RECEIVED

APR 13 2016

OFFICE OF THE SENATE COUNCIL

Course Information

Date Submitted: 7/10/2015

Current Prefix and Number: FOR - Forestry , FOR 250 STATISTICS AND MEASUREMENTS I

Other Course:

Proposed Prefix and Number: FOR 250

What type of change is being proposed?

Major Change

Should this course be a UK Core Course? Yes

Statistical Inferential Reasoning

1. General Information

a. Submitted by the College of: AGRICULTURE, FOOD AND ENVIRONMENT

b. Department/Division: Forestry

c. Is there a change in 'ownership' of the course? No

If YES, what college/department will offer the course instead: Select...

e. Contact Person

Name: Laura R. Lhotka

Email: laura.lhotka@uky.edu

Phone: 859-257-8718

Responsible Faculty ID (if different from Contact)

Name: Darryl Cremeans

Email: darryl.cremeans@uky.edu

Phone: 859-257-1396

f. Requested Effective Date

Semester Following Approval: Yes OR Effective Semester:

2. Designation and Description of Proposed Course

a. Current Distance Learning (DL) Status: N/A

b. Full Title: STATISTICS AND MEASUREMENTS I

Proposed Title: Statistics and Measurements I

c. Current Transcript Title: STATISTICS AND MEASUREMENTS I

Proposed Transcript Title: Statistics and Measurements I

d. Current Cross-listing: none

Proposed – ADD Cross-listing :

Proposed – REMOVE Cross-listing:

e. Current Meeting Patterns

LECTURE: 2

LABORATORY: 2

Proposed Meeting Patterns

LECTURE: 3

LABORATORY: 3

f. Current Grading System: ABC Letter Grade Scale

Proposed Grading System: *Letter (A, B, C, etc.)*

g. Current number of credit hours: 3

Proposed number of credit hours: 4

h. Currently, is this course repeatable for additional credit? No

Proposed to be repeatable for additional credit? No

If Yes: Maximum number of credit hours:

If Yes: Will this course allow multiple registrations during the same semester? No

2i. Current Course Description for Bulletin: The application of statistical concepts, computations, and software to forestry sampling and inventory problems. Land, individual tree and timber stand measurement techniques will be covered as will the design and implementation of sampling systems to derive information necessary to meet landowner objectives.

Proposed Course Description for Bulletin: The application of statistical concepts, computations, and software to forestry sampling and inventory problems. Land, individual tree and timber stand measurement techniques will be covered as will the design and implementation of sampling systems to derive information necessary to meet landowner objectives.

2j. Current Prerequisites, if any: Prereq: MA 109 or Calculus, FOR 110, FOR 200

Proposed Prerequisites, if any: MA 109 or calculus

2k. Current Supplementary Teaching Component:

Proposed Supplementary Teaching Component: No Change

3. Currently, is this course taught off campus? No

Proposed to be taught off campus? No

If YES, enter the off campus address:

4. Are significant changes in content/student learning outcomes of the course being proposed? Yes

If YES, explain and offer brief rational: The course content and student learning outcomes have been modified to meet the Statistical Inferential Reasoning requirements of the UK Core. An additional credit hour has been added to accommodate the expanded content on statistics.

5a. Are there other depts. and/or pgms that could be affected by the proposed change? Yes

If YES, identify the depts. and/or pgms: Natural Resources and Environmental Science

5b. Will modifying this course result in a new requirement of ANY program? No

If YES, list the program(s) here:

6. Check box if changed to 400G or 500: No

Distance Learning Form

Instructor Name:

Instructor Email:

Internet/Web-based: No

Interactive Video: No

Hybrid: No

1.How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations?

2.How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc.

3.How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc.

4.Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above?

If yes, which percentage, and which program(s)?

5.How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting?

6.How do course requirements ensure that students make appropriate use of learning resources?

7.Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program.

8.How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (http://www.uky.edu/UKIT/)?

9.Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? NO

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10.Does the syllabus contain all the required components? NO

11.I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name:

SIGNATURE|TTBA225|Terrell T Baker|FOR 250 CHANGE Dept Review|20150302

SIGNATURE|LGRABAU|Larry J Grabau|FOR 250 CHANGE College Review|20150716

SIGNATURE|MQFLET00|Melissa Q Pittard|FOR 250 CHANGE UKCEC Expert Review|20151005

SIGNATURE|JMETT2|Joanie Ett-Mims|FOR 250 CHANGE UKCEC Review|20160406

SIGNATURE|JMETT2|Joanie Ett-Mims|FOR 250 CHANGE Undergrad Council Review|20160413

Course Change Form

https://myuk.uky.edu/sap/bc/soap/rfc?services=

Open in full window to print or save

Generate R

Attachments:

Browse... Upload File

	ID	Attachment
Delete	5181	FOR250StatisticalInferentialReasoning_UKCore.pdf
Delete	6534	comments and questions for designer.docx
Delete	6535	Sample assignments.pdf

First 1 2 Last

NOTE: Start form entry by choosing the Current Prefix and Number
(*denotes required fields)

	Current Prefix and Number:	FOR - Forestry / FOR 250 STATISTICS AND MEASUREMENTS I	*Proposed Prefix & Number:* (example: PHY 401G) ☑ Check if same as current	FOR 250

*	What type of change is being proposed?	☑ Major Change ☐ Major – Add Distance Learning ☐ Minor - change in number within the same hundred series, ex 799 is the same "hundred series" ☐ Minor - editorial change in course title or description which do change in content or emphasis ☐ Minor - a change in prerequisite(s) which does not imply a ch course content or emphasis, or which is made necessary by the significant alteration of the prerequisite(s) ☐ Minor - a cross listing of a course as described above

Should this course be a UK Core Course? ◉ Yes ○ No

If YES, check the areas that apply:

☐ Inquiry - Arts & Creativity	☐ Composition & Communications - II
☐ Inquiry - Humanities	☐ Quantitative Foundations
☐ Inquiry - Nat/Math/Phys Sci	☑ Statistical Inferential Reasoning
☐ Inquiry - Social Sciences	☐ U.S. Citizenship, Community, Diversity
☐ Composition & Communications - I	☐ Global Dynamics

1. General Information

a. Submitted by the College of: AGRICULTURE, FOOD AND ENVIRONMENT Submission Date: 7/10/2015

b. Department/Division: Forestry

c.* Is there a change in "ownership" of the course?

○ Yes ◉ No If YES, what college/department will offer the course instead? Select...

e.* * Contact Person Name: Laura R. Lhotka Email: laura.lhotka@uky.edu Phone: 859-257-8718
* Responsible Faculty ID (if different from Contact) Darryl Cremeans Email: darryl.cremeans@uky.ed Phone: 859-257-1396

f.* Requested Effective Date: ☑ Semester Following Approval OR Specific Term: 4

2. Designation and Description of Proposed Course.

a.	Current Distance Learning(DL) Status:	◉ N/A ○ Already approved for DL* ○ Please Add ○ Please Drop

*If already approved for DL, the Distance Learning Form must also be submitted unless the department affirms (by checking this box) that the proposed chan affect DL delivery.

b.	**Full Title:**	STATISTICS AND MEASUREMENTS I	*Proposed Title: **	Statistics and Measuremen
c.	**Current Transcript Title (if full title is more than 40 characters):**	STATISTICS AND MEASUREMENTS I		
c.	*Proposed Transcript Title (if full title is more than 40 characters):*	Statistics and Measurements I		

d.	**Current Cross-listing:**	☑ N/A	OR	Currently[3] Cross-listed with (Prefix & Number):	none
	Proposed – ADD[3] Cross-listing (Prefix & Number):				
	Proposed – REMOVE[3,4] Cross-listing (Prefix & Number):				

e. Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours [5] for each meeting patterr

Current:	Lecture 2	Laboratory[5] 2	Recitation	Discussion	Indep. Stu
	Clinical	Colloquium	Practicum	Research	Residency
	Seminar	Studio	Other	Please explain:	
*Proposed: **	Lecture 3	Laboratory[5] 3	Recitation	Discussion	Indep. Stu
	Clinical	Colloquium	Practicum	Research	Residency
	Seminar	Studio	Other	Please explain:	

f.	**Current Grading System:**	ABC Letter Grade Scale		
	*Proposed Grading System:**	◉ *Letter (A, B, C, etc.)* ○ *Pass/Fail* ○ *Medicine Numeric Grade (Non-medical students will receive a letter grade)* ○ *Graduate School Grade Scale*		
g.	**Current number of credit hours:**	3	*Proposed number of credit hours:**	4
h.*	**Currently, is this course repeatable for additional credit?**			○ Yes ◉
*	*Proposed to be repeatable for additional credit?*			○ Yes ◉
	If YES:	*Maximum number of credit hours:*		
	If YES:	*Will this course allow multiple registrations during the same semester?*		○ Yes ○

i. Current Course Description for Bulletin:

The application of statistical concepts, computations, and software to forestry sampling and inventory problems. Land, individual tree and timber stand measurement techniques will be covered as will the design and implementation sampling systems to derive information necessary to meet landowner objectives.

* *Proposed Course Description for Bulletin:*

The application of statistical concepts, computations, and software to forestry sampling and inventory problems. Lan individual tree and timber stand measurement techniques will be covered as will the design and implementation of sampling systems to derive information necessary to meet landowner objectives.

j. Current Prerequisites, if any:

Prereq: MA 109 or Calculus, FOR 110, FOR 200

* *Proposed Prerequisites, if any:*

MA 109 or calculus

*

k. Current Supplementary Teaching Component, if any: ○ Community-Based Experience

		○ Service Learning ○ Both
	Proposed Supplementary Teaching Component:	○ Community-Based Experience ○ Service Learning ○ Both ◉ No Change
3.	**Currently, is this course taught off campus?**	○ Yes ◉
*	*Proposed to be taught off campus?*	○ Yes ◉
	If YES, enter the off campus address:	
4.*	**Are significant changes in content/student learning outcomes of the course being proposed?**	◉ Yes ○
	If YES, explain and offer brief rationale:	
	The course content and student learning outcomes have been modified to meet the Statistical Inferential Reasoning requirements of the UK Core. An additional credit hour has been added to accommodate the expanded content on statistics.	
5.	**Course Relationship to Program(s).**	
a.*	**Are there other depts and/or pgms that could be affected by the proposed change?**	◉ Yes ○
	If YES, identify the depts. and/or pgms:	
	Natural Resources and Environmental Science	
b.*	**Will modifying this course result in a new requirement[Z] for ANY program?**	○ Yes ◉
	If YES[Z], list the program(s) here:	
6.	**Information to be Placed on Syllabus.**	
a.	☐ Check box if changed to 400G or 500.	If changed to 400G- or 500-level course you must send in a syllabus and *you must include the differentiation* between under graduate students by: (i) requiring additional assignments by the graduate students; and/or (ii) establishing different grading course for graduate students. (See *SR 3.1.4.*)

[U]See comment description regarding minor course change. *Minor changes are sent directly from dean's office to Senate Council Chair.* If Chair deems the change as "not minor," the form will b appropriate academic Council for normal processing and contact person is informed.
[W]Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.
[U] Signature of the chair of the cross-listing department is required on the Signature Routing Log.
[U] Removing a cross-listing does not drop the other course – it merely unlinks the two courses.
[U] Generally, undergrad courses are developed such that one semester hr of credit represents 1 hr of classroom meeting per wk for a semester, exclusive of any lab meeting. Lab meeting gene least two hrs per wk for a semester for 1 credit hour. (See *SR 5.2.1.*)
[U] You must *also* submit the Distance Learning Form in order for the course to be considered for DL delivery.
[U]In order to change a program, a program change form must also be submitted.

Course Review Form
Statistical Inferential Reasoning

Course: FOR 250

Reviewer Recommendation
Accept ☐ Revisions Needed ☐

Using the course syllabus as a reference, identify when and how the following learning outcomes are addressed in the course. Since learning outcomes will likely be addressed multiple ways within the same syllabus, please identify a representative example (or examples) for each outcome.

☒ Evidence of course activities that will enable students to evaluate common claims arising from the formal statistical inference conveyed through margins of error and confidence intervals; and to articulate the sense in which margins of error and confidence intervals address and quantify risks that are of practical interest.

Date(s)/location(s) on syllabus or assignment:
Lectures 14 and 17 - Statisitical Variability and Homework assignment number 2

Brief Description:
covers standard error of the mean and confidence intervals

☒ Evidence of course activities that will enable students to evaluate common claims arising from the formal statistical inference conveyed through null hypothesis testing within statistically designed experiments, and to articulate the sense in which null hypothesis testing addresses and quantifies risks that are of practical interest.

Date(s)/location(s) on syllabus or assignment:
Lectures 38, 42, and 44 and Homework assignment number 4

Brief Description:
chi-squared, t-tests and ANOVA covered in these lectures including null hypothesis testing using natural resource data

☒ Evidence of course activities that will enable students to evaluate common claims that arise from statistical constructs, like charts and graphs, tables and numerical summaries, through the informal act of human inference; and to articulate some of the associated challenges (e.g. with conditional reasoning, hidden variables, confounding, association versus correlation, not having the right information, misinterpreting randomness).

Date(s)/location(s) on syllabus or assignment:
Lectures 2, 23 and 26 and Homework assignment number 3

Brief Description:
explains bias, accuracy and precision and the hazards of misinterpreting linear regressions, etc.

☒ Topic distribution includes estimation (at least 25%), statistical testing (at least 25%), describing data (at least 20%), and information literacy (at least 5%).

Date(s)/location(s) on syllabus or assignment:

Cruise Report - Lab 14 and Lecture 46, Lectures 5, 8, and 11 and Homework assignment number 1, etc.

Brief Description:
class project is a statistical estimate of forest samples taken expanded to stand level, covers frequency and distributions, covers central limit theorem, covers statistical notation, etc.

☒ Assessable artifact(s) are identified and focused on demonstrating that the use and worth of statistical inference is for making everyday decisions. The artifact(s) should be conceptually focused and not primarily focused on computations and derivations.

Date(s)/location(s) on syllabus or assignment:
Lecture 32 and 35

Brief Description:
covers practical application of testing sample variability to determine correct sample size to achieve desired statistical accuracy and sample stratification

☐ Sufficient evidence to suggest that the course is not confined to, or even largely focused on computation, but rather is designed to provide a conceptual understanding of statistical inferential reasoning (increasing student skill with computations is a perfectly acceptable by-product of the course). **This box must be checked by the reviewer for the submission to move forward.**

Date(s)/location(s) on syllabus or assignment:

Brief Description:

Reviewer Comments:

Commonwealth Ave
The Arboretum
Shady Ln
McDonald Ave

Crew = _____ Date = _____

Plot#	Tree#	Species	Diameter inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Crew = _____ Date = _____

Plot#	Tree#	Species	Diameter inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Crew = _____ Date = _____

Plot#	Tree#	Species	Diameter inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Crew = ______________________________ Date = ____________________

Plot#	Tree#	Species	Diameter inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Crew = _____ Date = _____

Plot#	Tree#	Species	Diameter inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

HARDWOOD TREE GRADING KEY

Department of Forestry, University of Kentucky

		YES/NO
1.	DBH ≥ 15.6" (14.6" FOR BASSWOOD & ASH)	4/2
2.	DBH ≥ 12.6"	7/3
3.	DBH ≥ 9.6"	10/**BG**
4.	DIT ≥ 19.6"	11/5
5.	DIT ≥ 15.6"	12/6
6.	DIT ≥ 12.6" (11.6" FOR BASSWOOD & ASH)	13/7
7.	DIT ≥ 11.6"	15/8
8.	DIT ≥ 10.6"	16/9
9.	DIT ≥ 9.6"	17/10
10.	DIT ≥ 7.6"	18/**BG**

	12'	14'	16'	length of grading section	
11. SCC ≥	10'	11'8"	13'4"	1 or 2 CC—each ≥ 3'	20/14
12. SCC ≥	10'	11'8"	13'4"	1 or 2 CC—each ≥ 5'	20/14
13. SCC ≥	10'	11'8"	13'4"	1 or 2 CC—each ≥ 7'	20/14
14. SCC ≥	8'	9'4"	10'8"	1, 2, 3, CC—each ≥ 3'	19/18
15. SCC ≥	8'	9'4"	10'8"	1, 2, 3 CC—each ≥ 3'	22/18
16. SCC ≥	8'	9'4"	10'8"	1 or 2 CC—each ≥ 3'	22/18
17. SCC ≥	10'	11'8"	13'4"	1 or 2 CC—each ≥ 7'	22/18
18. SCC ≥	6'	7'	8'	All CC ≥ 2'	23/**BG**

19.	TCD ≤ 9% or [9% < Rot ≤ 40%, no S&C or SD]	**G2**/23
20.	TCD ≤ 9%	**G1**/21
21.	S&C ≤ 15% and TCD ≤ 40%	**G2**/23
22.	TCD ≤ 9%	**G2**/23
23.	TCD ≤ 50%	**G3/BG**

DIT—diameter inside bark at top of grading section; **CC**—clear cutting(s); **SCC**—sum of clear cuttings; **TCD**—total cull deduction (sweep, crook & rot); **S&C**—cull deduction due to sweep and or crook; **SD**—surface defects(s); **G1**—grade 1; **G2**—grade 2; **G3**—grade 3; and **BG**—below grade.

FOR 250 Lab 7 – Variable Plot Cruising

Given: Area = ~15 acres, 15 points (marked on map)(note some are on edges and must be dealt with accordingly – mirage plot preferred, walkthrough second best) ~200 feet square grid

Working in small groups, each group will measure 3 or 4 plots; I recommend rotating roles at each plot

10/23

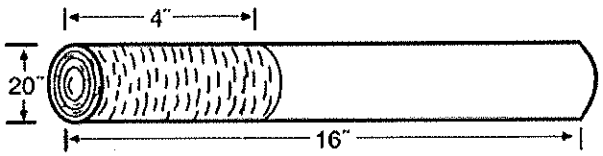
Plots 1, 6 and 7:	Alwes, Auden, Ayres, Manning
Plots 2-5:	Adams, Dixon, Dunn, Grigsby, Magee
Plots 9-12:	Bowden, Freshwater, Hardymon, Heckman, Hilliard
Plots 8 and 13-15:	Betts, Musser, Philhower, Phillips, Rolland

Equipment needed for each group: Prism, Chalk, Compass, Flagging, D-tape, Hypsometer, Clipboard and Forms

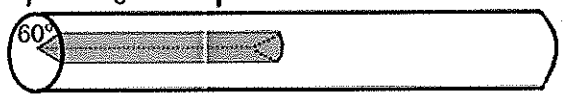
Procedure:

1. Locate and mark point center (flag a small limb and stick in the ground)
2. Mark with slash 'IN' trees from North clockwise, mark with X when measurement is complete
3. Record on form provided
4. Plot number
5. Tree number
6. Species
7. DBH to nearest inch (rounding down)(all sizes of 'IN' trees)
8. Merchantable height (to a 8 inch top diameter) to the nearest half log (rounding down)
9. Perform any appropriate cull deductions
10. Apply a tree grade to the second worst face as we practiced in earlier lab

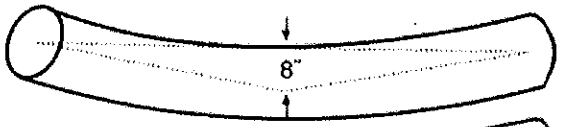
Rule 1. Cull Section
cull = 4/16 = 25%



Rule 2. Cull Section
cull = (6/16) (60/360) = 6 1/4%

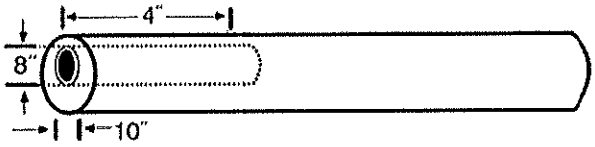


Rule 3. Cull Section
cull = $\frac{8-2}{20}$ = 30%



Rule 4. Crook
cull = $(\frac{4}{16})(\frac{10}{20})$ = 12 1/2%

Rule 5. Interior Defect
cull = $\frac{(8)\ (10)}{(20-1)^2}\ (\frac{4}{16}) = 5\frac{5}{9}\%$



Crew = ______________________________ Date = ______________

Plot#	Tree#	Species	DBH in inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Crew = _____ Date = _____

Plot#	Tree#	Species	DBH in inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Crew = _____ Date = _____

Plot#	Tree#	Species	DBH in inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Crew = _____ Date = _____

Plot#	Tree#	Species	DBH in inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Crew = ______________________________ Date = ______________

Plot#	Tree#	Species	DBH in inches	Merchantable Height - logs	% Cull	Tree Grade	Notes

Commonwealth Dr
The Arboretum
Shady Ln
McDonald Ave

HARDWOOD TREE GRADING KEY

Department of Forestry, University of Kentucky

		YES/NO
1.	DBH ≥ 15.6" (14.6" FOR BASSWOOD & ASH)	4/2
2.	DBH ≥ 12.6"	7/3
3.	DBH ≥ 9.6"	10/**BG**
4.	DIT ≥ 19.6"	11/5
5.	DIT ≥ 15.6"	12/6
6.	DIT ≥ 12.6" (11.6" FOR BASSWOOD & ASH)	13/7
7.	DIT ≥ 11.6"	15/8
8.	DIT ≥ 10.6"	16/9
9.	DIT ≥ 9.6"	17/10
10.	DIT ≥ 7.6"	18/**BG**

	12'	14'	16'	length of grading section	
11. SCC ≥	10'	11'8"	13'4"	1 or 2 CC—each ≥ 3'	20/14
12. SCC ≥	10'	11'8"	13'4"	1 or 2 CC—each ≥ 5'	20/14
13. SCC ≥	10'	11'8"	13'4"	1 or 2 CC—each ≥ 7'	20/14
14. SCC ≥	8'	9'4"	10'8"	1, 2, 3, CC—each ≥ 3'	19/18
15. SCC ≥	8'	9'4"	10'8"	1, 2, 3 CC—each ≥ 3'	22/18
16. SCC ≥	8'	9'4"	10'8"	1 or 2 CC—each ≥ 3'	22/18
17. SCC ≥	10'	11'8"	13'4"	1 or 2 CC—each ≥ 7'	22/18
18. SCC ≥	6'	7'	8'	All CC ≥ 2'	23/**BG**
19.	TCD ≤ 9% or [9% < Rot ≤ 40%, no S&C or SD]				**G2**/23
20.	TCD ≤ 9%				**G1**/21
21.	S&C ≤ 15% and TCD ≤ 40%				**G2**/23
22.	TCD ≤ 9%				**G2**/23
23.	TCD ≤ 50%				**G3/BG**

DIT—diameter inside bark at top of grading section; **CC**—clear cutting(s); **SCC**—sum of clear cuttings; **TCD**—total cull deduction (sweep, crook & rot); **S&C**—cull deduction due to sweep and or crook; **SD**—surface defects(s); **G1**—grade 1; **G2**—grade 2; **G3**—grade 3; and **BG**—below grade.

FOR 250 Lab 6 – Fixed Plot Cruising

Given: Area = ~15 acres, 1/10th acre plots (37.2' radius), 10% cruise thus 15 plots (marked on map)(note some are on edges and must be dealt with accordingly – mirage plot preferred, walkthrough second best)

Plots are oriented true North – South East – West at ~200 feet spacing

Working in small groups, each group will measure plots; I suggest rotating roles (diameter taker, height taker, recorder, determine in trees, cull estimator, grader). In other words, let everyone perform each job.

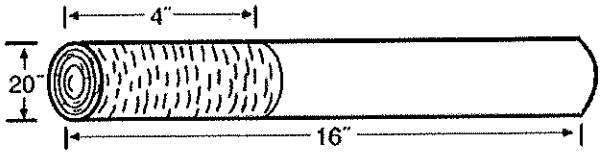
Plots 1, 6 and 7:	Adams, Betts, Dunn, Heckman, Musser
Plots 2-5:	Alwes, Bowden, Freshwater, Hillard, Philhower
Plots 9-12:	Auden, Grigsby, Magee, Phillips, Rolland
Plots 8 and 13-15:	Ayres, Dixon, Hardymon, Manning

Equipment needed for each group: chalk, clipboard, compass, d-tape, flagging, hypsometer

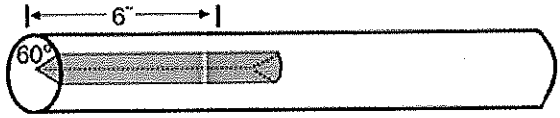
Next week another group will re-measure your plots and we will compare

1. Locate and mark plot center (flag a small tree or stick)
2. Find 'IN' trees from North clockwise, mark when measurement is complete
3. Record on form provided...
4. Plot number
5. Tree number
6. Species
7. DBH to nearest inch (rounding down)(only measure trees 10" DBH and greater)
8. Merchantable height (to a 8 inch top diameter) to the nearest half log (rounding down)
9. Perform any appropriate cull deductions entering the percent on the form.
10. Apply a tree grade to the second worst face as we practiced in earlier lab

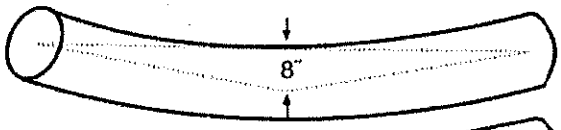
Rule 1. Cull Section
cull = 4/16 = 25%



Rule 2. Cull Section
cull = (6/16) (60/360) = 6 1/4%

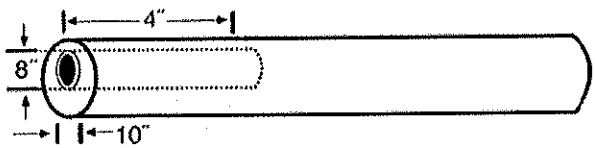


Rule 3. Cull Section
cull = $\frac{8-2}{20}$ = 30%



Rule 4. Crook
cull = $(\frac{4}{16})(\frac{10}{20})$ = 12 1/2%

Rule 5. Interior Defect
cull = $\frac{(8)\ (10)}{(20-1)^2}\ (\frac{4}{16})$ = $5\frac{5}{9}$%



Lab Summary Assignment – Walnut Grove Timber Inventory

1. Summarize data collected from the fixed plot cruise using the methods discussed in class.

Report sawtimber results of Trees/Acre, Basal Area/Acre, Board Foot/Acre, Average Diameter, Average Merchantable Height, Average BF/tree, Average Cull Percent, Percent of basal area occupied by black walnut. Using the numbers from Tennessee region II (pages 6-7) find the value for this tract. TREAT THIS AS A 10 PERCENT SAMPLE CRUISE.

- http://www.tn.gov/agriculture/article/ag-businesses-forest-products-bulletin

2. Summarize the data collected from the point cruise using the methods discussed in class.

Report timber results of Trees/Acre, Basal Area/Acre, Board Foot/Acre, Average Diameter, Average Merchantable Height, Average BF/tree, Average Cull Percent, Percent of volume occupied by black walnut.

3. Write a report that would provide the landowner with usable information that could be used when dealing with a mill owner wanting to purchase this timber. This should include introduction (including brief description of the stand), methodology for each cruising procedure, results (including stand and stock tables) for each method, and a discussion comparing the results you obtained.

Do original work, not working in teams.

This is worth 15% of your grade.

This is to be turned in no later than Nov 23rd in class. Do not procrastinate!

FOREST MEASUREMENTS (FOR 250)

Inventory Planning

BASIC PROTOCOL

1. Assume the stand area is 15 acres (boundaries are edge of woods on north and west sides, and the major trail system on the south and east sides)
2. Inventory will include only sawtimber ($\geq$ 10 in DBH to 8 in top)
3. Both gross and net stumpage (not log or lumber) volumes and values will be estimated
4. Volume will be in units of board feet (Doyle)
5. Assume tree tops, roots, branches, and cull trees will not be harvested.
6. Inventory will be carried using both fixed-plot sampling and point-sampling
7. Species, DBH, and merchantable height will be recorded for each tally tree
8. Need a stand map to plan sampling

QUESTIONS TO CONSIDER

1. What sample design will you use? (see class HO on random, systematic & stratified sampling; Chap. 10)
2. What number of plots and points will you use? (see Sections 3-5; 10-6 through 10-8; 11-25)
3. How will you space or locate your plots and points? (see Section 10-6; Fig. 10-2)
4. What plot size will you use? (see Section 10-6)
5. What method will you use to estimate cull deduction for converting gross to net volume? (see Section 6-11 through 6-13)
6. What method will you use to measure merchantable height? (see Section 7-7 through 7-11)
7. What equipment will you need for the inventory?

ASSIGNMENT

Run *CHITEST* for each of the two nominal data sets given below. For each case, carefully define H_0 and H_1, then run the chi-square test and interpret your results. Discuss the real-world implications or meaning of the statistical results. [Note that Excel always runs the test at alpha = 0.05]

1. Here is a contingency table classifying 2X8 dimensional lumber by grade and work shift. Do grades of lumber produced differ significantly by shift?

	Lumber Grade				
Shift	A	B	C	Reject	Total
1	10	25	28	5	68
2	8	32	30	7	77
3	6	15	25	10	76
Total	24	72	103	22	221

Shifts are 1 = 8AM-4PM; 2 = 4PM-Midnight, 3 = Midnight-8AM

Lumber Grades are A = Good, B = Fair, C = Poor, Reject = below-grade

2. Here is a contingency table classifying seedling mortality by species. Does mortality differ between species?

Species	Killed	Survived
Hemlock	97	223
White Pine	167	253

Killed and survived refers to numbers of seedlings killed by a late spring frost

For example, consider a sample of N=200 beer-drinkers. For each drinker we have information on sex (variable X, taking on 2 possible values: "Male" and "Female") and preferred category of beer (variable Y, taking on 3 possible values: "Light", "Regular", "Dark"). An "observed" contingency table for these data might look like the following.

OBSERVED

	Light	Regular	Dark	Total
Male	20	40	50	110
Female	50	20	20	90
Total:	70	60	70	200

This is a two-way 2x3 contingency table (i.e. two rows and three columns).

We now need to calculate an "expected" table based on the H_0: There is no difference in preference between men and women. Created the expected table by filling in each cell using the relationship: [(column total/grand total)*row total].

EXPECTED

	Light	Regular	Dark	Total
Male	38.5	33	38.5	110
Female	31.5	27	31.5	90
Total:	70	60	70	200

We can now use these two tables to do a chi-square test.

Statistics and Measurements I (FOR 250)

Categorical Data

CHI-SQUARE TEST FOR INDEPENDENCE

Chi-square is a test statistic that has the following characteristics:

- **Used for categorical or nominal variables**
- **Tests for independence among variables**
- **Uses Contingency Tables**
- **Uses Observed and Expected Data**

What is the difference between categorical, ordinal and interval variables?

In talking about variables, sometimes you hear variables being described as categorical (or sometimes nominal), or ordinal, or interval. Below we will define these terms and explain why they are important.

Categorical

A categorical variable (sometimes called a nominal variable) is one that has two or more categories, but there is no intrinsic ordering to the categories.

Ordinal

An ordinal variable is similar to a categorical variable. The difference between the two is that there is a clear ordering of the variables.

Interval

An interval variable is similar to an ordinal variable, except that the intervals between the values of the interval variable are equally spaced.

3. Fertilizer was applied to some nursery beds at the beginning of the growing season. The total biomass (g) of 1-year-old Loblolly Pine seedlings per bed was recorded on seven fertilized and six non-fertilized beds at the end of the growing season. The results were as follows:

Fertilized	570	592	630	512	634	493	558
Non-Fertilized	502	593	503	583	482	445	

Perform a t-test at alpha = 0.10 to determine if seedling growth was significantly affected by fertilization. Do you think a one-tailed or two-tailed test is more appropriate in this case?

4. Soil depth over bedrock (inches) was measured on steeply-sloping forested sites that had been disturbed by recreational use of ORVs and on sites that had not been disturbed. Here are the results:

Disturbed Site	48	21	88	8	35	11	47	18	49
Undisturbed	46	21	89	6	32	10	48	15	47

First, analyze this data using an independent samples t-test. Did ORV use cause enough erosion to significantly reduce the depth of soil?

Next, consider each pair of measurements (48/46, 21/21, 88/89...) to represent data from paired plots (i.e. from geographically distinct locations with adjacent disturbed/undisturbed sites) and analyze the data using a paired t-test. Did ORV use cause enough erosion to significantly reduce the depth of soil?

Discuss the different results from the independent and paired test.

2. Here are some data from a previous assignment:

Species	Hardwood (H) or Conifer (C)	Air-dry Density (lbs/cu.ft. at 20% moisture)
Apple	H	46
Alder	H	28
White Ash	H	41
Basswood	H	26
Beech	H	45
Black Locust	H	49
Black Walnut	H	38
Bur Oak	H	43
Cottonwood	H	28
Alaska Cedar	C	31
Eastern Red Cedar	C	33
Northern White Cedar	C	22
Black Cherry	H	35
Chestnut	H	30
Bald Cypress	C	32
Douglas Fir	C	33
American Elm	H	35
Balsam Fir	C	25
Hackberry	H	37
Eastern Hemlock	C	28
Honeylocust	H	45
Hickory	H	48
Red Maple	H	38
Sugar Maple	H	44
Red Oak	H	42
White Oak	H	47
Osage Orange	H	57
Southern Yellow Pine	C	38
Ponderosa Pine	C	28
Yellow-poplar	H	28
Redwood	C	28
Sitka Spruce	C	28
Sycamore	H	34
Tamarack	C	37
Willow	H	27

Does hardwood air-dry (20% moisture) density differ from conifer density?

ASSIGNMENT

Answer all the questions below. For each question, give a null hypothesis; alternative hypothesis; alpha level; summary of test results including mean, sample size (*n*) and any other important statistics; and a brief interpretation for each question.

1. Here are some data from a previous assignment.

Pine	Bottomland Hardwoods	Upland Hardwoods
	(cubic feet/acre)	
570	520	420
640	710	210
480	770	290
560	840	350
510	630	540
590	760	180
670	890	260
600	810	320
780	580	270
700	860	200

Does the cubic volume of Bottomlands Hardwoods differ significantly from the volume of Upland Hardwoods? Does the cubic volume of Upland Hardwoods differ significantly from the volume of Pine?

4. **T-Test assuming equal or unequal variance**

- Conservative approach is to always assume unequal variance
- If t-test is significant when assuming unequal variance it will only be more significant (lower p-value) if variances are equal

5. **Here are some details concerning the t-Test procedure:**

1. (a) calculates a ***t-statistic***; (b) compares the ***t-statistic*** to a ***critical t-value*** which is determined by the alpha that you choose; if the ***t-statistic*** is greater than the ***critical t-value*** reject H_0; if the ***t-statistic*** is less than the ***critical t-value*** accept H_0; (c) provides a ***p-value*** that compares the significance of your test result to the alpha value; ***p-value*** < alpha, reject H_0; ; ***p-value*** ≥ alpha, accept H_0.
2. Use Excel Statistical Functions: TTEST, then choose (a) whether the test is one-tailed or two-tailed and (b) whether the test is paired, two samples assuming equal variance, or two samples assuming unequal variance.
3. Can do the same test using Excel Data Analysis Tools:t-Test.
4. "Statistical Functions: TTEST" only gives only ***p-value***; "Data Analysis Tools:t-Test" gives ***p-value***, ***t-statistic***, and ***critical t-value***.

NOTE: Analysis-of-Variance (ANOVA) is used to test for differences among more than two samples

2. One-Tailed and Two-Tailed Significance Tests

NOTE: Conservative approach is to always perform two-tailed tests

One important concept in significance testing is whether you use a one-tailed or two-tailed test of significance. The answer is that it depends on your hypothesis. When your research hypothesis states the direction of the difference or relationship, then you use a one-tailed probability. For example, a one-tailed test would be used to test these null hypotheses: Females will not score significantly higher than males on an IQ test. Blue collar workers are will not buy significantly more product than white collar workers. Superman is not significantly stronger than the average person. In each case, the null hypothesis (indirectly) predicts the direction of the difference. A two-tailed test would be used to test these null hypotheses: There will be no significant difference in IQ scores between males and females. There will be no significant difference in the amount of product purchased between blue collar and white collar workers. There is no significant difference in strength between Superman and the average person. The one-tailed probability is exactly half the value of the two-tailed probability.

There is a raging controversy (for about the last hundred years) on whether or not it is ever appropriate to use a one-tailed test. The rationale is that if you already know the direction of the difference, why bother doing any statistical tests. While it is generally safest to use a two-tailed tests, there are situations where a one-tailed test seems more appropriate. The bottom line is that it is the choice of the researcher whether to use one-tailed or two-tailed research questions.

3. Paired t-Test or Independent Samples t-Test

You use the paired t-test when there is one ***interval variable*** and two ***nominal variables***. One of the nominal variables has only two values. The most common design is that one nominal variable represents different individuals, while the other is "before" and "after" some treatment. Sometimes the pairs are spatial rather than temporal, such as left vs. right, injured limb vs. uninjured limb, above a dam vs. below a dam, etc.

[Note: In forestry, an example might be comparing tree height (or other properties) on 10 pairs of spatially adjacent disturbed and undisturbed sites instead of just comparing 10 unpaired disturbed sites to 10 undisturbed sites]

An example would be the performance of undergraduates on a test of manual dexterity before and after drinking a cup of tea. For each student, there would be two observations, one before the tea and one after. Using a paired t-test has much more statistical power when the difference between groups is small relative to the variation within groups

Statistics and Measurements I (FOR 250)

t-Tests:Two-Sample Hypothesis Testing

1. The T-Test

The t-test assesses whether the means of two groups are *statistically* different from each other. This analysis is appropriate whenever you want to compare the means of two groups.

What does it mean to say that the averages for two groups are statistically different? Consider the three situations shown in Figure 2.

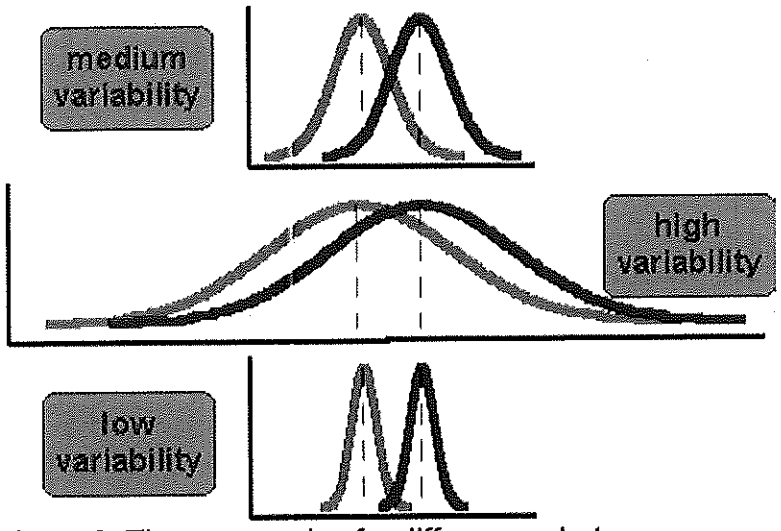


Figure 2. Three scenarios for differences between means.

The first thing to notice about the three situations is that ***the difference between the means is the same in all three***. But, you should also notice that the three situations don't look the same -- they tell very different stories. The top example shows a case with moderate variability of scores within each group. The second situation shows the high variability case. the third shows the case with low variability. Clearly, we would conclude that the two groups appear most different or distinct in the bottom or low-variability case. Why? Because there is relatively little overlap between the two bell-shaped curves. In the high variability case, the group difference appears least striking because the two bell-shaped distributions overlap so much. This leads us to a very important conclusion: when we are looking at the differences between scores for two groups, we have to judge the difference between their means relative to the spread or variability of their scores. The t-test does just this.

Andrew Emery
FOR 250-001
December 5th 2013

Discussion:

While there is a possibility for some deviation within the sample I believe that the tract has been fairly represented by the fixed plot cruise. The point sampling cruise method is too difficult to obtain quality sample expansion figures in a tract as diverse as Walnut Woods. Point sampling would work much better in an environment which is dominated by one to three species. That knowledge being know, I have used the fixed plot method figures for my recommendation.

Conclusion:

Given the information in the Results section I would give a recommendation to harvest the Walnut Woods tract. There are large quantities of very desirable timber there which could possibly become damaged if left. The highest yield would be met if the timber were to be harvested now, allowing younger trees with higher growth rates to populate the tract. I evaluate the stand to be well stocked and at maturity for the dominant species of Black Walnut. The site for Walnut Woods is of rich deep soil and lots of moisture, so rejuvenation of the site will not be an issue. My recommendation has been based on the monetary value taken from fixed plot cruise figures.

Andrew Emery
FOR 250-001
December 5th 2013

I divided the "Board-foot Volumes by 16-ft logs" table by the "Basal Area by 16-ft logs" table to get the "Board-foot Volume per sq ft of Basal area by 16-ft logs" table, (displayed below on the left).

BF Volume per sqft of Basal Area by 16ft log				
	1	2	3	4
10	26	37	40	0
12	37	55	67	71
14	45	70	87	96
16	52	83	107	122
18	57	93	122	140
20	62	103	136	159
22	66	112	148	175
24	69	118	158	185
26	72	124	168	200
28	74	129	175	208
30	77	134	183	218
32	79	139	191	230
34	80	142	196	236
36	82	146	203	245
38	83	149	208	251
40	85	152	183	236
44	0	164	0	0

BAF 10	# of Logs				
DBH	1	2	3	4	Sum
10	0	1	0	0	1
12	2	5	0	0	7
14	3	3	1	2	9
16	2	2	0	1	5
18	3	6	2	0	11
20	5	2	0	0	7
22	5	5	4	0	14
24	3	6	2	0	11
26	1	1	3	1	6
28	0	1	2	0	3
30	1	1	0	0	2
32	2	0	0	0	2
34	2	1	0	0	3
36	1	0	0	1	2
38	0	1	0	1	2
40	1	0	0	0	1
44	0	1	0	0	1
Sum	31	36	14	6	87

Using the "Board-foot Volume per square foot of Basal area by 16-ft logs" table and multiplying it by the table(located above on the right) displaying the number of logs per stem by DBH yields the Ratios of each DBH by number of stems with its associated BF volume per square foot of Basal Area by 16-ft log. Displayed below.

Ratios					
	1	2	3	4	Sum
10	0	37	0	0	37
12	74	274	0	0	348
14	135	210	87	193	625
16	103	166	0	122	391
18	170	557	243	0	970
20	309	206	0	0	516
22	330	559	594	0	1482
24	206	707	316	0	1229
26	72	124	504	200	900
28	0	129	351	0	480
30	77	134	0	0	211
32	158	0	0	0	158
34	161	142	0	0	302
36	82	0	0	245	327
38	0	149	0	251	399
40	85	0	0	0	85
44	0	164	0	0	164
			Sum of ratios		**8623**

The Sum of all the ratios in the above table is then used to calculate the Volume per acre. Volume per acre equals (sum of the ratios/no of trees)*Basal Area per acre. This produces the table below estimating the Volume at 6159 Board-foot per acre.

BA per Acre	Trees/ Acre	Vol per Acre
62	32	6159

Andrew Emery
FOR 250-001
December 5th 2013

Combined Stand and Stock Table		
DBH (in)	Tract Total	Trees/Acre
10	18.33	1.31
12	89.13	6.37
14	84.19	6.01
16	35.81	2.56
18	62.25	4.45
20	32.09	2.29
22	53.03	3.79
24	35.01	2.50
26	16.27	1.16
28	7.02	0.50
30	4.07	0.29
32	3.58	0.26
34	4.76	0.34
36	2.83	0.20
38	2.54	0.18
40	1.15	0.08
44	1.04	0.07
Total	453	32

The Basal Area per acre equals (total number of trees tallied/number of points)*BAF.

BA per Ac	Trees/ Acre
62	32

To Find the Volume with Point sampling I used the Volume/Basal-Area Ratios Approach. To do this you must have a table of "Board-foot Volumes by 16-ft logs" as well as a table of "Basal Area by 16-ft logs".

BF Volume per sq ft of basal area by 16 ft log (from Chart)				
DBH	1	2	3	4
10	14	20	22	
12	29	43	53	56
14	48	75	93	103
16	72	116	149	170
18	100	164	215	248
20	135	225	297	346
22	174	295	392	462
24	216	370	496	582
26	266	459	619	737
28	317	551	750	890
30	376	658	898	1069
32	441	776	1068	1283
34	506	894	1235	1487
36	581	1035	1434	1732
38	655	1170	1635	1975
40	740	1330	1594	2059
44		1731		

Basal Area by 16-ft Log				
	1	2	3	4
10	0.545	0.545	0.545	0.545
12	0.785	0.785	0.785	0.785
14	1.069	1.069	1.069	1.069
16	1.396	1.396	1.396	1.396
18	1.767	1.767	1.767	1.767
20	2.182	2.182	2.182	2.182
22	2.640	2.640	2.640	2.640
24	3.142	3.142	3.142	3.142
26	3.687	3.687	3.687	3.687
28	4.276	4.276	4.276	4.276
30	4.909	4.909	4.909	4.909
32	5.585	5.585	5.585	5.585
34	6.305	6.305	6.305	6.305
36	7.068	7.068	7.068	7.068
38	7.876	7.876	7.876	7.876
40	8.726	8.726	8.726	8.726
44	10.559	10.559	10.559	10.559

Andrew Emery
FOR 250-001
December 5th 2013

Tract Value by Species by Grade				
	G1	G2	G3	Sum
BW	$13,899	$11,151	$2,888	**$27,938**
AE	$0	$449	$20	**$469**
HB	$113	$17	$122	**$252**
KCT	$0	$752	$0	**$752**
YP	$7,310	$1,134	$131	**$8,576**
BC	$0	$0	$85	**$85**
BSW	$0	$44	$653	**$697**
RO	$3,618	$0	$0	**$3,618**
H	$0	$0	$58	**$58**
SM	$238	$0	$0	**$238**
WA	$3,891	$0	$0	**$3,891**
	$29,069	**$13,548**	**$3,957**	**$46,574**

The table shows that the Grade 1 logs have clearly yielded far more profit than the Grade 2 or 3 logs. Also to note is that Black Walnut was less than 50 percent of the total Board-foot volume, but was nearly 60 percent of the total monetary value of the stand.

In Point sampling the figures do not seem to represent the tract as accurately.

BAF 10	# of Logs				
DBH	1	2	3	4	**Sum**
10	0	1	0	0	**1**
12	2	5	0	0	**7**
14	3	3	1	2	**9**
16	2	2	0	1	**5**
18	3	6	2	0	**11**
20	5	2	0	0	**7**
22	5	5	4	0	**14**
24	3	6	2	0	**11**
26	1	1	3	1	**6**
28	0	1	2	0	**3**
30	1	1	0	0	**2**
32	2	0	0	0	**2**
34	2	1	0	0	**3**
36	1	0	0	1	**2**
38	0	1	0	1	**2**
40	1	0	0	0	**1**
44	0	1	0	0	**1**
Sum	**31**	**36**	**14**	**6**	**87**

The Table above shows the distribution of stems by DBH and number of logs per stem, with a total of 87 stems in the sample. This information is used to make the Stand and Stock Table for Walnut Woods located below. Each DBH class is calculated an area per stem. The BAF (10) divided by that DBHs area per stem equals the number of trees per acre represented by each stem for that respective DBH. Trees per acre equals number of trees tallied for DBH class times DBH class per-acre conversion factor all divided by the total number of points.

Andrew Emery
FOR 250-001
December 5th 2013

This cruise summary shows that Black Walnut is undoubtedly the dominant species in tract at 49.73% of volume and Yellow-Poplar a distant co-dominate with 19.16% of total volume. The next several charts show the distribution of volume by grade for each species, and the number of logs per species by grade.

#Logs per Species by Grade			
	G1	G2	G3
BW	12.5	25	13
AE	0	2	1.5
HB	2	1	6.5
KCT	0	6	0
YP	13.5	12.5	2
BC	0	0	2
BSW	0	1	6.5
RO	3.5	0	0
H	0	0	1
SM	1.5	0	0
WA	2.5	0	0

Tract BF by Species by Grade				
	G1	G2	G3	Sum
BW	29260	26239	13557	69055
AE	0	5100	225	5325
HB	1289	189	1387	2864
KCT	0	8550	0	8550
YP	21189	4767	656	26611
BC	0	0	478	478
BSW	0	504	7420	7924
RO	9522	0	0	9522
H	0	0	309	309
SM	496	0	0	496
WA	7735	0	0	7735
				138870

All the Board-foot volumes are calculated using the Doyle scale. The timber values are based on the Tennessee Forest Products Bulletin with all species that are not Black Walnut, Yellow-Poplar, Black Cherry, Red Oak, Hickory, Sugar Maple, or White Ash being priced as mixed hardwoods. These prices are per 1000BF.

Value by Species by Grade according to the Tennessee Forest Products Bulletin			
	G1	G2	G3
BW	475	425	213
AE	88	88	88
HB	88	88	88
KCT	88	88	88
YP	345	238	200
BC	238	225	178
BSW	88	88	88
RO	380	270	228
H	338	225	188
SM	480	300	213
WA	503	313	213

Taking the "Tract BF by Species by Grade" table and dividing it by 1000 to make the units compatible for the "Value by Species by Grade according to the Tennessee Forest Products Bulletin" table. Then the two table can be multiplied together to give the value by species by grade in dollar units. The value of the Walnut Woods tract is $46,574 and breaks down as follows in the table below:

100

Andrew Emery
FOR 250-001
December 5th 2013

Final Project FOR 250-001

Walnut Woods Timber Inventory

Introduction:

This recommendation is for a plot located on the South side of the University of Kentucky's campus in the arboretum. The specific location of the plot is Walnut Woods, which is a 15 acre tract with mixed hardwood species. A timber cruise is used to estimate the total amount of timber in a given tract. This is done by measuring tree heights, diameter, and species. In this tract the estimations were calculated using two separate cruise methods, the fixed plot cruise and the point cruise methods.

Methods and Procedures for fixed plots cruise:

For a fixed plot cruise each tree will have an equal opportunity to be selected. The sampling intensity will be based on budget limitations, the value of the timber in the stand, and the variability with in the stand. In the Walnut Woods tract a 9% sample was conducted, with 1/10th acre plots. Therefore 9% of 15 acres is 1.35 acres. Placing this in the equation: area sampled/plot area= number of plots, yields 1.35/.1= 13.5 which gets rounded up to 14 plots. These 14 plots each represent 1.07 acres in the total tract. Each of the plots were assigned according to a grid with random placement pertaining to site conditions and locations.

Methods and Procedures for point cruise:

In a point cruise the trees will be sampled in proportion to their respective basal area. This gives larger trees a higher probability of being sampled. The basal area factor is determined by which factor will yield between 5 and 12 trees per sample point. In Walnut Woods the basal area factor used was 10. Therefore every tree which was sampled using this method counts for a basal area of $10ft^2$. For a tract 15 acres in size, each acre is represented by one plot. These 15 plots were assigned according to a grid with random placement pertaining to site conditions and locations.

Results:

The fixed plot method sample was expanded to the following Cruise Summary:

Species	Sawtimber Trees	Total BF volume	Average BF/Tree	BF / Acre	Average DBH	Average MHT	% total Volume
BW	300	69054.44	230.18	4603.63	19.3	1.87	49.73%
AE	22	5325.00	239.63	355	18.5	1.75	3.83%
HB	89	2864.44	32.23	190.963	10.5	1.19	2.06%
KCT	33	8550.00	256.50	570	27.5	2.00	6.16%
YP	111	26611.11	239.50	1774.074	17.5	2.80	19.16%
BC	11	477.78	43.00	31.85185	12.0	2.00	0.34%
BSW	44	7924.00	178.29	528.2667	17.8	1.88	5.71%
RO	11	9522.22	857.00	634.8148	29.0	3.50	6.86%
H	11	309.33	27.84	20.62222	12.0	1.00	0.22%
SM	11	496.00	44.64	33.06667	13.0	1.50	0.36%
WA	11	7735.00	696.15	515.6667	29.0	2.50	5.57%
	656	138869.33	211.83	9257.956			100.00%

Hello,

I am the SIR area expert for the UKCEC. I am currently reviewing your course, FOR 250 and I have a couple of comments/questions.

Your course overall looks like it will be a good addition to SIR courses. It looks like it has a nice mix of conceptual and practical focus in statistical and inferential reasoning. Here are my questions and comments:

1. Could you please provide samples of assessable artifacts that will demonstrate the use and worth of statistical inference for making everyday decisions per the SIR rubric?
2. Could you also provide sample assignments that demonstrate evidence of evaluating common claims arising from formal statistical evidence through margins or error and confidence intervals, hypothesis testing, and evaluation of common claims that arise from statistical constructs (the first three sections of the SIR course review form)?
3. I took a look through the tentative course schedule and mapped it to the SIR topic distribution for
    a. estimation (confidence intervals and margin of error),
    b. statistical testing (hypothesis testing),
    c. describing data (statistical constructs),
    d. and information literacy and found that 5 class

and found 5 classes map to part a (11%), 3 classes to part b (7%), and 6 classes to part c (13%). The SIR guidelines request 25%, 25%, 20%, and 5%, respectively. As I am a statistician, and not a forestry expert, I realize that I could certainly be missing references to these areas in your tentative schedule simply because I am not familiar with the terminology. Also, I do want to mention that these are guidelines, and we certainly do not need to devote exactly the requested amount of time to those areas of the SIR template, we should strive to be close. I personally know that this can be a difficult task as I have now implemented a SIR revision to two current courses. (STA 296 and STA 381).

To review from course designer:

Thank you for your patience and your kind suggestions. I hope the package I return now meets with approval. I have rearranged and revised the curriculum of the course to better meet the core criteria. I have updated the application form also. The assessable artifact (the timber cruise) will be more statistic laden under the revised course.

Some background that may be of interest...
The Forestry program historically required two separate courses (1 to cover forest mensuration and 1 to cover general statistics). Since the 2 topics are intimately related, we combined them to reduce total credit hours required by our graduates. We are now increasing the credit hours of this course from 3 to 4 to more fully cover the statistical component for all majors. Having statistical instruction hosted within a forestry course, we feel our students receive a better understanding of using statistics in forestry. Additionally, the nature of this topic requires a laboratory component which not only gives them hands-on experience but allows them to use the data they personally collect for statistical analysis. In this expanded course, we propose to set aside every Friday for statistical instruction and to establish the relationship of how forest mensuration is built on these concepts. We hope this

appreciation of the skill and ownership will translate to any major who chooses to take this course to satisfy their core requirements.

From reviewer to course designer:

From reading the student assignment I have two thoughts:

1. This assignment does not seem to address variability or uncertainty, which is a key component in the rubric used to assess SIR courses. It seems that the student uses a sampling method to sample trees, but seems confident that there is very little variability when generalizing to the population.

I attached the rubric. Perhaps another assignment would be better suited for the artifact? I will say that you may have intended this assignment to address only one row of the rubric, which is completely acceptable, as long as you have other assignments that will address the other rows of the rubric (they will need to be designated as well, but not necessarily right now. It will happen during the semesters when the course is taught). If this is the case, what row did you intend and do you have assignments that will address an understanding of variability?

2. The assignment is quite long and may be difficult to assess for those outside of FOR due to its length and the fact that it is not a typical statistics-type course. This may sound strange to you, but almost all of the people who have been assessing the SIR artifacts thus far have been from the STA department. Other than that, the more that I read, the more that I really liked the course and I think that it will make a very good addition to the SIR courses.

From Course designer to reviewer:

To clarify, students are asked to carry out 2 different sampling systems of the same area – one area based and one tree size based. They will encounter over a dozen species of trees of varying sizes and quality. I would space non-forestry majors with a crew who can identify the trees for them. We then compare the 2 sampling systems for ease of use, quality of results and real-world utility. The results from these cruises determine selling price of standing timber tracts and thus need to be as accurate as possible with the realm of practicality.

This exercise illustrates the inherent large variability of natural systems. We also spend lectures discussing how to get adequate sample numbers to obtain significance through presampling and stratification. Then we test our attained sample quality after the exercise and discuss what we found and ways to improve our confidence levels.

I feel the timber cruise project along with other assignments addresses the rubric to at least the meets expectations level.