Note: this outline is for last year, there will be changes to the exercise list for this fall.

Course Outline
Geography 472

FIELD MAPPING

Instructor: Ev Wingert, PSB 312A, 956-7672, evw@aloha.net

Place: The class will meet **promptly** at 8:30 AM Saturday mornings in PSB 310 unless prior arrangements have been made. The Saturday sessions will be mostly conducted off campus, after an on-campus introduction, and will vary in length depending upon the student's field efficiency. It is not uncommon to be in the field until 4 to 5 PM, but on other occasions, field work may be done by noon, leaving time for afternoon data analysis and plotting! There will be no formal work back in the lab after field time, but it is useful for teams to get together after field time to clean and check equipment, exchange data, and make plans for plotting during the week. There will be no formal time scheduled in the week, but it will probably be necessary for teams to meet sometime during the week and work out materials that will need to be turned in the following week.

Course Synopsis: Field Mapping is the practice of collecting primary data in a field setting for the express purpose of mapping or updating the information about a site. By mapping a site [miniaturizing it] it is possible to study and measure it in a context some distance from the field. People have been mapping from primary data almost from the beginning of cartography around 6000BP. Early mapping developed an elementary body of geometric techniques which, over the years, grew and evolved into the more specialized fields of surveying, photogrammetry and the other engineering-oriented technical fields that are now disciplines in their own right. However, many of the original techniques remain useful and are still appropriate for many applications today. For example, the first method to be explored in this class, compass and pacing, existed in the 9th and 10th centuries. Plane table mapping was used extensively by George Washington and Thomas Jefferson, Surveyors, and in almost all topographic mapping before 1955. And plane table mapping is still the best method for many types of very large scale archeological and other types of site mapping.

New techniques are continuously becoming available. Global Positioning Systems will totally change how we map many subjects in the next 5 years or less, but the method will not have the same impact on the field of legal and resource mapping. GPS is inherently a low precision mapping or positioning system however, high resolution systems are now
available. The high resolution systems that are appropriate for legal and control work cost nearly a $10,000 compared to other “resource and recreational grade” GPS units ranging from $90 to $3000, which will price its application out of all but the most demanding markets. However, there are methods to increase GPS accuracy of the lower cost equipment, but the methods also slow the data acquisition rate. There are some situations where low precision GPS is much better than anything we have now. However, in dense vegetation and rugged terrain it simply will not work.

As many of the early but relatively low-tech methods were superseded by better equipment and higher degrees of technology, specialized fields grew, and much higher levels of precision became possible, but at a price. A commonly accepted tenet of all mapping is that we always take pains to make the most accurate maps possible. However, there is also a conflicting tenet: a lower accuracy map, carefully done, is always better than no map. While it is highly desirable to survey the trail from Haleakala Crater to Seven Pools with the best electronic surveying equipment available, one is just as likely to reach the destination with a carefully prepared sketch map.

The distinction between a surveyed map and field mapped data is usually clear but there are many cases when a map compiled from low precision methods is used inappropriately, far beyond its accuracy intent, causing poor decisions and/or legal liability situations to arise. The person using any map must be cognizant of how a map was made and the limits to its confidence.

Cost is a constant factor. To hire a licensed surveying team to survey the Kaupo Gap trail will cost several thousands of dollars, while compass and pacing might be done by a careful individual on a pleasure hike. Which is better, more accurate, more expeditious, more useful, more cost-effective? There are very few, if any, hard and fast answers or rules of procedure when it comes to mapping from field data. One always does the most careful and consistent work possible within the technological limits imposed by equipment available. One always produces maps that reflect, not exaggerate, the characteristics of the data used to make the map.

Objectives: This course will attempt to accomplish several principle objectives. First, it will expose the student to a range of useful technologies and methods for mapping at large scales. Associated with each exercise will be abundant opportunities for monitoring the accuracy that will result from a range of different precision equipment. It is expected that the student will be constantly monitoring the accuracy potential of equipment and method and be drawing conclusions about situations where the method represents a good match to the problem at hand or just not adequate.
Second, in field situations we will be paying close attention to the subject of our mapping, as it relates to technique which is a major difference between legal surveying and field mapping. When we are mapping a vegetation 'boundary', its precision is limited by the nature of the boundary. It makes no sense to map a boundary that grades between two plant species groups over 10 meters, with an instrument that has a potential precision of 2 centimeters. However, it is necessary to map that boundary with a method that has a consistent error factor so that the mapped boundary line falls within the transition zone.

A goal of all mapping is to allow patterns to be analyzed and developing a map of patterns requires quite different methods than mapping boundaries or other linear features. A principle goal of the course to match method and its associated precision to the type of phenomena being mapping. The student should be constantly thinking about the economical match of method and topic within the constraints of accuracy needed.

The third aspect of the course is almost a side effect, but important to all cartographers and those who conduct fieldwork. I never really understood scale and generalization before I started to map in the field. These central aspects of all mapping give the concepts of accuracy and precision meaning in a very real analytical sense, and may be the most important outcome of this course for many.

In summary, this course is designed to link the often abstract concepts embedded in maps to the real world. It will give the student a practical sense of how maps for many different purposes can be made. And it will provide an understanding of the confidence that can be ascribed to the maps that field scientists use, and often rely on with a misdirected sense of accuracy.

Readings: At the present there is no single affordable introductory field mapping text to supplement what I think is necessary lecture and field material. Therefore, selections from a few texts will be available on occasion and will be placed on reserve in PSB 310. I view the readings as supplementary and can be consulted when you need more information about a technique or method.

Required Materials: (all available in the University bookstore)

1. Waterproof field notebook.
2. At least one High Density 3.5 inch floppy disk for backup of data.
3. Hand calculator with trigonometric functions.
Recommended Materials:

4. Daypack or map bag.
5. Hand compass with sighting line and declination adjustment. (We will supply field compasses for all class members if you do not have your own. But if you anticipate future field work involving a good compass, it is better to develop experience on your own unit. However, you might want to consult with me before spending a lot of money on a less than totally satisfactory model.)
6. Clipboard, masking tape, large zip-lock plastic bags for waterproofing lunches, cameras, spare clothes, etc.

Highly Recommended Supplies:

7. Shoes and clothes that you don’t mind getting muddy. There will be times when slippers will be inadequate (or at least very uncomfortable) footwear.
8. Canteen or water bottle!!!
9. Light rain gear or a good poncho! (Unfortunately because of the short time available for class meetings, we will work outside in all weather conditions that will not damage the instruments.
10. Hat or some headgear to protect you from the tropical sun.
11. A small collection of the usual first aid gear, lots of Band-Aids, aspirin, chocolate, snacks, etc. as your personal needs dictate.

COURSE OUTLINE

NOTE: The sites that are used as subjects for the field labs are quite fluid and may change or remain yet to be established as this outline is written [????]. In every case possible, you will receive the exercise handout a week in advance. The handout will incorporate information on methodology and the actual field conditions at the site so that
you can prepare for contingencies such as clothing, shoes, rain gear, and food. In all cases if you miss the handout or I am late getting one out, please plan for the worst condition. Eg. Bring food, water, and good shoes!

UNIT A - Reconnaissance Survey

1st week: [August 26] COMPASS AND PACING - pace calibration, closed traverse, basic compass use, plotting. CAMPUS* or ** (ASTERISKS INDICATE THE NUMBER OF PEOPLE IN A TEAM FOR EXERCISES)
   Reading: Rutstrum 1-11.

2nd week: [Sept 2] COMPASS AND TAPING - distance taping, planimetric traverse, compass use, AutoCad plotting, scales. LYON ARBORETUM***
   Reading: Brinker 148-170.

3rd week: [Sept 9] SITE MAPPING - compass intersection, notes, baselines, traverse. ULUPO HEIAU GROUNDS***

UNIT B - Plane Table Mapping

4th week: [Sept 16] BASIC PLANE TABLE 1 - plane table, alidade, tape, range poles, leveling rods. CAMPUS***
   Reading: Brinker 306-320.

5th week: [Sept 23] BASIC PLANE TABLE 2 - plane table, alidade, tape, range poles, leveling rods. CAMPUS***

6th week: [Sept 30] PLANE TABLE SITE MAPPING - plane table, stadia rods, radiation, sketching. Makiki Nature Center***

7th week: [Oct 7] PLANE TABLE SITE MAPPING - continued.

UNIT C - GPS MAPPING

8th week: [Oct 14] RESOURCE GRADE GPS FOR DATA PLOTTING - Compilation, data
downloading, plotting data, accuracy evaluation. (?????)
Reading: Van Sickle, pp 61-84, 43-55.

9th week: [Oct 21] DEVELOPING CONTROL POINTS - Survey grade GPS, data downloading, differential processing, data accuracy. CAMPUS***

------------------------------------- UNIT D - TOTAL STATION WORK -------------------------------------

10th week: [Oct 28] MID-TERM EXAMINATION [Take Home] and BASIC THEODOLITE SURVEY - theodolite, prism rod, closed traverse. CAMPUS***
Reading: Brinker 173-207.

11th week: [Nov 4] BASIC THEODOLITE SURVEY - theodolite, prism rod. CAMPUS***

12th week: [Nov 11] TOTAL STATIONS - total station setups, leveling rod, adjustment, plotting. ARBORETUM***

13th week [Nov 25] Thanksgiving weekend holiday

14th week: [Dec 2] TOPOGRAPHIC MAPPING - total station setups, triangulation. HAKIPU‘U***

------------------------------------- FINAL FIELD PROBLEM AND EXAM -------------------------------------

15th week: [Dec 9] FINAL FIELD PROBLEM - map accuracy

FINAL EXAMINATION - PSB 310 (date and time to be arranged)

NOTE: This list of field exercises will probably be modified as the course progresses. As interesting problems are encountered and weather problems arise during the semester, labs may be substituted or extended. It is quite common for requests for mapping help to come in during the semester. If they represent useful tasks in expanding equipment and methodological skill, I may substitute these for the planned labs. A couple of courses ago, we worked on a job, mapping a fishpond in Kaneohe that is being restored. Three years ago we were asked to do a topographic map of a site at the 5000 foot level of Mauna Loa on the Big Island. Class members
have also participated in topographic mapping for State Parks on the NaPali Coast on Kauai. We have also had a request to map the botanical gardens in the Waimea Valley and have been working on Kahana Valley State Park mapping. If anyone knows of other interesting projects that might profit from our help be sure to talk to me about it.

July 30, 2007