



North Carolina Department of Environmental Quality  
Division of Water Resources  
Water Sciences Section

**Biological Laboratory Annual Certification Renewal Application**

**Please be sure to include/mail:**

- 1. Check for fees.**
- 2. Résumés for ALL personnel.**
- 3. Standard Operating Procedures Document updates or revisions.**

All pages of this application **MUST** be completed. If a Section does not apply to the lab, write N/A.

Company Name \_\_\_\_\_

Lead contact from this laboratory for correspondence from DWR \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_

Email address \_\_\_\_\_

Physical street address \_\_\_\_\_

Mailing address (if different from physical address) \_\_\_\_\_

Please list any North Carolina certifications for wastewater chemical analyses or any non-DWR biological certifications maintained by the laboratory: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Has this laboratory ever been denied certification or decertified for performing toxicity testing or aquatic population survey and analysis? Which state(s) and why? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The following information is necessary for shipment of certification performance evaluation samples:

Preferred Overnight Carrier \_\_\_\_\_ Account # \_\_\_\_\_

\*\*Must be capable of picking up packages in Raleigh, NC\*\*

**Personnel for Aquatic toxicity testing/Biological survey** (Please attach resume for each person listed.)

Laboratory Supervisor

Name/Title \_\_\_\_\_

Academic Training \_\_\_\_\_

Professional Certifications \_\_\_\_\_

Substitute Supervisor

Name/Title \_\_\_\_\_

Academic Training \_\_\_\_\_

Professional Certifications \_\_\_\_\_

Other personnel involved with toxicity testing and/or biological survey:

Name/Title \_\_\_\_\_

Academic Training \_\_\_\_\_

Professional Certifications \_\_\_\_\_

Name/Title \_\_\_\_\_

Academic Training \_\_\_\_\_

Professional Certifications \_\_\_\_\_

Name/Title \_\_\_\_\_

Academic Training \_\_\_\_\_

Professional Certifications \_\_\_\_\_

Name/Title \_\_\_\_\_

Academic Training \_\_\_\_\_

Professional Certifications \_\_\_\_\_

**Laboratory Specifications**

Total laboratory area in square feet \_\_\_\_\_

Total linear bench space in feet \_\_\_\_\_

What is the culture water source for organisms to be used in NC tests? \_\_\_\_\_

What is the dilution water source for North Carolina tests? \_\_\_\_\_

**Categories Desired for Certification**

List parameters(organisms) desired under each category.

Active cultures are required for certification. Regulatory testing performed with organisms not maintained as a viable reproducing culture may be considered on a case by case basis by the Aquatic Toxicology Unit. Cladocerans must be cultured in-house.

(1) Acute Toxicity Testing/Invertebrate

_____	_____
_____	_____

(2) Acute Toxicity Testing/Vertebrate

_____	_____
_____	_____

(3) Chronic Toxicity Testing/Invertebrate

_____	_____
_____	_____

(4) Chronic Toxicity Testing/Vertebrate

_____	_____
_____	_____

(5) Aquatic Population Survey and Analysis-Check desired parameters.

- fish
- macroinvertebrates
- algae
- aquatic macrophytes

(6) Algal and Aquatic Plant Toxicity Testing

_____	_____
_____	_____

**Certification Renewal Rate Schedule**

**Number of categories**

**Fee**

1	\$500.00
2	\$900.00
3	\$1,300.00
4	\$1,700.00
5	\$2,100.00
6	\$2,500.00

Checks should be made payable to: North Carolina Department of Environment Quality.

\*\*\*Please Note: All returned checks will be charged a \$25.00 processing fee\*\*\*

Total cost of certification renewal: \_\_\_\_\_ Check number: \_\_\_\_\_

Attach check here:

This document and the attached check are submitted for Biological Laboratory Certification by the State of North Carolina per 15A NCAC 02H.1101-1110. Unless superseded by additional documentation, previous information submitted in the standard operating procedures document and application accurately reflect procedures with respect to aquatic toxicity testing currently in practice at this laboratory and that follows the Criteria and Procedures Document listed on our website.

\_\_\_\_\_  
Signature of Laboratory Supervisor

\_\_\_\_\_  
Date

Please submit all materials to:

via US Mail:

NC Department of Environment and Natural Resources  
DWR/Water Sciences Section  
1621 Mail Service Center  
Raleigh, NC 27699-1621  
Attn: Cindy Moore

via UPS or Federal Express:

NC Department of Environment and Natural Resources  
DWR/Water Sciences Section  
4401 Reedy Creek Road  
Raleigh, NC 27607  
Attn: Cindy Moore

**Culturing** (These pages may be duplicated as necessary for multiple cultures. Use additional sheets as required.)

Organism \_\_\_\_\_

Original Source \_\_\_\_\_

Date(s) obtained \_\_\_\_\_

Describe the culturing system, including vessels and environmental controls: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Describe culturing strategy including population control, culture water replacement, food type, feeding frequency and amount, special substrates, etc.: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

How is the age of the organisms determined for testing purposes? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What is the source of culture water? \_\_\_\_\_

\_\_\_\_\_

How is the culture water prepared (treated) before use? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What is the average hardness of culture water when used in the culture? \_\_\_\_\_

before being treated? \_\_\_\_\_

How is the culture water stored? \_\_\_\_\_

\_\_\_\_\_

What analyses are performed on the culture water, and what is the frequency of these analyses? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Describe any additional quality assurance procedures utilized. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reference toxicant is used to determine population health: \_\_\_\_\_

Source of this toxicant: \_\_\_\_\_

Frequency that reference toxicant tests are performed: \_\_\_\_\_

What dilution water is utilized for these tests? \_\_\_\_\_

How is each reference toxicant test evaluated graphically? \_\_\_\_\_

What are the consequences of out-of-range values? \_\_\_\_\_

Are EPA certified reference toxicant samples analyzed? \_\_\_\_\_ How often? \_\_\_\_\_

Which personnel are responsible for taxonomic identification of the organism? \_\_\_\_\_  
\_\_\_\_\_

How often are these identifications accomplished? \_\_\_\_\_

What references are used for this identification? \_\_\_\_\_

Are representative specimens preserved and/or mounted? \_\_\_\_\_

If so, at what intervals? \_\_\_\_\_

**Testing**

*These pages should be duplicated for each test type/organism combination applied for.*

Category \_\_\_\_\_

Organism \_\_\_\_\_

Test Type \_\_\_\_\_

Describe all environmental systems employed in testing for the control of temperature, light intensity, photoperiod, etc.  
\_\_\_\_\_  
\_\_\_\_\_

List the manufacturer, composition, and volume of testing vessels employed. \_\_\_\_\_

\_\_\_\_\_

List types and composition of dosing equipment (diluters, pipettes, etc) employed. \_\_\_\_\_

\_\_\_\_\_

How is dilution water treated prior to use? \_\_\_\_\_

\_\_\_\_\_

What analyses are performed on the water, and how frequently are these conducted? \_\_\_\_\_

\_\_\_\_\_

How is the dilution water stored? \_\_\_\_\_

\_\_\_\_\_

What is the average hardness of the dilution water before treatment? \_\_\_\_\_

after treatment? \_\_\_\_\_

List any replicate, blank, or blind analyses performed as part of in-lab quality assurance of toxicity testing (the analyses and responses to be detailed in the Standard Operating Procedures Document): \_\_\_\_\_

\_\_\_\_\_

**Testing Equipment**

*Any changes in this equipment list that affects the ability to perform testing should be reported to the Aquatic Toxicology Branch within 30 days of such change. \*\*Failure to do so could result in categorical decertification.\*\**

Equipment	Make	Model	Calibration method (if any)
NIST traceable thermometer			
D.O meter			
pH meter			
chlorine analysis			
conductivity meter			
hardness analysis			
Refrigerator			
Incubator			
dissecting microscope			



compound microscope			
light meter			
Hemocytometer			
Autoclave			
Centrifuge			
shaker table			
Spectrophotometer			
Fluorometer			

Additional equipment: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

List any replicate, blank, or blind analyses performed as part of in-lab quality assurance of water quality measurements performed in toxicity testing (the analyses and responses to be detailed in the Standard Operating Procedures Document): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Sampling**

Will your facility provide sample collection equipment or conduct sampling for North Carolina clients? \_\_\_\_\_

Does your facility employ automated sampling equipment? \_\_\_\_\_

If so, list equipment used: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

What type of collection vessels and shipping containers will be provided to clients? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

What commercial carriers are used for sample shipment? \_\_\_\_\_  
 \_\_\_\_\_

Outline sampling procedures, including instructions to sampling personnel, and sample identification: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Are sample temperatures recorded on receipt of sample? \_\_\_\_\_

Are total residual chlorine measurements recorded on receipt of sample? \_\_\_\_\_

Is a sample log maintained? \_\_\_\_\_

**Chain-of-Custody**

Will adhesive seals and/or lockable shipping containers be provided to clients? \_\_\_\_\_

Outline the chain-of-custody instructions provided to clients and the steps taken at your lab upon receipt of the sample:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Data Analyses**

List data analysis techniques employed for each test endpoint (These should be described in detail in the Standard Operation Procedures document): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe how data calculations, data entry, and statistical analyses are quality assured: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Aquatic Population Survey and Analysis**

**General Equipment List**

List general sampling and sample identification equipment:

Equipment	Make	Model
dissecting microscope		
compound microscope		

**Fish**

**Sample Collection**

Will your facility provide sample collection equipment or conduct sampling for North Carolina clients? \_\_\_\_\_

If so, what type of collection equipment and shipping containers will be provided to clients? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What commercial carriers are used for sample shipment? \_\_\_\_\_

\_\_\_\_\_

List sampling and sample identification equipment:

Equipment	Make	Model	Calibration method (if any)
Weighing Scales			
Length measuring device			
Backpack shocker			
Generator			
Nets (list)			

Additional equipment: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Describe collection techniques employed, including the purpose of each technique and sample identification (attach additional pages, if necessary). \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Describe sample preservation techniques used: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Chain-of-Custody**

Will adhesive seals and/or lockable shipping containers be provided to clients? \_\_\_\_\_

Describe chain-of-custody procedures and the steps taken at your lab upon receipt of the sample: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Is a sample log maintained? \_\_\_\_\_

**Identification**

Are reference organism collections available for taxonomic review? \_\_\_\_\_

Where is the reference collection maintained or with whom are the specimens vouchered? \_\_\_\_\_  
\_\_\_\_\_

Are reference or whole samples from population surveys maintained at least one year after collection? \_\_\_\_\_

Are copies of all taxonomic guides and references specified by the Division of Water Resources located in the laboratory (see Appendix)? \_\_\_\_\_

List or append other references used for taxonomy or population analyses: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Data Analyses**

Are you using an Index of Biological Integrity (IBI)? If so, list metrics:

- |           |           |
|-----------|-----------|
| 1. _____  | 2. _____  |
| 3. _____  | 4. _____  |
| 5. _____  | 6. _____  |
| 7. _____  | 8. _____  |
| 9. _____  | 10. _____ |
| 11. _____ | 12. _____ |

Describe data analysis techniques employed (these should be described in detail in the Standard Operation Procedures document): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Describe how data calculations, data entry, and statistical analyses are quality assured: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**In-lab Quality Assurance**

List any replicate, blank, or blind analyses performed as part of in-lab quality assurance of population survey (the analyses to be detailed in the Standard Operating Procedures Document): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Macroinvertebrates**

**Sample Collection**

Will your facility provide sample collection equipment or conduct sampling for North Carolina clients? \_\_\_\_\_

If so, what type of collection equipment and shipping containers will be provided to clients? \_\_\_\_\_

\_\_\_\_\_

What commercial carriers are used for sample shipment? \_\_\_\_\_

**List sampling and sample identification equipment:**

Equipment	Make(s)	Model(s)	Net Mesh Size
Trawls			
Dredges			
Box sampler			
Hess sampler			
Surber sampler			
Sweep net, please specify type:			

Additional equipment: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Describe collection/picking techniques employed, including the purpose of each technique and sample identification (attach additional pages if necessary): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Describe sample preservation techniques used: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Chain-of-Custody**

Will adhesive seals and/or lockable shipping containers be provided to clients? \_\_\_\_\_

Describe chain-of-custody procedures and the steps taken at your lab upon receipt of the sample: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Is a sample log maintained? \_\_\_\_\_

**Identification**

Are reference organism collections available for taxonomic review? \_\_\_\_\_

Are reference or whole samples from population surveys maintained at least one year after collection? \_\_\_\_\_

Are copies of all taxonomic guides and references specified by the Division of Water Resources located in the laboratory (see Appendix)? \_\_\_\_\_

List or append other references used for taxonomy or population analyses: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Data Analyses**

Describe data analysis techniques employed (these should be described in detail in the Standard Operation Procedures document): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe how data calculations, data entry, and statistical analyses are quality assured: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**In-lab Quality Assurance**

Discuss analyses performed as part of in-lab quality assurance of population survey (the analyses to be detailed in the Standard Operating Procedures Document): \_\_\_\_\_

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\_\_\_\_\_

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### TAXONOMY for Benthic Macroinvertebrates

The following list specifies those genera that can normally be taken to the species level using readily available and accepted taxonomic keys. Many other genera can be taken to the species level by using various papers, in-house keys, unpublished manuscripts and other such sources that will differentiate species. Species level identification should be undertaken whenever possible.

For more information regarding taxonomic effort, please refer to the North Carolina Taxonomic guides for the most current levels of taxonomic effort for Ephemeroptera, Plecoptera, Trichoptera, and Aquatic Coleoptera of North Carolina. Those publications can be found at this link: <http://portal.ncdenr.org/web/wq/taxonmanual>. For groups not included with this link, please contact Eric Fleek at [eric.fleek@ncdenr.gov](mailto:eric.fleek@ncdenr.gov) for further information.

**EPHEMEROPTERA**

<i>Baetis</i>	<i>Baetisca</i>	<i>Drunella</i>
<i>Ephemerella</i>	<i>Eurylophella</i>	<i>Neoephemera</i>
<i>Serratella</i>	<i>Stenacron</i>	<i>Stenonema</i>

**PLECOPTERA**

<i>Acroneuria</i>	<i>Agnatina</i>	<i>Diploperla</i>
<i>Helopicus</i>	<i>Isogenoides</i>	<i>Isoperla</i>
<i>Paragnetina</i>	<i>Perlinella</i>	

**TRICHOPTERA**

<i>Brachycentrus</i>	<i>Ceraclea</i>	<i>Diplectrona</i>
<i>Hydropsyche</i>	<i>Micrasema</i>	<i>Molanna</i>
<i>Neophylax</i>	<i>Nectopsyche</i>	<i>Psychomyia</i>
<i>Rhyacophila</i>	<i>Symphitopsyche</i>	<i>Triaenodes</i>

**ODONATA**

<i>Boyeria</i>	<i>Neurocordulia</i>	
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**MEGALOPTERA**

<i>Chauliodes</i>	<i>Nigronia</i>	
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**COLEOPTERA****CRUSTACEA****OLIGOCHAETA (if mature specimens)**

<i>Allonais</i>	<i>Amphichaeta</i>	<i>Arcteonais</i>
<i>Bratislavia</i>	<i>Paranais</i>	<i>Haemonais</i>
<i>Stylaria</i>	<i>Ophidonais</i>	<i>Tubifex</i>
<i>Slavina</i>	<i>Specaria</i>	<i>Spirosperma</i>
<i>Uncinaiis</i>	<i>Vejdovskyella</i>	<i>Aulodrilus</i>
<i>Bothrioneurum</i>	<i>Branchiura</i>	<i>Haber</i>
<i>Ilyodrilus</i>	<i>Isochaetides</i>	<i>Limnodrilus</i>
<i>Potamothrix</i>	<i>Quistadrilus</i>	



*DIPTERA*

*Ablabesmyia*  
*Orthocladius*

*Cricotopus*  
*Polypedilum*

*Labrundinia*

**Algae**

**Sample Collection**

Will your facility provide sample collection equipment or conduct sampling for North Carolina clients? \_\_\_\_\_

If so what type of collection equipment and shipping containers will be provided to clients? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What commercial carriers are used for sample shipment? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**List sampling and identification equipment:**

Equipment	Make	Model	Calibration method (if any)
Microscope			

Additional equipment: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe collection techniques employed, including the purpose of each technique: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe sample preservation techniques used: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe identification and enumeration techniques employed: \_\_\_\_\_

\_\_\_\_\_

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**Chain-of-Custody**

Will adhesive seals and/or lockable shipping containers be provided to clients? \_\_\_\_\_

Describe chain-of-custody procedures and the steps taken at your lab upon receipt of the sample: \_\_\_\_\_

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Is a sample log maintained? \_\_\_\_\_

**Identification**

Are reference algae collections available for taxonomic review? \_\_\_\_\_

Are reference or whole samples from population surveys maintained at least one year after collection? \_\_\_\_\_

Are copies of all taxonomic guides and references specified by the Division of Water Resources located in the laboratory (see Appendix)? \_\_\_\_\_

List or append other references used for taxonomy or population analyses: \_\_\_\_\_

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**Data Analyses**

Describe data analysis techniques employed (these should be described in detail in the Standard Operation Procedures document): \_\_\_\_\_

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Describe how data calculations, data entry, and statistical analyses are quality assured: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**In-lab Quality Assurance**

List any replicate, blank, or blind analyses performed as part of in-lab quality assurance of population survey (the analyses to be detailed in the Standard Operating Procedures Document): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Taxonomic Reference List**

Phytoplankton identifications should be taken to at least the genus level, and to species level when possible. Please provide a list of the taxonomic nomenclature (i.e., taxa list) being used and supporting reference materials. A copy of the Taxonomic Reference Table used by DWR can be found at:  
[http://portal.ncdenr.org/c/document\\_library/get\\_file?uuid=5a9f0eda-c42f-4bd5-801c-f50ed96ea6c0&groupId=38364](http://portal.ncdenr.org/c/document_library/get_file?uuid=5a9f0eda-c42f-4bd5-801c-f50ed96ea6c0&groupId=38364)

**Aquatic Macrophytes**

Describe specimen collection techniques: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If quantitative sampling is conducted, please describe List sampling techniques and equipment: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe sample preservation techniques used: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Are reference plant collections available for taxonomic review? \_\_\_\_\_

Are reference or whole samples from population surveys maintained at least one year after collection? \_\_\_\_\_

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Describe chain-of-custody procedures: \_\_\_\_\_

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Are copies of all taxonomic guides and references specified by the Division of Water Resources located in the laboratory (see Appendix)? \_\_\_\_\_

List or append other references used for taxonomy or population analyses: \_\_\_\_\_

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Describe data analysis techniques employed: \_\_\_\_\_

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**Appendix: Required and Recommended References****FISH REFERENCES**

## REQUIRED

Menhinick, E.F. 1991. The Freshwater Fishes of North Carolina. North Carolina Wildlife Resources Commission, Raleigh, N.C. 227 pp.

## RECOMMENDED

Rohde, F.C., Arndt, R.G., Foltz, J.W., and J.M. Quattro. 2009. The Freshwater Fishes of South Carolina. University of South Carolina Press. 430 pages.

Etnier, D.A. and W.C. Starnes. 1993. The Fishes of Tennessee. University of Tennessee Press. Knoxville, TN. 681pp.

Jenkins, R.E. and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. America Fisheries Society. Bethesda, MD.

**BENTHIC MACROINVERTEBRATE REFERENCES**

## REQUIRED

Standard Operating Procedures for Benthic Macroinvertebrates, Biological Assessment Unit, July 2006, DENR/DWQ/WQS/ESB

Beaty, S.R. Taxonomy Document with Standard Taxonomic Effort Levels for Ephemeroptera of North Carolina. NCDENR, DWQ, Biological Assessment Unit. November 2010.

Beaty, S.R. Taxonomy Document with Standard Taxonomic Effort Levels for Plecoptera of North Carolina. NCDENR, DWQ, Biological Assessment Unit. November 2010.

Beaty, S.R. Taxonomy Document with Standard Taxonomic Effort Levels for Trichoptera of North Carolina. NCDENR, DWQ, Biological Assessment Unit. November 2010.

Beaty, S.R. Taxonomy Document with Standard Taxonomic Effort Levels for Coleoptera of North Carolina. NCDENR, DWQ, Biological Assessment Unit. November 2010.

Kathman, R.D., and R.O. Brinkhurst. 1998. Guide to the Freshwater Oligochaetes of North America. Aquatic Resources Center, College Grove, TN. 264 pp.

Ciegler, J.C. 2003. Water Beetles of South Carolina (Coleoptera: Gyrinidae, Haliplidae, Noteridae, Dytiscidae, Hydrophilidae, Hydraenidae, Scirtidae, Elmidae, Dryopidae, Limnichidae, Heteroceridae, Psephenidae, Ptilodactylidae, and Chelonariidae). Biota of South Carolina. Vol. 3. Clemson University, Clemson, S.C. 207 pp.

Wiggins, G.B. 1996. Larvae of the North American Caddisfly Genera (Trichoptera), Second Edition. University of Toronto Press, Toronto.

Stewart, K.W. and B.P. Stark. 2002. Nymphs of the North American Stonefly Genera (Plecoptera). Second Edition. The Caddis Press. Columbus, Ohio, xii + 510pp.

Epler, J.H. 2001. Identification Manual for the Larval Chironomidae (Diptera) of North and South Carolina.

Epler, J.H. 2006. Identification Manual for the Aquatic and Semi-aquatic Heteroptera of Florida (Belostomatidae, Corixidae, Gelastocoridae, Gerridae, Hebridae, Hydrometridae, Mesoveliidae, Naucoridae, Nepidae, Notonectidae, Ochteridae, Pleidae, Saldidae, Veliidae).

Gelhaus, J.K. 2002. Manual for the Identification of Aquatic Crane Fly Larvae for Southeastern United States.

Burch, J.B. 1982. Freshwater Snails (Mollusca: Gastropoda) of North America.

Tennessee, K. 2004. CABW Odonata Manual (A Guide to Identifying Odonata Larvae of the Carolinas).

Bogan, A.E., and J.M. Alderman. 2008. Workbook and Key to the Freshwater Bivalves of South Carolina. Revised Second Edition.

Holsinger, J.R. 1972. The Freshwater Amphipod Crustaceans (Gammaridae) of North America.

Williams, W.D. 1976. Freshwater Isopods (Asellidae) of North America.

Klemm, D.J. 1995. Identification Guide to the Freshwater Leeches (Annelida: Hirudinea) of Florida and Other Southern States.

Brigham, A.R., and W.U. Brigham. 1982. Aquatic Insects and Oligochaetes of North and South Carolina. Midwest Aquatic Enterprises, Mahomet, Illinois. 837 pp.

Merrit, R.W., and K.W. Cummins, and M.B. Berg (editors). 2008. An Introduction to Aquatic Insects of North America. Fourth Edition. Kendall Hunt Publishing. Dubuque, Iowa. 1158 pp.

## PHYTOPLANKTON REFERENCES

### REQUIRED

Wehr, J.D. and R.G. Sheath (eds.) 2003. Freshwater Algae of North America: Ecology and Classification. Academic Press. San Diego, California. 918 pp.

Whitford, L.A. and G.J. Schumacher. 1984. A Manual of Fresh-water Algae. Sparks Press, Rockingham, N.C. 337 pp.

### RECOMMENDED

Kramer, Kurt, and Lange-Bertalot, Horst. Suswasserflora von Mitteleuropa. Stuttgart: Gustav Fischer Verlag, 1991. Teils 1-4.

Patrick, Ruth and Charles W. Reimer. 1966. The Diatoms of the United States, Vol. 1. Academy of Nat. Sci. of Philadelphia, Philadelphia, Pa. 688 pp.

Prescott, G.W. 1973. Algae of the Western Great Lakes Area. Wm. C. Brown Co. Pub., Dubuque, Iowa. 997 pp.

## AQUATIC PLANT REFERENCES

### REQUIRED

Aulbach-Smith, C.A. and S.J. deKozlowski. 1990. Aquatic and Wetland Plants of South Carolina. South Carolina Water Resources Commission, Columbia SC. 123 pp.

Copies can be obtained from: Publications Coordinator, SC Water Resources Commission, 1201 Main St., Suite 1100, Columbia, SC 29201. (803) 737- 0800

### RECOMMENDED

Beal, Ernest O. 1977. A Manual of Marsh and Aquatic Vascular Plants of North Carolina, with Habitat Data. The North Carolina Agriculture Research Service, Raleigh, NC.

Copies can be obtained from: North Carolina Agriculture Research Service, NC State University, Raleigh, NC 27695

Gleason, H.A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada, 2nd edition The New York Botanical Garden, The Bronx, NY, NY. 910 pp.

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Godfrey. R.K. and J.W. Wooten. 1979. Aquatic and Wetland Plants of Southeastern United States: Monocotyledons. University of Georgia Press. Athens, GA.

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Radford, A.E., H.E. Ahles and C.R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. The University of North Carolina Press, Chapel Hill, NC. 1184 pp.

Although Radford et al. is outdated, it is still a superb reference text and the only one that covers all vascular plants for North Carolina