

**GEOLOGY 450
FIELD GEOLOGY
FALL SEMESTER, 2012**

****subject to change****

Time: Mondays, 5:00 - 5:50 p.m.
Location: Stevens Hall 134
Instructor: B. Saini-Eidukat, office 127 Stevens Hall, ext. 1-8785
email: bernhardt.saini-eidukat@ndsu.edu
Office hours: Tuesdays, 2:00 - 4:00 p.m.
Web Site: www.ndsu.edu/pubweb/~sainieid/field/
Semester Hours: 3

Course Schedule and Costs:

1. **Class Meetings NSDU:**
NDSU class meetings Aug XX and XX: Mondays, 5:00- 5:50 p.m., Stevens Hall 134.

2. **Class Meeting Dickenson:** We will meet at the NDSU Dickinson Research Center at 11:00 (CST) on Saturday, Sept 1 (see map). This will mean departing Fargo at 7:00 a.m. or earlier. We will be camping at the NDSU Dickinson Science Center (formerly Experiment Station) and we will have access to showers and lab space in the evenings. The director of the station is Dr. Kris Ringwall. We will return to Fargo late in the evening on Friday, September 7. You will have 6.5 days to complete the mapping of an 8 square mile area of rugged, badlands terrain. You need to be fit and to be well-equipped for long days in the field. We will depart for the field each morning by 7:30 a.m. after breakfast and will return at 6:30 p.m. in the evening. You will need to be prepared for any type of weather. Previous groups have experienced all types of weather from 100 degree days to freezing temperatures and snow. We will resupply with provisions at a store every evening. You will be able to cook your own meals at the camp site if you so wish or you will be able to eat out in Dickinson although the choices are limited. After dinner, we will catch up on notes and start drafting the report.

3. **Course Fee:** \$XX estimated (covers camping fee, guidebook, field supplies) to be paid to Mrs. Phyllis Murray, Stevens Hall 218, by Friday, Aug XX.

Class Meeting Topics:

August 20 - Logistics; stratigraphy and paleoenvironments

Aug 27 - Structural Geology

Course Grading:

Abstract, Introduction, Methods, Previous studies (5)

Descriptive stratigraphy (10)

Sedimentological interpretation (20)

Description of structures and structural interpretation (30)

Summary and Conclusions (5)

Use and comprehension of references (5)

Use of English and geological terminology (5)

COMMENTS ON THE GEOLOGICAL MAP

Accuracy of representation of geology (15)

COMMENTS ON THE GEOLOGICAL SECTION

Representation of geology (5)

All illustrations used in the report (photographic images, drafted geological sections, maps, conceptual diagrams) should be labeled as figures and referred to in the text. Remember to provide a caption for each figure. Remember to cite references using standardized journal protocols e.g. GEOLOGY. Remember to show all measurements in metric units (English units in parentheses) and to use accepted abbreviations.

Students are encouraged to go through revisions of each chapter with the instructor. They then submit a full version of the report and it is marked up and an estimated letter grade awarded. Students then have the option of making revisions, both to the geological analysis and the English usage, and resubmitting for a final grade.

Special Needs:

Any students with disabilities or other special needs who need special accommodations in this course, are invited to share these concerns with the instructor as soon as possible.

Academic Responsibility:

All work in this course must be completed in a manner consistent with NDSU University Senate Policy, section 335: Code of Academic Responsibility and Conduct (<http://www.ndsu.edu/policy/335.htm>).

Intended Student Outcomes:

- Demonstrate your knowledge of Earth materials and processes
- Use geological techniques and instruments to gather geologic data
- Communicate effectively within the discipline of geology: Present your understanding of the geologic history of the study area in a written report format accompanied by a standard geologic map and cross section
- Integrate geologic knowledge, skills and the scientific method

FIELD GEOLOGY 450 REPORT

Useful information on how to prepare various sections of the report can be found under several links at:

<http://www.ndsu.edu/pubweb/~ashworth/webpages/g450/lb/>

The final report must be well written, well produced, and submitted on time if it is to be accepted for grade. All measurements should be stated in the metric system. The report should include: 1) a concise interpretation of the geology of the study area, 2) a map showing the distribution of stratigraphic units and structures, and 3) geologic cross-sections to support interpretation.

1. WRITTEN REPORT consisting of the following sections:

ABSTRACT A 100 word (single paragraph) summary of your interpretation of the geology of the Little Badlands.

INTRODUCTION Include the scope and purpose of the study, exact location (latitude, longitude) and legal description of the study area (township, range, section #s, names of U.S.G.S. 7.5 minute quadrangle), and descriptions of the topography, drainage, vegetation, and land use in the Little Badlands area. Your description should be accompanied by a fully- labeled map, showing major physiographic features and the location of the study area to various settlements in the area.

METHODS Describe the methods that were used in the study. These were plotting geological boundaries and structures on aerial photographs (scale 1:7200), measuring sections using a Jacob staff and Brunton compass, measuring the strike and dip of beds, joints, faults, cross-beds and pebble orientations using a Brunton compass, assigning colors with a Munsell Soil Color Chart, and surveying a geological section using a Sokkia Total Station.

PREVIOUS STUDIES Summarize previous studies that have been made in the region. The minimum this summary should include is reference to the earliest

and most recent studies. One of the main purposes of this section is to introduce the different hypotheses that exist to explain the geology of the region.

STRATIGRAPHY Describe the general relationships of the stratigraphic units in the area to the regional setting in the Williston Basin. A composite stratigraphic column, surveyed geologic cross-section, a geological map, and reference sections should be referred to in the report. Starting with the oldest stratigraphic unit, describe the thickness, lithological variation, weathering characteristics, dominant colors, sedimentary structures, mineral and fossil content of the major stratigraphic units, including the Quaternary units. Photographs of the stratigraphic units should be used to illustrate this section. Refer to measured reference sections in an Appendix.

SEDIMENTOLOGICAL AND EROSIONAL HISTORY Based on your observations infer the sedimentological and erosional processes that have occurred in the area from the time of the deposition of the first unit to the present day. Support your discussion with reference to a geological cross-section, geological map, rose diagrams of cross-bedding and pebble imbrication, pebble analyses, and grain size/ velocity diagrams. Remember to discuss location and geology of possible source areas, mode of deposition, flow velocities, etc. Integrate your discussion with reference to information from the literature. Photographs of sedimentological structures should be included to help support your discussion.

STRUCTURE Describe in detail the types of structures observed in the field (faults, joints, folds, slump blocks, unconformities). Remember to discuss the evidence for the age of the structures. Use photographs, stereographic projections, a geological cross-section based on your map, and the surveyed geological cross-section to illustrate your answer. Remember to refer to your map.

STRUCTURAL INTERPRETATION. Introduce the different interpretations that have been proposed to explain the structures of the Little Badlands. area. Discuss the merits of each of the hypotheses in terms of your own observations integrated with information from the literature (including subsurface information). Remember to use stereographic projections and other diagrams to help support your interpretation.

CONCLUSIONS AND FURTHER RESEARCH Summarize your results and suggest further research that would enable you to strengthen your interpretation.

REFERENCES List in alphabetical order by author the articles used in the preparation of the report. Use the style of the Geological Society of America publications.

APPENDICES Describe at least one detailed reference section for each stratigraphic unit. Depths and thicknesses of beds must be included ([see example of a reference section](#))

2. GEOLOGIC MAP A computer-drafted, colored geological map prepared from observations on aerial photographs is a necessary part of the report. On the map identify, section lines and numbers, roads, tracks, drainage paths, distinctive patches of vegetation e.g. woodland. Show on the map, all major stratigraphic boundaries and structures. Use U.S.G.S. or standard geological symbols to show dip and strike of beds and structures. Remember not to clutter the map with unnecessary detail.

Boundaries should be shown with a solid line where observed and with a dashed line where inferred. Geological units are to be shown in colors applied lightly. The following information must be included on the map: a) a fully labeled legend with explanations of units and symbols. b) a concise title including subject and location, including the legal description, county and state. c) author's name. d) scale, in metric and English units. e) elevational data. f) arrows showing true and magnetic north g) lines of cross-sections

3. GEOLOGICAL CROSS-SECTION

Computer drafted and colored geological cross-sections are required. One of these should be based on your map and the other on the section you surveyed using the Total Station. The sections should be referenced by lines on the map. The following information should be included: a) a fully labeled legend (explain all units and use only conventional symbols for displaying rock types. b) the colors of the lithostratigraphic units must be the same as those used on the map. c) a concise title stating line of section, area, county, state. d) scale both vertical and horizontal. Include both visual and numerical scale. e) location of section lines, major drainage channels, roads, etc. g) compass directions of the end points of the section (N, NE, NNE, etc.). h) correlation lines between stratigraphic units.

GENERAL REFERENCES USEFUL IN PRODUCTION OF GEOLOGICAL MAPS AND SECTIONS

General references for field geology useful for the descriptions of various types of surveys, standard map and lithological symbols, etc.:

- AGI Data Sheets Third Edition. (Compiled by Dutro, J.T., Jr., Dietrich, R.V., and Foose, R.M., 1989)
- Barnes, J.W. 1981. Basic Geological Mapping: 1-112. Geological Society of London Handbook, The Open University Press and Halsted Press.
- Compton, R. R. 1962. Manual of Field Geology: 1-378. John Wiley and Sons, Inc.
- Gardiner, V. and Dackombe, R. 1983. Geomorphological Field Manual: 1-254. Allen and Unwin.

Kottowski, F.E. 1965. Measuring Stratigraphic Sections: 1-253. Holt, Rhinehart, and Winston.

Tucker, M. E. 1982. The Field Description of Sedimentary Rocks: 1-112. Geological Society of London Handbook, The Open University Press and Halsted Press.