Aquatics / Water Resources Study Guide

This study guide should provide insight into the information necessary to do well on the aquatic portion of the written test.

Key Topics/Learning Objectives

1. Understanding of the basic hydrologic cycle and hydrology including surface and ground water characterization. Identify how local hydrology is affected by geological characteristics.
2. Understand what a watershed is and why watershed management is an important tool for addressing water quantity and quality issues. Learn how to determine watershed boundaries. Learn what factors contribute to successful watershed planning and management.
3. Have an understanding of aquatic, riparian, and wetland ecosystems in a watershed.
4. Learn to identify aquatic invertebrates common to Montana and learn their ecology. Also understand the user of aquatic macroinvertebrates in predicting and monitoring water quality. This would require identification of aquatic macroinvertebrate species which may indicate water characteristics (temp, oxygen content, tds concentrations, etc.) and the special morphological features these species may have for those environments.
5. Learn to identify fish species common to Montana, and learn their ecology. This would require identification of fish species which may indicate water characteristics (temp, oxygen content, tds concentrations, etc.) and the special morphological features these species may have for those environments.
6. Learn the different types of aquatic and wetland ecosystems in a watershed determining components.

7. Learn major human impacts on water quality and quantity and develop an understanding of management practices which can reduce or eliminate adverse impacts on the water resource. Learn to identify major sources of point and non-point source pollution. Learn the major impacts of impaired water quality on humans, livestock, and wildlife.
8. To expand an awareness of basic hydrology and the watersheds including determination of water discharge and recharge areas and an understanding of a water budget.
9. To learn the basic measurement methods for indicators of water quality and how to apply these methodologies.
10. To learn the basic physical and chemical properties of water. A basic knowledge of how these properties affect the geological features that comes in contact with water. Chemical properties that should be reviewed would include, but are not limited to alkalinity, osmosis, hardness, total dissolved solids, and dissolved oxygen should be familiar to the participants. Physical properties that should be reviewed would include, but are not limited to conservation of energy, sediment transport, and energy grade lines.

Publications

1. Non-point Pointers - Fact Sheets U.S. EPA
   Understanding & managing nonpoint source 513-489-8190
   Pollution in your community
2. Montana Stream Management Guide NRCS For Landowners, Managers & Stream Users 406-444-6667
3. Water Rights in Montana DNRC 1997 version 406-444-6637
4. Headwaters to a Continent: A reference guide Montana Watercourse To Montana's Water 406-994-5392
5. Classification and Management of Montana's MT Forest & Conservation Riparian and Wetland Sites Experimental Station Hansen, Paul L. et al. Misc. Public #54
6. Facts About Montana's Water DNRC Water Management Bureau Water Resources Division Helena, Montana 59620 406-444-6637
7. Aquatic Entomology Local Library or Bookstore
   McCafferty, W. P. 1981 Science Books Intern. Boston, Mass.
8. A Field Guide to Montana Fishes Montana Fish, Wildlife & Parks
   Holton, George D. 1990 Sold at regional Offices
9. Water resource Engineering McGraw Hill Books /Library
   Linsley/Franzini/Freyberg/Tchobanoglous Fourth ed. 1992

10. Soil and Water Conservation Engineering Wiley Books/Library
    Schwab/Frevert/Edminster/Barnes, Second ed. 1966
11. **Montana Field Guide**- an informational resource about Montana's vertebrate wildlife species at **http://fieldguide.mt.gov**