Aquatics

Key Topics/Learning objectives

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

Learning Objectives

1. Understanding hydrologic cycle including surface and groundwater. Identify how local hydrology is affected by geological characteristics.

2. Understand a watershed and watershed management. Learn how to determine watershed boundaries. Learn what factors contribute to successful watershed planning and management.

3. Understand aquatic, riparian, and wetland function in a watershed.

4. Identify aquatic invertebrates common to Colorado and their ecology. Understand use of aquatic macroinvertebrates in water quality monitoring, requiring identification of aquatic macroinvertebrate species which may indicate water characteristics (temp, oxygen content, etc.) and features these species may have for those environments.

5. Identify fish species common to Colorado, their ecology by identification of fish species which may indicate water characteristics (temp, oxygen content, etc.) and features these species may have for those environments.

6. Identify the different types of aquatic and wetland ecosystems in a watershed.

7. Learn major human impacts on water quality and quantity, develop an understanding of management practices which can reduce adverse impacts on the water resource. Learn to identify sources of point and non-point source pollution. Learn impacts of impaired water quality on humans, livestock, and wildlife.

8. To expand awareness of hydrology and the watershed including determination of water discharge and recharge areas.

9. Learn measurement methods for indicators of water quality and how to apply them.

10. Learn physical and chemical properties of water and how these properties effect geological features that come in contact with water. Student should be familiar with chemical properties including, but are not limited to alkalinity, osmosis, hardness, total dissolved solids, and dissolved oxygen. Physical properties that should be reviewed would include but are not limited to conservation of energy, sediment transport, energy grade lines.

Water/Aquatics Resources

General Aquatic Ecology Resources

Watersheds, the water cycle, and water quality

http://water.epa.gov/type/rsl/monitoring/vms21.cfm

Managing for healthy riparian areas:

http://www.wildlife.state.nh.us/Wildlife/Northeast_Mgt_Guide/Ch09_Riparian_Zones.pdf

http://ohioline.osu.edu/ls-fact/0001.html

Wetland function and values:

http://cfpub.epa.gov/watertrain/pdf/modules/WetlandsFunctions.pdf

Lake Ecology:

http://cfpub.epa.gov/watertrain/pdf/limnology.pdf

Aquatic Ecology Monitoring Techniques:

http://water.epa.gov/type/rsl/monitoring/index.cfm

(Note: In particular see the links to Stream, Lake, and Wetland Volunteer Methods Manuals)

Wetlands as Habitat for Wildlife/Fisheries (species, life history traits, and how to manage for them):

Invertebrates:

http://www.dep.wv.gov/WWE/getinvolved/sos/Documents/Benthic/WVSOS_MacroIDGuide.pdf

http://dnr.maryland.gov/education/envirothon/Aquatic%20Insect%20Ecology.pdf

Fish:

http://anrcatalog.ucdavis.edu/pdf/8112.pdf

The amphibian leaflet mentions habitat requirements and the negative effects of bullfrogs:

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_022220.pdf

Habitat needs and Managing wetlands for wading birds:

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_022165.pdf

The most relevant sections of the mammal leaflet are the management techniques for wetlands and discussion about the benefits of beavers and minimizing damage caused by them.

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_022221.pdf

Theme-specific Aquatic Ecology References:

Agriculture:

General guide to farm pond management:

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_022244.pdf

Managing livestock to protect riparian and wetland areas:

http://ohioline.osu.edu/ls-fact/0004.html

Urban Forestry:

Urban Wetlands, Emporia State University

http://home.kc.surewest.net/kcmallonees/wetlands/urbanwetlands.htm

Note: Not Colorado-specific but has good information. Pay special attention to the "References" section for links to other resources.

EFFECTS OF HUMAN SETTLEMENT ON BIRD COMMUNITIES IN LOWLAND RIPARIAN AREAS OF COLORADO

http://millerlab.nres.illinois.edu/pdfs/Effects%20of%20Human%20Settlement%20on%20Bird%20Communities%20in%20Lowland%20Riparian%20Areas%20of%20Colorado%20(USA).pdf

Note: pay attention to the concepts and findings of the study and don't get intimidated by the statistical methods.

Effects of Urban Sprawl on the Little Blackwater River, MD

http://www.fws.gov/northeast/marylandfisheries/reports/Final%20report%20triad%20study%20C10-03.pdf

Note: Again, not Colorado-specific but covers important concepts that apply to any urban area. Pay attention also to the techniques used to evaluate water quality. Read through all three of these references pretending to be a city planner for where you live (or some other urban area) and you are in charge of balancing the development needs of the city with environmental responsibility and regulations.