North Carolina Department of Environment and Natural Resources
Division of Water Quality

Beverly Eaves Perdue
Governor

Charles Wakild, P.E.
Director

Dee Freeman
Secretary

Biological Laboratory Certification Application

Prior to submission please attach:

1. **Check for fees.**
2. **Personnel Rèsumès .**
3. **Standard Operating Procedures Document.**
4. **Reference Toxicant Data and Control Charts.**

Company Name _____ Phone _____

_____ Fax _____

Physical Street Address

Street_____ City_____ State_____ Zip_____

Mailing Address (if different from physical street address)

Street_____ City_____ State_____ Zip_____

E-mail Address_____

Contact person from this laboratory to receive correspondence from North Carolina's Water Quality Section

_____

Please list any NC certifications for wastewater chemical analyses or any non-NCDWQ 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, N.C.)

Personnel *Attach resume for each person listed.*

Laboratory Supervisor-Aquatic toxicity testing/Biological survey

Name/Title_____

Academic Training_____

Professional Certifications (ex. Ecological Society of America) _____

Substitute Supervisor

Name/Title_____

Academic Training_____

Professional Certifications _____

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

Name/Title_____

Academic Training_____

Professional Certification_____

Name/Title_____

Academic Training_____

Professional Certifications _____

Name/Title_____

Academic Training_____

Professional Certifications_____

Name/Title_____

Academic Training_____

Professional Certifications_____

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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 N.C. tests?_____

What is the dilution water source for NC 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. Currently, cladocerans must be cultured in-house.

___(1) Acute Toxicity Testing/Invertebrate

_____

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___(2) Acute Toxicity Testing/Vertebrate

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___(3) Chronic Toxicity Testing/Invertebrate

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___(4) Chronic Toxicity Testing/Vertebrate

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

_____ fish

_____ macroinvertebrates

_____ algae

_____ aquatic macrophytes

___(6) Algal and Aquatic Plant Toxicity Testing

_____

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_____

Total number of categories desired for certification:_____

Certification Rate Schedule

Number of categories	Fee
1	$500.00
2	$900.00
3	$1300.00
4	$1700.00
5	$2100.00
6	$2500.00

Checks should be made payable to: North Carolina Department of Environment and Natural Resources.

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 NCAC 2H .1101-.1110. Unless superceded by attached 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.

_____ _____

Signature of Laboratory Supervisor Date

Please submit all materials to:

North Carolina Department of Environment and Natural Resources
DWQ/Environmental Sciences Section
1621 Mail Service Center
Raleigh, North Carolina 27699-1621
Attn: Lance Ferrell

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

Organism _____

Original Source_____ Date(s) obtained _____

Describe the culturing system, including vessels and environmental controls:

_____

_____

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

_____

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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: _____

_____

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_____

What reference toxicant is used to determine population health?_____

What is the source of this toxicant? _____

How often are reference toxicant tests 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?_____

_____

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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.

_____

_____

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

_____

_____

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_____

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

_____

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_____

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):

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Testing Equipment

Any changes in this equipment list which affect the ability to perform testing should be reported to the State Laboratory within 30 days of such change. Failure to do so could result in categorical decertification.

	Make	Model	Calib. method
NIST traceable thermometer			
D.O meter			
pH meter			
chlorine analysis			
conductivity meter			
hardness analysis			
refrigerator			
incubator			
dissecting microscope			
compound microscope			
light meter			
Hemacytometer			
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):

_____

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_____

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:

_____

_____

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_____

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:

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Data Analyses

List data analysis techniques employed for each test endpoint (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: _____

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Aquatic Population Survey and Analysis

General Equipment List

List general sampling and sample identification equipment:

	Make	Model	Calib. method (if appropriate)
thermometer			
D.O. meter			
pH meter			
conductivity meter			
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**:**

	Make	Model	Calib. method (if appropriate)
multi-parameter meter			
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):_____

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Describe sample preservation techniques used:_____

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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 organism collections available for taxonomic review?_____

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

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

List or append other references used for taxonomy or population analyses:_____

_____

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Data Analyses

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

1._____ 7._____

2._____ 8._____

3._____ 9._____

4._____ 10._____

5._____ 11._____

6._____ 12._____

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: _____
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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):

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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?_____

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What commercial carriers are used for sample shipment?_____

List sampling and sample identification equipment**:**

	Make	Model	Calib. method (if appropriate)
trawls (list)			
dredges (list)			
box sampler			
Hess sampler			
Surber sampler			
sweep net, please list type (A-frame, D-frame, etc.)			

Additional equipment:

_____ _____

_____ _____

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_____ _____

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

_____

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Collection/picking techniques (continued):

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Describe sample preservation techniques used:_____

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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 organism collections available for taxonomic review?_____

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

Are copies of all taxonomic guides and references specified by the Division of Water Quality 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: _____

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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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TAXONOMY

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, depending on the taxonomic expertise of the identifier, using various papers, in-house keys, unpublished manuscripts and other such sources that will differentiate species, but may not be widely known or accepted.

Species level identification should be undertaken whenever possible, and the reference used for identification listed, if the genus is not on the list below.

EPHEMEROPTERA

Baetis	*Baetisca*	*Drunella*
Ephemerella	*Eurylophella*	*Neoephemera*
Serratella	*Stenacron*	*Stenonema*

PLECOPTERA

Acroneuria	*Agnetina*	*Diploperla*
Helopicus	*Isogenoides*	*Isoperla*
Paragnetina	*Perlinella*	

TRICHOPTERA

Brachycentrus	*Ceraclea*	*Diplectrona*
Hydropsyche	*Micrasema*	*Molanna*
Neophylax	*Nectopsyche*	*Psychomyia*
Rhyacophila	*Symphitopsyche*	*Triaenodes*

ODONATA

Boyeria	*Neurocordulia*

MEGALOPTERA

Chauliodes	*Nigronia*

COLEOPTERA

CRUSTACEA

OLIGOCHAETA (if mature specimens)

Allonais	*Amphichaeta*	*Arcteonais*
Bratislavia	*Paranais*	*Haemonais*
Stylaria	*Ophidonais*	*Tubifex*
Slavina	*Specaria*	*Spirosperma*
Uncinais	*Vejdovskyella*	*Aulodrilus*
Bothrioneurum	*Branchiura*	*Haber*
Ilyodrilus	*Isochaetides*	*Limnodrilus*
Potamothrix	*Quistadrilus*	

DIPTERA

Ablabesmyia	*Cricotopus*	*Labrundinia*
Orthocladius	*Polypedilum*	

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?_____

_____

_____

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What commercial carriers are used for sample shipment?_____

List sampling and identification equipment**:**

	Make	Model	Calib. method
light meter			
centrifuge			

Additional equipment:

_____ _____

_____ _____

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

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Describe sample preservation techniques used:_____

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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 for at least one year after collection?_____

Are copies of all taxonomic guides and references specified by the Division of Water Quality 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: _____

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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):

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Listed below are acceptable names of taxa that can be taken to genus using readily available and accepted taxonomic keys. **Phytoplankton genera should be taken to the species level whenever possible**. Depending on taxonomic expertise, many other genera may be taken to species level using papers, in house keys, unpublished manuscripts and other such sources that allow differentiation of species, but which may not be widely known or accepted. Documentation of references used to identify genera not listed below should be readily available.

BACILLARIOPHYCEAE

ACHNANTHES
AMPHORA
AMPHIPRORA
ANOMOEONEIS
ASTERIONELLA
ATTHEYA
BACILLARIA
CAPARTOGRAMMA
CHAETOCERAS
COCCONEIS
COSCINODISCUS
CYCLOTELLA
CYLINDROCYSTIS
CYMATOPLEURA
CYMBELLA
DIATOMA
DIPLONEIS
EUNOTIA
FRAGILARIA
FRUSTULIA
GOMPHONEMA
GYROSIGMA
LEPTOCYLINDRUS
MELOSIRA
MERIDION
NAVICULA
NEIDIUM
NITZSCHIA
PINNULARIA
PLEUROSIGMA
RHIZOSOLENIA
RHOICOSPHENIA
RHOPALODIA
SKELOTONEMA
STEPHANODISCUS
STAURONEIS
SURIRELLA
SYNEDRA
TABELLARIA
THALASSIONEMA

CHLOROPHYCEAE

ACTINASTRUM
ANKISTRODESMUS
ARTHRODESMUS
ASKENASYELLA
ASTEROCOCCUS
BOTRYOCOCCUS
CARTERIA
CHARACIUM
CHLAMYDOMONAS
CHLORELLA
CHLOROCOCCALES
CHLOHORMIDIUM
CHLOROGONIUM
CHODATELLA
CLOSTERIUM
CLOSTERIOPSIS
COELASTRUM
COSMARIUM
CRUCIGENIA
CYLINDROCYSTIS
DESMIDIUM
DICTYOSPHAERIUM
EUDORINA
FRANCEIA
GLOEOCYSTIS
GOLENKINIA
GONIUM
HAEMATOCOCCUS
HYDRODICTYON
KIRCHNERIELLA
LAGERHEIMIA
MESOTAENIUM
MICRACTINIUM
MOUGEOTIA
MOUGEOTIOPSIS
NANNOCHLORIS
NEPHROCYTIUM
OEDOGONIUM
OOCYSTIS
PANDORINA
PEDIASTRUM
PHACOTUS
PHEASTER
PLEUROTAENIUM

CHLOROPHYCEAE - continued

DIMORPHOCOCCUS
ELAKATOTHRIX
EUASTRUM
PROTOCOCCUS
PSEUDOKEPHRYON
PTEROMONAS
QUADRIGULA
SCENEDESMUS
SCHRODERIA
SELENASTRUM
SPHAEROCYSTIS
SPHAERELLOPSIS
SPIROGYRA
SPONDYLOSIUM
POCILLOMONAS
POLYBLEPHARIDES
POLYEDRIOPSIS
STAURASTRUM
TETRASPORA
TETRASTRUM
TETRASELMIS
TETRAEDRON
THORAKOMONAS
TREUBARIA
ULOTHRIX
VOLVOX
WESTELLA
XANTHIDIUM

CHRYSOPHYCEAE

APEDINELLA
BICOECA
CENTRITRACTUS
CHROMULINA
CHRYSIDIASTRUM
CHRYSOCOCCUS
CHRYSOSPHAERELLA
CYCLONEXIS
DESMARELLA
DINOBRYON
HETEROMASTIX
KEPHRYION
MALLOMONAS
OCHROMONAS
OPHIOCYTIUM
PAVLOVA
PSEUDOPEDINELLA
SPHAEROECA
SYNURA

CRYPTOPHYCEAE

CALYCOMONAS
CHROOMONAS
CRYPTOMONAS
RHODOMONAS

CYANOPHYCEAE

ANABAENA
ANABAENOPSIS
ANACYSTIS
APHANIZOMENON
APHANOCAPSA
APHANOTHECE
ARTHROSPIRA
CHROOCOCCUS
COCCOCHLORIS
DACTYLOCOCCOPSIS
GLOEOCAPSA
GLOEOTHECE
GOMPHOSPHAERIA
JOHANNESBAPTISA
LYNGBYA
MERISMOPEDIA
MICROCYSTIS
NODULARIA
OSCILLATORIA
PHORMIDIUM
POLYCYSTIS
RAPHIDIOPSIS
SPIRULINA

DINOPHYCEAE

AMPHIDINIUM	*GYRODINIUM*
CERATIUM	*HETEROCAPSA*
CYSTODINIUM	*KATODINIUM*
EXUVIAELLA	*PERIDINIUM*
GLENODINIUM	*POLYRIKOS*
GYMNODINIUM	*PROROCENTRUM*

EUGLENOPHYCEAE

EUGLENA	*PHACUS*
EUTREPTIA	*TRACHELOMONAS*
LEPOCINCLIS	

PRASINOPHYCEAE

PYRAMIMONAS

PRYMNESIOPHYCEAE

CHRYSOCHROMULINA

XANTHOPHYCEAE

OLISTHODISCUS	*TRIBONEMA*

Aquatic Macrophytes

Describe specimen collection techniques:

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

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Describe sample preservation techniques used:_____

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Are reference plant collections available for taxonomic review?_____

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

Describe chain-of-custody procedures: _____

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Are copies of all taxonomic guides and references specified by the Division of Water Quality 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, Edward 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, Hydrophildae, Hdyraenidae, 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, Gelastocoridea, 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.

Tennessen, 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

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

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.

RECOMMENDED

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

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

AQUATIC PLANT REFERENCES

REQUIRED

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

RECOMMENDED

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

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.

Gleason and Cronqist's second edition includes the recent changes in plant nomenclature.

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

Godfrey. R.K. and J.W. Wooten.1981. Aquatic and Wetland Plants of Southeastern United States: Dicotyledons. University of Georgia Press. Athens, GA.