

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY  
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: WATERSHED MANAGEMENT

Code No.: FOR 318-4

Program: FISH & WILDLIFE/PARKS & RECREATION/WATER RESOURCES TY

Semester:           V                          V                          IV                          .

Date: SEPTEMBER 1987

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New: \_\_\_\_\_ Revision: X

APPROVED: *[Signature]*  
Chairperson

Jan-27/87  
Date



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Course Name

Course Number

PHILOSOPHY/GOALS:

A practical course designed for field personnel to provide information on water management and methods to assist in minimizing erosion and sedimentation on land undergoing development.

METHOD OF ASSESSMENT (GRADING METHOD)

Unit Tests (3) 50%

Assignments (4) 50%

A total of three unit tests based on lecture material will be written at the completion of units 2, 4 and 7 and, will account for 50% of the course work.

A series of six assignments will be handed in, valued at 50%. All assignments must be handed in to pass the course though marks for only the best 5 will be calculated in the final grade.

Reports are due two weeks after assigned; a total of 10% will be deducted for every day late. Reports submitted after 1 week after the due date will receive 0.

Marks are cumulative and 60% is considered a pass. If a final grade of less than 60% is received, a test based on the entire course material will be written during the rewrite period.

TEXTBOOK(S):

Stream Enhancement Guide, 1980, Fisheries and Oceans and Ministry of the Environment, Province of British Columbia

Suggested:

Great Lakes Shore Processes and Shore Protection, 1981, Ontario Ministry of Natural Resources

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UNIT #1 Important Physical Properties of Water Affecting Management

- density relationships
- thermal and oxygen stratification
- zonation of lakes and productivity
- wind action, waves and seiches
- temperate streams
- river meanders and particle movement

**Assignment 1 - Lake Productivity**

UNIT #2 Control of Runoff in Watersheds

- basic run-off equation
- control of run-off by vegetation and proper management practices
- role of natural and artificial impoundments, reservoirs and ponds
- construction of impoundments and ponds for private watersheds

**Assignment 2 - Role of Beavers in Watersheds**

**UNIT TEST #1**

UNIT #3 The Aquatic Community and its Habitat

- invertebrates and key vertebrates and their biological requirements to survive
- biological indicator species

**Assignment 3 - Biological indicators (W. Davignon Creek)**

UNIT #4 - Shore Processes and Shore Protection

- shore features and processes
- shore protection; criteria and guidelines
- legalities of shore protection devices

**Assignment 4 - Report on Shore Processes and Shoreline Protection Measures**

**UNIT TEST 2**

UNIT #5 - Forestry Practices and Watershed Management

- types of logging practices
- effects of logging on aquatic environments
- proper logging practices to minimize damage
- construction of resource roads, stream crossings, and culvert installation

**Assignment 5 - Application of the Principles of Forest Harvesting and Road Construction to Minimize Environmental Damage**

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UNIT #6 Stream Improvement Measures

- problem situations in streams
- erosion control
- streamside improvements
- stream channel improvements
- stream flow control

**Assignment 6 - Stream Enhancement Planning**

UNIT #7 Water Pollution Concerns (if time permits)

All field trips are compulsory. Students missing field trips without documentation will receive an automatic 0 for the corresponding technical report.

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GRADING

< 60%.....	R
60 - 69%.....	C
70 - 79%.....	B
80%.....	A

TECHNICAL REPORT FORMAT

Technical reports will be brief and concise and complete with diagrams/figures and tables wherever possible. Figures will be neat, labelled by hand - lettering and done entirely in black ink.

Length of report will be a maximum of 4 pages (not including title page and reference list) and will be typed or neatly printed.

Technical reports will include:

1. title page
2. abstract/summary
3. introduction
4. procedure
5. results
6. calculations (if applicable)
7. discussion and conclusion
8. appendices (if applicable)
9. reference list using the author - year system  
(see reference list in this handout)

N.B. FOOTNOTES ARE NOT ACCEPTABLE IN SCIENTIFIC TECHNICAL REPORTS

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SCIENTIFIC REPORT WRITING

General

- type on standard sized typing paper
- leave margins at least 1" at each side for instructor's comments
- double space
- be brief and concise
- underline all scientific names
- verify all literature citations, do not use quotes or footnotes
- do not use I, me, you, we, our, etc.

All reports should include the following components:

1. Title - brief but specific, denoting contents of paper
2. Abstract - a very brief description of the study, important findings and conclusions (in some reports a Summary may be placed at the end of the report instead)
3. Introduction - justification, intent of the study (WHY?)
  - related studies may be included
  - a description of the study area and time of the study
  - a figure denoting the location of the study area should be included and cited eg. "The study area consists of two 100-meter stretches of the West Davignon Creek (see Fig. 1)."
4. Procedure - include methods of study (how was the study conducted)
  - materials used
5. Results - a presentation of results, and only results, in an organized format
  - include tables and figures, properly numbered and entitled

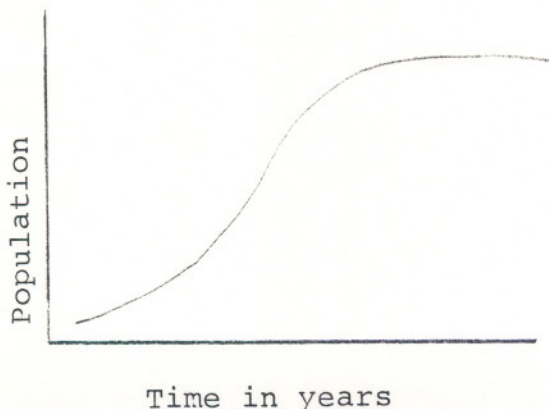


Fig. 1. Theoretical growth curve

Table 10. Population numbers of caribou on Pribilof Isl.

Year	Est. Number (from fecal count)
1956	6
1957	10
1958	14
1959	19
1960	27
1961	* no data
1962	37

Source. Jonston et al. (1973)

6. Calculations (may not apply in some reports)
- one example of each different calculation used in presenting the results should appear in this section. Subsequent work using the same calculations should appear in the Appendix. Hence, with the exception of one example calculation, all calculations used to generate data in tables must be shown in the Appendix.
7. Discussion and Conclusions
- results are interpreted and discussed
  - other literature may be used for comparison and verification
  - refer to data (results) using table and figure numbers eg. "A predominance of Class I organisms is evident at the stream station as indicate in Table 3."
  - any questions posed at the end of the field exercise should be answered in this section
  - there are several acceptable methods of citing references using the author's last name and the date of publication only. e.g., According to Saunders (1972), the principle component of lake trout stomach samples (n=785) in Round Lake prior to 1965 was lake herring (Coregonus artedii) at 72% by volume. Data from this study, however, indicates rainbow smelt (Osmerus mordax) as the dominant food item in 525 lake trout sampled, averaging 97% of stomach contents by volume (Figures 1 and 2). This change in forage species preference is attributed to the introduction of rainbow smelt in 1969 (Wilson, 1971).  
(Note the placement of the period)  
FOOTNOTES ARE NOT ACCEPTABLE  
QUOTES ARE NOT ACCEPTABLE

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8. Appendix - present calculations for all values appearing in tables.
9. Reference - presented on a separate page at end of report,  
i.e., 1) **For paper presented in a journal:**

Mason, C.F. and R. J. Bryant. 1974. The structure and diversity of the animal communities in a broad land reed-swamp, J. Zool., 172, 289-309.

1 1  
issue no. page reference

2) **For book references:**

Hynes, H. B. N., 1970. The Ecology of Running Waters, Liverpool University Press, Liverpool.

MAJOR DO'S AND DON'TS

1. Don't use first person in report text, i.e., I, we, our.
2. Do refer to tables and figures by number. Be sure all tables and figures in Results are numbered and entitled.
3. Use correct citation of references.
4. Do not use quotes.
5. Scientific names of species need only appear once in text of report. They are placed in brackets and underlined after the common name of the species appears for the first time.



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REPORT MARKING - ONE REPORT SUBMITTED PER TWO STUDENTS

SECTION	MARK	MARKING BASED ON
1. Abstract/Summary	1	Conciseness; completeness
2. Introduction	1	Conciseness; completeness
3. Procedure	1	Conciseness; completeness
4. Results	2	Organization; labels, number on tables, figures; neatness; correctness
5. Calculations	1 (if applicable)	Correctness, completeness
6. Discussion	4 (or 5 if calculations not applicable)	Conciseness; organization; reference material used and cited; completeness
TOTAL 10		
7. Appendix	minus 1 mark if absent or incorrect	
8. References	minus 1 mark if absent or incorrect	

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FIELD TRIP 1. The Effect of a Beaver Dam in Natural Resource Conservation

Instructions:

1. Read Handout - A Re-Emphasis on the Value of the Beaver in Natural Resource Conservation
2. Using equipment provided as well as field observations, attempt to quantify the effect beaver have on:
  - i) water quality
  - ii) water flow
  - iii) sedimentation
  - iv) aquatic communities
  - v) terrestrial vegetation/diversity

Note: Compare above dam site to below dam site

3. Using field data and available literature discuss the importance of beaver dams in watershed management and natural resource conservation

Note: Refer to course outline for report writing format and literature citation

Equipment Provided:

1. 100 ml graduated cylinders
2. filter papers
3. secchi disc
4. HACH kit
5. conductivity bridge
6. thermometers
7. flow meter
8. surberer samplers, whirl pac bags, preservative
9. dip nets
10. pails
11. meter sticks, tape measurers (30, 50m)

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Instructions:

1. Read available information including "The Effect of Logging on Fish" (included in outline).
2. Using detailed field notes and literature, attempt to qualify those forestry practices at the site having a negative impact on the environment (explain).
3. Suggest some post-operation works which might improve the situation (be specific).

Note: Figures may be used to detail mitigating works.

FIELD TRIP 3. Habitat Comparison, West Davignon Creek

Instructions:

1. Read Handout Exercise 28 Benthos - Indicator Organisms and Diversity Index from Eckblad, J.W., 1978. Laboratory Manual of Aquatic Biology., Wm. C. Brown Co. Publishers, Dubuque, Iowa.
2. Measure the following parameters at both the down and upstream station
  - A. Physical
    - flow
    - substrate type
    - water temperature
    - bank vegetation (spp., % cover)
    - bank soil type
    - turbidity and/or T.D.S.
  - B. Biological
    - aquatic invertebrates (be sure to take the same of no. of samples in the same format at both stations, need approx. 100 individuals from each station)
    - fish samples (electroshocking)

REFERENCES

- Case, A.B. and D.A. Rowe. 1978. Environmental Guidelines for Resource Road Construction. Fisheries and Environment Canada, Forestry Service.
- Clemens, Robert H., No date. The Role of Vegetation in Shoreline Management. A guide for Great Lakes shoreline property owners. Fisheries and Environment Canada, Dept. of Army Corps of Engineers, North Central Division.
- Kerr Wood Leidal Associates Ltd. and D.B. Lister and Associates Ltd. 1980. Stream Enhancement Guide. Fisheries and Oceans and Ministry of Environment, Province of British Columbia.
- Ontario Conservation Authorities. 1981. Erosion Control. Conservation Services Manual Volume I. ISBN 0-7743-7067-X.
- Ontario Ministry of Natural Resources. 1982. Building a Dam and other Water Projects.
- Ontario Ministry of Natural Resources. 1981. Great Lakes Shore Processes and Shore Protection.
- Rothwell, R.L. 1978. Watershed Management Guidelines for Logging & Road Construction in Alberta. Northern Forest Research Centre. Canadian Forestry Service, Fisheries & Environment Canada, Edmonton, Alberta.
- U.S. Army Corps of Engineers, North Central Division. 1978. Help Yourself - A discussion of erosion problems on the Great Lakes and alternative methods of shore protection.
- U.S. Army Corps of Engineers. 1973. Shore Protection Manual. Vol 1-3. Coastal Engineering Research Center, Ft. Belvoir, Virginia.
- U.S. Army Corps of Engineers. No date. Low Cost Shore Protection - A Property Owner's Guide.
- U.S. Department of Agriculture, Forestry Service. 1966. Wildlife Habitat Improvement Handbook. Forestry Service, Washington. FSH 2609.11:146 pp.
- U.S. Department of Transportation. Federal Highway Administration. 1979. Restoration of Fish Habitat in Relocated Streams. U.S. Government Printing Office, Washington, D.C. 20402. FHWA-1P-79-3.

## WATERSHED MANAGEMENT

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### REPORT:

1. Compare physical and biological parameters of the upstream and downstream stations (table format).
2. Consult with Eckblad handout and determine the diversity and biotic indices for both stations (show work).
3. In addition to discussing the results obtained (i.e., interpreting your results), provide a comprehensive discussion of biological indicator species, their importance and their limitations in the assessment of water quality (consult literature).
4. Suggest methods which may improve fish habitat at the downstream station (be sure to rationalize any suggestions).

### FIELD TRIP 4. Michigan Shore Processes & Protection

1. Make careful notes at each site as to:
  1. shore processes at work
  2. types and functions of shore protection works
  3. materials used for shore protection
  4. improper solutions
  5. construction guidelines violated and why structures may fail

( Ref.: Help Yourself, Great Lakes Shore Processes and Protection )