

Kenneth H Pollock Spring 2008

Design of Ecological Field Studies

Final Take Home Exam-Time Allowed 2 weeks –Due April 30, 2008

1. (30 pts) A few very short answer questions.
 - A) What are the 2 absolutely crucial elements that are essential for a study to be a true experiment as defined in this class?
 - B) So who was this R. A. Fisher person and why is he relevant to our class?
 - C) What is hidden replication in a factorial treatment design and why is it important?
 - D) Is retrospective power analysis a valid approach according to my close colleague John Hoenig?
 - E) I spent a lot of time discussing sampling designs but then Tom Wentworth said there is a whole new class of studies that should be considered with very different approaches that I didn't even mention. What sort of studies are these?
 - F) What is publication bias in a meta-analysis and how does it relate to research bias?
 - G) Consider an analysis of covariance. First can you tell me why researchers might use it if they have a true experimental situation and then if they cannot randomize their treatments to their experimental units?
 - H) Second can you present the model equation and the key assumptions behind the analysis?
 - I) What is the difference between optimal and proportional allocation in stratified random sampling?
 - J) When might adaptive sampling give you precision gains over simpler sampling designs?

2. (20pts) In true experiments one design that is commonly used is a randomized complete block design. (a) Can you show me the analysis of variance table structure (not equations) with numerical df if you have 7 treatments in 4 blocks when it is a randomized complete block design? Further can you also give me the

analysis of variance table for a completely random design when you have 4 replicates of each of 7 treatments? (b) Can you tell me why researchers should use blocking factors if possible using the material in (a) to help you? (c) If there is no need for the blocking factor can you tell me one reason why the completely random design is slightly better. (Hint this aspect becomes more important if there only a small number of treatments and a small number of replicates).

3. (25pts) If one has some large scale environmental impact then experiments are very hard to do. There are several designs that are possible here. Ideally one should use a Before-After-Control-Impact design with true replication. Sometimes it is not possible to use the BACI design and a matched pairs design on control and impacted plots after the impact is used. Discuss the features of this design and its strengths and weaknesses compared to the BACI design. Give an example of where this approach might have to be used (~2 typed pages).
4. (25 pts) If you had the time in your uneventful life (☺) please indicate a meta-analysis that you would like to carry out as a research project and why it would be interesting. Also indicate some of the important problems you would face in doing accomplishing a valid meta-analysis (~2-3 typed pages).