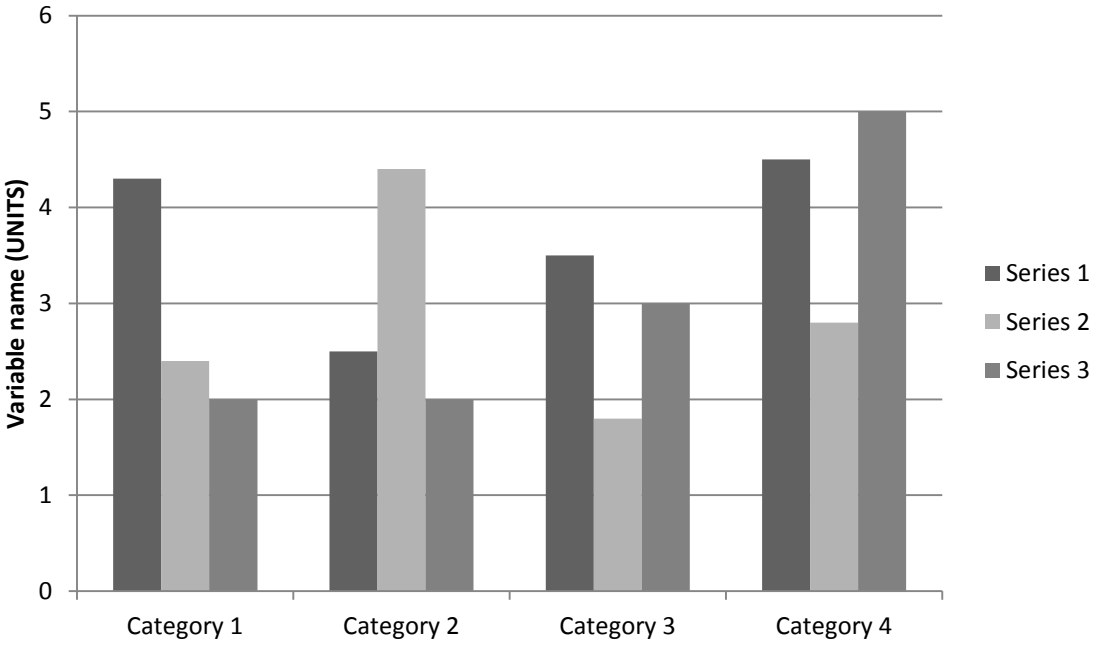


Figure 4. Bar graph showing content content content…

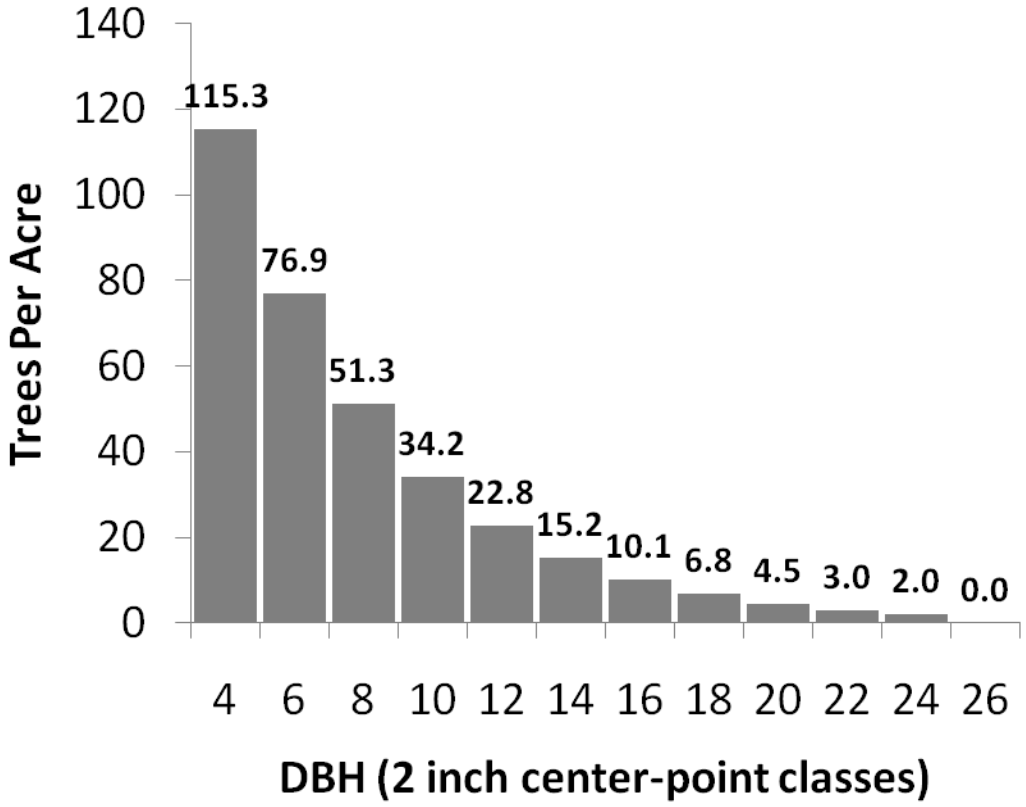


Figure 5. A balanced uneven-aged diameter distribution of a hypothetical stand with a basal area of 146 square feet per acre, a maximum tree size of 24 inches dbh, and a q-factor of 1.5.

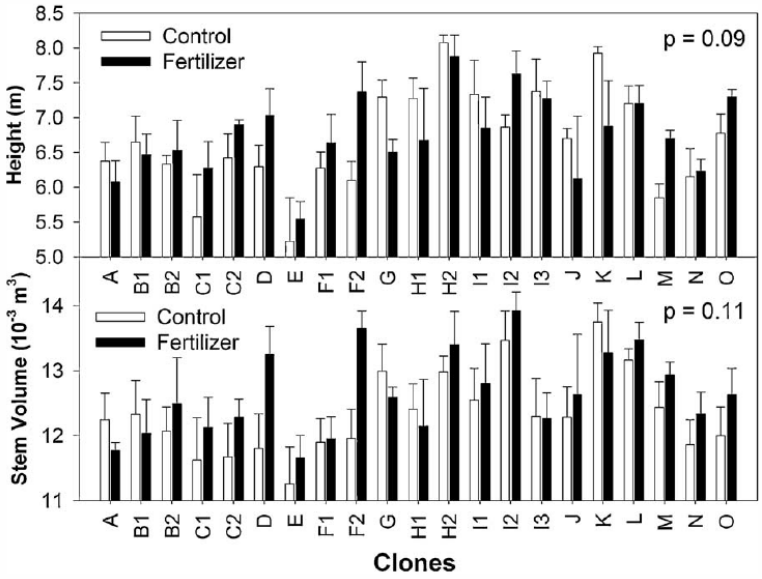


Fig. 3. Clone-by-fertilizer interactions at age six for stem growth of 21 clones of *P. taeda*. Stem volume was calculated based on the empirical formula found in Burkhart (1977). Standard error bars are shown, and *p*-values are presented for the interactions depicted.

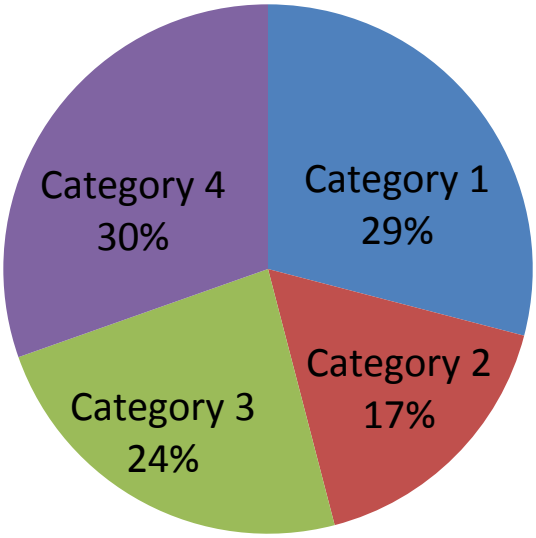


Figure 6. Pie graph showing content content content…

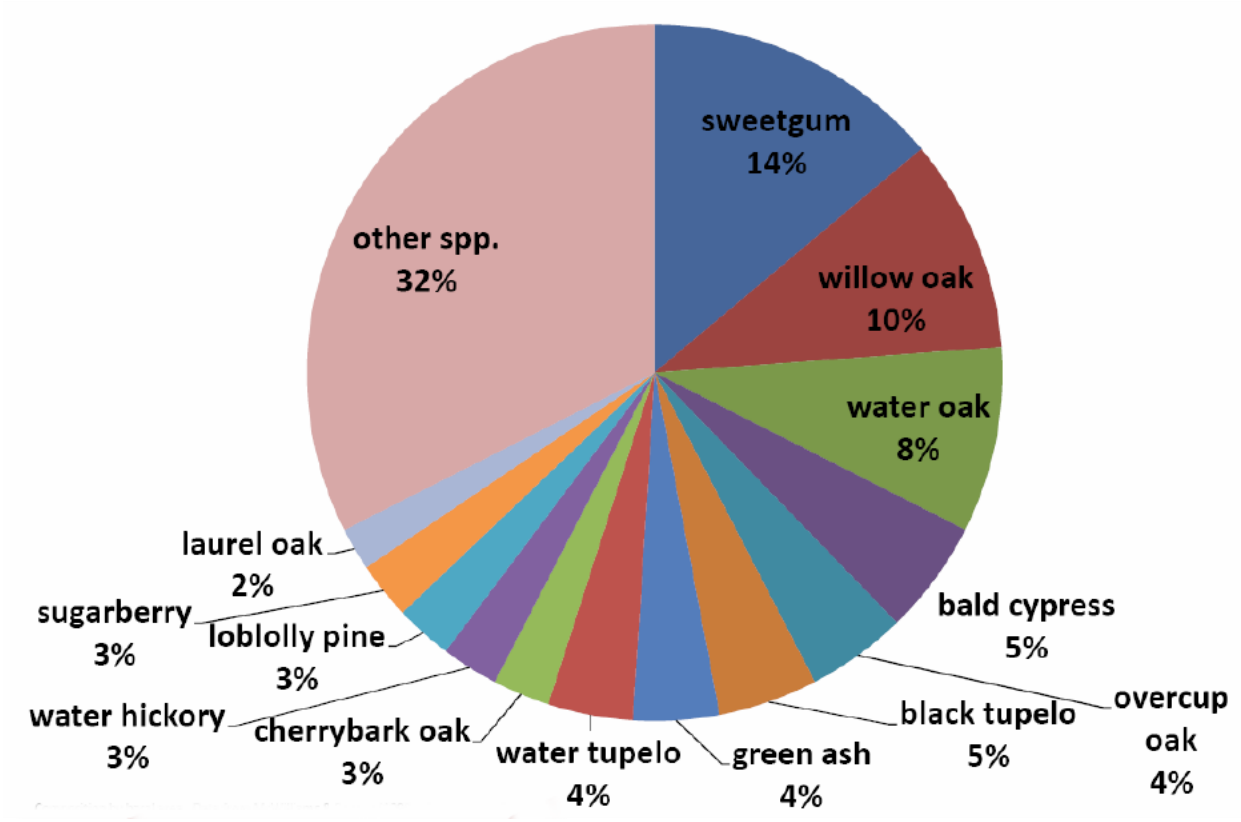


Figure 7. Composition by basal area of a typical bottomland hardwood stand in the Western Gulf Coastal Plain. Data is from McWilliams, W. H., and J. F. Rosson Jr. 1990. Composition and vulnerability of bottomland hardwood forests of the coastal plain province in the south central United States. Forest Ecology and Management **33-34**:485-501.

MAP FORMAT & EXAMPLES

Maps should be prepared using GIS software whenever possible. If maps are to be distributed in electronic format, ensure that maps will be legible if printed in black and white.

At a minimum, each map should include the following:

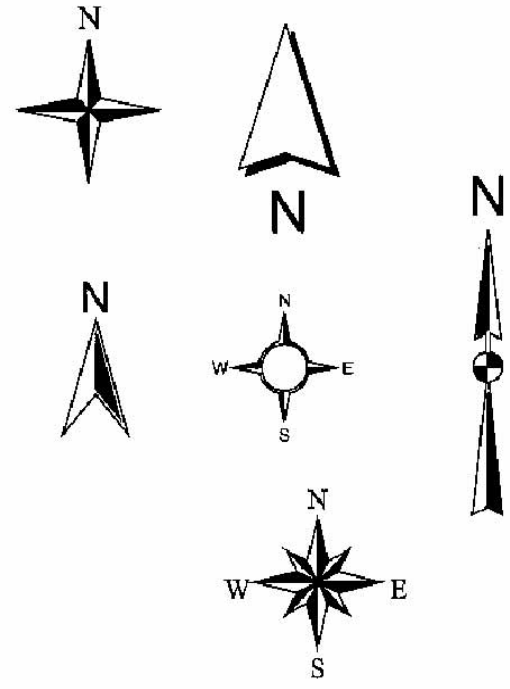
1. Title (indicating the theme and location of the map)
2. Map body
3. Neatline
4. North arrow
5. Legend
6. Scale bar with convenient divisions (50's or 100's for metric; multiples of 66 for English units)
7. Appropriate labels
8. Textual or visual information that locates the map body on a larger scale.
9. Author information
10. Created date
11. Attribution of any data sources such as imagery

Many other kinds of information can be included on a map depending on what you are trying to communicate.

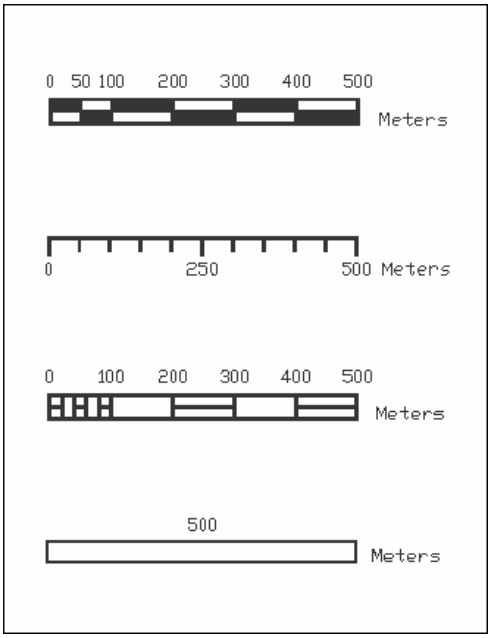
Neatline: A box around all the content on a map

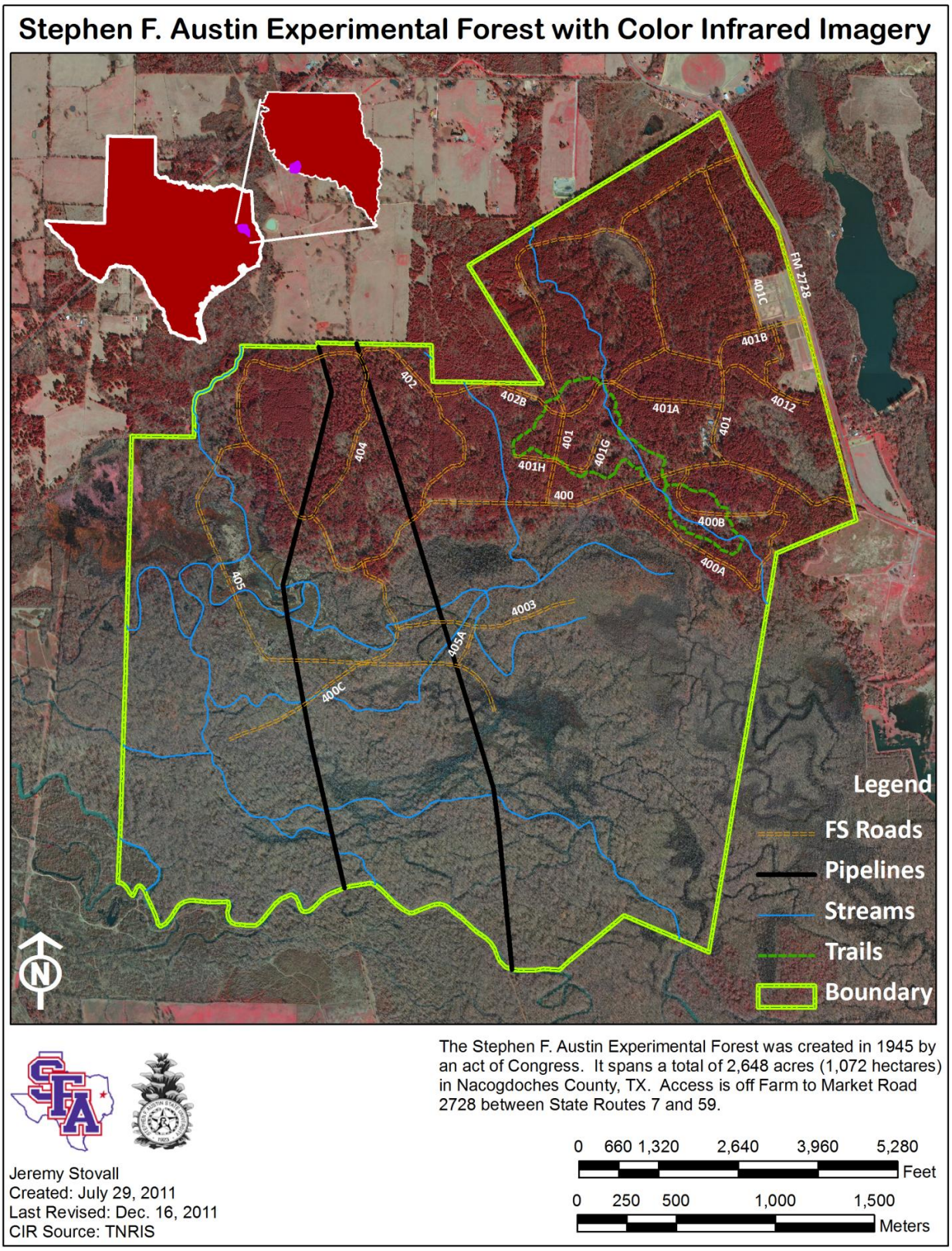
Legend: An example of each symbol used on the map with a textual description of what it symbolizes.

North Arrow Examples:



Scale Bar Examples:




Stephen F. Austin Experimental Forest with Color Infrared Imagery
FM 2728
401C
401B
401A
4012
401
401G
401H
402
402B
404
400
400B
400A
405
4003
405A
400C
Legend
FS Roads
Pipelines
Streams
Trails
Boundary
N
The Stephen F. Austin Experimental Forest was created in 1945 by an act of Congress. It spans a total of 2,648 acres (1,072 hectares) in Nacogdoches County, TX. Access is off Farm to Market Road 2728 between State Routes 7 and 59.
0 660 1,320 2,640 3,960 5,280
Feet
0 250 500 1,000 1,500
Meters
Jeremy Stovall
Created: July 29, 2011
Last Revised: Dec. 16, 2011
CIR Source: TNRIS

Transect Lines and Plot Locations in the Ball Park Complex, Nacogdoches County, Texas

Table 1. Acreage of each stand, including buffers in the ballpark complex, Nacogdoches County, TX.

Stand/Area	Acreage
Total Stand	42.89
Pine Stand	5.03
HDWD Stand	33.54
Buffer Area	4.32

0 100 200 400 Feet

Created by: Penny Whisenant, Katherine Syring, Jeremy Priest
Date: 5/3/11
Source: Texas Natural Resource Information System (TNRIS), Walker GIS Lab, Arthur Temple College of Forestry and Agriculture.

Legend

- Upland Hardwood-Pine
- Pine Stand
- Ball Park Complex
- SMZ
- Streams
- Transect Lines
- Plots

A Note on Using Maps as Figures in Technical Reports

Maps may sometimes be used within the body of a technical report. In this case, maps should be treated and labeled as a figure. When used as a figure, maps often do not include all the components listed on page 18. Rather, text and features on maps used as figures should be minimized as much as possible to communicate the map's desired content as clearly and concisely as possible.

Fig. 1. Location of Chinese tallow study areas along the Texas Coast during 1995 and 1996.

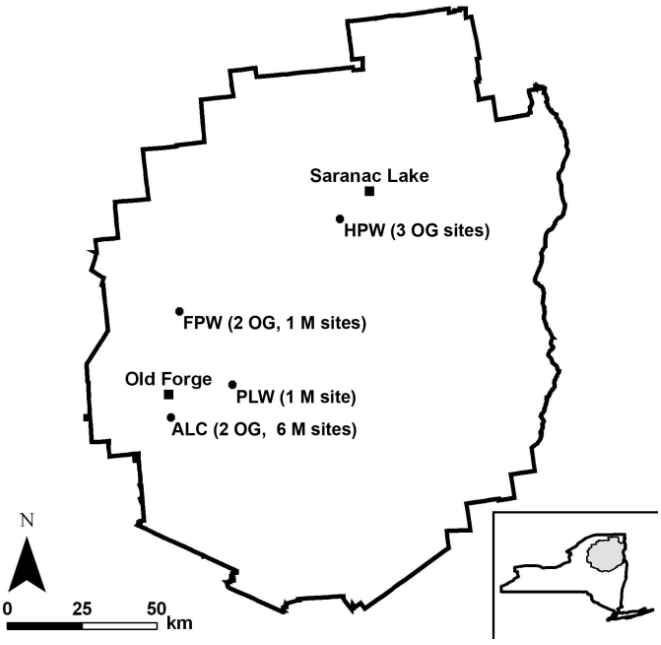


Figure 1. Map of study sites in the 2.5 x 10^6 ha Adirondack State Park in upstate New York, USA. The location of the park in New York State is shown in the inset, and the towns of Old Forge and Saranac lake are included on the map for reference. Site labels are locations (ALC, Adirondack League Club private reserve; FPW, Five Ponds state wilderness area; HPW, High Peaks state wilderness area; and PLW, Pigeon Lakes state wilderness area) followed by stand age class (M, mature; OG, old-growth).