



June 22, 2011

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
PO Box 50130
Charleston, WV 25305-0130

RE: Request for Quotation DEP15456

Dear Mr. Bowman:

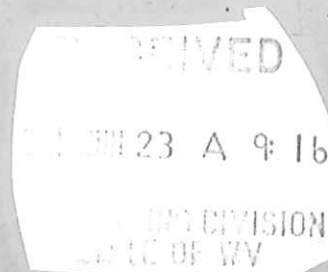
Great Lakes Environmental Center, Inc. (GLEC) is pleased to submit the attached quotation in response to your request for benthic analysis of 500 samples from West Virginia. GLEC is a leader in the identification of freshwater organisms collected across North America.

We have a thorough understanding of West Virginia's Benthic Standard Operating Procedures, will use those SOP's to pick up and process the samples in a timely manner. We also have stringent QA/QC procedures that ensure the accuracy of the data supplied. These procedures include internal QC oversight and the use of outside labs for verification of samples and difficult specimens. GLEC also maintains a proprietary database that can provide data in many formats.

We look forward to the prospect of serving West Virginia in their effort to monitor their waterways. If you have any questions, or require additional information, please contact Mike Sergeant at msergeant@glec.com or myself at dmccauley@glec.com, or by phone at 231-941-2230. Thank you again for the opportunity to propose our services.

Sincerely,

Dennis McCauley
President
Great Lakes Environmental Center, Inc.



Great
Lakes
Environmental
Center

Applied
Environmental
Sciences
www.glec.com

Traverse City
Operations
739 Hastings St.
Traverse City
MI 49686

231 941-2230
231 941-2240 fax

Columbus
Operations
1295 King Ave.
Columbus
OH 43212

614 487-1040
614 487-1920 fax



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER
DEP15456

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
CHUCK BOWMAN
304-558-2157

VENDOR

RFQ COPY
 TYPE NAME/ADDRESS HERE
 Great Lakes Environmental Center, Inc
 739 Hastings Street
 Traverse City, MI 49686

SHIP TO

ENVIRONMENTAL PROTECTION,
 DEPARTMENT OF
 DIV OF WATER AND WASTE MGT
 601 57TH STREET SE
 CHARLESTON, WV
 25304 304-926-0499

DATE PRINTED 05/26/2011	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
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BID OPENING DATE: **06/23/2011** BID OPENING TIME **01:30PM**

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	LS		961-48		
FIELD TESTING SERVICES THE WEST VIRGINIA PURCHASING DIVISION, FOR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION, IS SOLICITING BIDS FROM QUALIFIED VENDORS FOR A CONTRACT TO PROVIDE PROCESSING AND IDENTIFICATION OF BENTHIC MACROINVERTEBRATE SAMPLES COLLECTED FROM WEST VIRGINIA WATERS, PER THE FOLLOWING SPECIFICATIONS, BID REQUIREMENTS, TERMS & CONDITIONS, AND THE ATTACHED BID SCHEDULE. EXHIBIT 3 LIFE OF CONTRACT: THIS CONTRACT BECOMES EFFECTIVE UPON AWARD AND EXTENDS FOR A PERIOD OF ONE (1) YEAR OR UNTIL SUCH "REASONABLE TIME" THEREAFTER AS IS NECESSARY TO OBTAIN A NEW CONTRACT OR RENEW THE ORIGINAL CONTRACT. THE "REASONABLE TIME" PERIOD SHALL NOT EXCEED TWELVE (12) MONTHS. DURING THIS "REASONABLE TIME" THE VENDOR MAY TERMINATE THIS CONTRACT FOR ANY REASON UPON GIVING THE DIRECTOR OF PURCHASING 30 DAYS WRITTEN NOTICE. UNLESS SPECIFIC PROVISIONS ARE STIPULATED ELSEWHERE IN THIS CONTRACT DOCUMENT, THE TERMS, CONDITIONS AND PRICING SET HEREIN ARE FIRM FOR THE LIFE OF THE CONTRACT. RENEWAL: THIS CONTRACT MAY BE RENEWED UPON THE MUTUAL WRITTEN CONSENT OF THE SPENDING UNIT AND VENDOR, SUBMITTED TO THE DIRECTOR OF PURCHASING THIRTY (30)						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE <i>[Signature]</i>	TELEPHONE 231-941-2230	DATE JUNE 21, 2011
TITLE PRESIDENT	FEIN 38-3077785	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

GENERAL TERMS & CONDITIONS
REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)

1. Awards will be made in the best interest of the State of West Virginia.
 2. The State may accept or reject in part, or in whole, any bid.
 3. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required \$125 fee.
 4. All services performed or goods delivered under State Purchase Order/Contracts are to be continued for the term of the Purchase Order/Contracts, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods this Purchase Order/Contract becomes void and of no effect after June 30.
 5. Payment may only be made after the delivery and acceptance of goods or services.
 6. Interest may be paid for late payment in accordance with the *West Virginia Code*.
 7. Vendor preference will be granted upon written request in accordance with the *West Virginia Code*.
 8. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.
 9. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.
 10. The laws of the State of West Virginia and the *Legislative Rules* of the Purchasing Division shall govern the purchasing process.
 11. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.
 12. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, the State may deem this contract null and void, and terminate such contract without further order.
 13. **HIPAA BUSINESS ASSOCIATE ADDENDUM:** The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, is available online at www.state.wv.us/admin/purchase/vrc/hipaa.htm and is hereby made part of the agreement. Provided that the Agency meets the definition of a Cover Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.
 14. **CONFIDENTIALITY:** The vendor agrees that he or she will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in <http://www.state.wv.us/admin/purchase/privacy/noticeConfidentiality.pdf>.
 15. **LICENSING:** Vendors must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, and the West Virginia Insurance Commission. The vendor must provide all necessary releases to obtain information to enable the director or spending unit to verify that the vendor is licensed and in good standing with the above entities.
 16. **ANTITRUST:** In submitting a bid to any agency for the State of West Virginia, the bidder offers and agrees that if the bid is accepted the bidder will convey, sell, assign or transfer to the State of West Virginia all rights, title and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to the bidder.
- I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, or person or entity submitting a bid for the same material, supplies, equipment or services and is in all respects fair and without collusion or fraud. I further certify that I am authorized to sign the certification on behalf of the bidder or this bid.

INSTRUCTIONS TO BIDDERS

1. Use the quotation forms provided by the Purchasing Division. Complete all sections of the quotation form.
2. Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder. Alternates offered by the bidder as **EQUAL** to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications.
3. Unit prices shall prevail in case of discrepancy. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.
4. All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications: Department of Administration, Purchasing Division, 2019 Washington Street East, P.O. Box 50130, Charleston, WV 25305-0130
5. Communication during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited (W.Va. C.S.R. §148-1-6.6).



State of West Virginia
 Department of Administration
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 2019 Washington Street East
 Post Office Box 50130
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Request for Quotation

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PAGE
2

ADDRESS CORRESPONDENCE TO ATTENTION OF
**CHUCK BOWMAN
 304-558-2157**

RFQ COPY

TYPE NAME/ADDRESS HERE

Great Lakes Environmental Center, Inc.
 739 Hastings Street
 Traverse City, MI 49686

ENVIRONMENTAL PROTECTION,
 DEPARTMENT OF
 DIV OF WATER AND WASTE MGT
 601 57TH STREET SE
 CHARLESTON, WV
 25304 304-926-0499

VENDOR

SHIP TO

DATE PRINTED	TERMS OF SALE	SHIP VIA	FOB	FREIGHT TERMS
05/26/2011				
BID OPENING DATE: 06/23/2011		BID OPENING TIME 01:30PM		

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
<p>DAYS PRIOR TO THE EXPIRATION DATE. SUCH RENEWAL SHALL BE IN ACCORDANCE WITH THE TERMS AND CONDITIONS OF THE ORIGINAL CONTRACT AND SHALL BE LIMITED TO TWO (2) ONE (1) YEAR PERIODS.</p> <p>CANCELLATION: THE DIRECTOR OF PURCHASING RESERVES THE RIGHT TO CANCEL THIS CONTRACT IMMEDIATELY UPON WRITTEN NOTICE TO THE VENDOR IF THE COMMODITIES AND/OR SERVICES SUPPLIED ARE OF AN INFERIOR QUALITY OR DO NOT CONFORM TO THE SPECIFICATIONS OF THE BID AND CONTRACT HEREIN.</p> <p>OPEN MARKET CLAUSE: THE DIRECTOR OF PURCHASING MAY AUTHORIZE A SPENDING UNIT TO PURCHASE ON THE OPEN MARKET, WITHOUT THE FILING OF A REQUISITION OR COST ESTIMATE, ITEMS SPECIFIED ON THIS CONTRACT FOR IMMEDIATE DELIVERY IN EMERGENCIES DUE TO UNFORESEEN CAUSES (INCLUDING BUT NOT LIMITED TO DELAYS IN TRANSPORTATION OR AN UNANTICIPATED INCREASE IN THE VOLUME OF WORK.)</p> <p>QUANTITIES: QUANTITIES LISTED IN THE REQUISITION ARE APPROXIMATIONS ONLY, BASED ON ESTIMATES SUPPLIED BY THE STATE SPENDING UNIT. IT IS UNDERSTOOD AND AGREED THAT THE CONTRACT SHALL COVER THE QUANTITIES ACTUALLY ORDERED FOR DELIVERY DURING THE TERM OF THE CONTRACT, WHETHER MORE OR LESS THAN THE QUANTITIES SHOWN.</p> <p>BANKRUPTCY: IN THE EVENT THE VENDOR/CONTRACTOR FILES FOR BANKRUPTCY PROTECTION, THE STATE MAY DEEM THE CONTRACT NULL AND VOID, AND TERMINATE SUCH CONTRACT WITHOUT FURTHER ORDER.</p> <p>THE TERMS AND CONDITIONS CONTAINED IN THIS CONTRACT SHALL SUPERSEDE ANY AND ALL SUBSEQUENT TERMS AND CONDITIONS WHICH MAY APPEAR ON ANY ATTACHED PRINTED DOCUMENTS SUCH AS PRICE LISTS, ORDER FORMS, SALES</p>						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE 231-941-2230	DATE JUNE 21, 2011
TITLE PRESIDENT	FEIN 38-3077785	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



State of West Virginia
 Department of Administration
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ADDRESS CORRESPONDENCE TO ATTENTION OF
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Great Lakes Environmental Center, Inc.
 739 Hastings Street
 Traverse City, MI 49686

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DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
05/26/2011				

BID OPENING DATE: 06/23/2011 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
<p>AGREEMENTS OR MAINTENANCE AGREEMENTS, INCLUDING ANY ELECTRONIC MEDIUM SUCH AS CD-ROM.</p> <p>REV. 05/26/2009</p> <p>NOTICE</p> <p>A SIGNED BID MUST BE SUBMITTED TO:</p> <p>DEPARTMENT OF ADMINISTRATION PURCHASING DIVISION BUILDING 15 2019 WASHINGTON STREET, EAST CHARLESTON, WV 25305-0130</p> <p>THE BID SHOULD CONTAIN THIS INFORMATION ON THE FACE OF THE ENVELOPE OR THE BID MAY NOT BE CONSIDERED:</p> <p>SEALED BID</p> <p>BUYER: CB-23</p> <p>RFQ. NO.: DEP15456</p> <p>BID OPENING DATE: 06/23/2011</p> <p>BID OPENING TIME: 1:30 PM</p> <p>PLEASE PROVIDE A FAX NUMBER IN CASE IT IS NECESSARY TO CONTACT YOU REGARDING YOUR BID:</p> <p>-----231-941-2240-----</p> <p>CONTACT PERSON (PLEASE PRINT CLEARLY):</p> <p>-----Dennis McCauley-----</p>						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE
<i>Dennis McCauley</i>	231-941-2230	JUNE 21, 2011

TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE
PRESIDENT	38-3077785	


WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

DEP15456
 BID SHEET

Item No.	Quantity	Description	Unit Price	Amount
A	500	Per sample un-sorted, identified to Genus level: 200-organism subsample	425	212,500
E	4	Per each "sample pick-up/delivery" not "per sample" (Assume 100 samples per pickup)	1,000	4,000
F	5 hr	Cost/hour for professional staff representation of data in legal/administrative setting	80	400

TOTAL = 216,900

Contractor: Great Lakes Environmental Center, Inc.

Signature: 

Date: June 21, 2011

Quantities listed on the bid schedule are for bid evaluation purposes only and are not a guarantee of quantities to be ordered over the life of the contract. Actual quantities ordered may be more or less than those stated on this schedule.

RFQ No. DEP15456

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

West Virginia Code §5A-3-10a states: No contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and the debt owned is an amount greater than one thousand dollars in the aggregate

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Debtor" means any individual, corporation, partnership, association, Limited Liability Company or any other form or business association owing a debt to the state or any of its political subdivisions. "Political subdivision" means any county commission; municipality; county board of education; any instrumentality established by a county or municipality; any separate corporation or instrumentality established by one or more counties or municipalities, as permitted by law; or any public body charged by law with the performance of a government function or whose jurisdiction is coextensive with one or more counties or municipalities. "Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

EXCEPTION: The prohibition of this section does not apply where a vendor has contested any tax administered pursuant to chapter eleven of this code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

Under penalty of law for false swearing (*West Virginia Code* §61-5-3), it is hereby certified that the vendor affirms and acknowledges the information in this affidavit and is in compliance with the requirements as stated.

WITNESS THE FOLLOWING SIGNATURE

Vendor's Name: Great Lakes Environmental Center, Inc.

Authorized Signature: *[Signature]* Date: June 21, 2011

State of Michigan

County of Grand Traverse, to-wit:

Taken, subscribed, and sworn to before me this 21st day of June, 2011.

My Commission expires Sept. 17th, 2015.

AFFIX SEAL HERE

NOTARY PUBLIC

[Signature: Gina M. Anderson]

GINA M. ANDERSON
Notary Public, State of Michigan
County of Grand Traverse
My Commission Expires Sep. 17, 2015
Acting in the County of Grand Traverse

PROPOSAL
FOR
PROCESSING AND IDENTIFICATION OF BENTHIC MACROINVERTEBRATE
SAMPLES COLLECTED
FROM WEST VIRGINIA WATERS

Prepared for:

State of West Virginia
West Virginia Department of Environmental Protection
Building 15
2019 Washington Street, East
Charleston, WV 25305-0130

Prepared by:



739 Hastings Street
Traverse City, Michigan 49686
Phone: (231) 941-2230
Facsimile: (231) 941-2240

Principal Contact Persons:

Mike Sergeant
msergeant@glec.com

Dennis McCauley
dmccauley@glec.com

June 22, 2011

INTRODUCTION AND STAFFING

The Benthic Team at Great Lakes Environmental Center, Inc. (GLEC) has broad experience collecting, sorting, identifying and enumerating macroinvertebrates from every region in the United States. The proposed Technical and Work Assignment Leader for this effort is Mike Sergeant. Mr. Sergeant has a M.S. in Zoology from Michigan State University and extensive experience as a benthic taxonomist while working at GLEC and in his previous positions as a contractor to the U.S. Environmental Protection Agency (EPA). He is North American Benthological Society (NABS) certified in Group 2 Eastern and Western EPT Taxa. Don McNew has a B.S. from the University of Michigan and will function as alternate technical and Work Assignment Leader. Mr. McNew is GLEC's senior taxonomist, has three NABS certifications and will provide oversight and guidance as well as production support for the proposed work. Charles Watson has a M.S. from East Tennessee State University and will add significant experience in benthic macroinvertebrates identification, especially in the taxonomy of chironomidae. Charles is NABS certified in four areas, including two areas relevant to this effort: Eastern EPT and Eastern Chironomidae. Sample processing tasks will be supported by Erica Bourdon, Natalie Sutherland, Amanda Sage and Michelle Lelli; each of these individuals has processed hundreds of benthic samples for identification by the GLEC benthic taxonomists.

A resume and copies of NABS certifications is provided for the taxonomists of the GLEC Benthic Team at the end of this document.

SUMMARY OF EXPERIENCE

GLEC has been collecting, sorting and identifying benthic organisms as part of various water quality studies for over 17 years. GLEC taxonomists have processed more than 4,000 benthic samples during that time period using a variety of protocols. Clients have included industrial firms, Indian tribes, the State of Michigan, the State of Delaware, the U.S. Department of Defense, and the EPA. A brief summary of major projects completed by GLEC is presented below.

- From 2009 to present, GLEC has processed over 400 benthic samples for the EPA's National Aquatic Resource Surveys (NARS) National River and Streams Assessment (NRSA). Sample identification has followed strict technical guidelines provided by EPA's Quality Assurance Project Plan (QAPP) and Laboratory Methods Manual. The samples identified were collected from all ecoregions of the conterminous United States and sub-sampled to 500 organisms. All organism types, including Chironomidae and Oligochaeta, are identified to genus level, where possible. Remote sampling in the various ecoregions required significant coordination for benthic sample preparation, shipment and tracking, as well as comprehensive database management of benthic invertebrate results. In general, subsampling is completed only when samples were estimated to contain greater than 500 individuals, and all identifications are taken to the lowest possible taxonomic level using a list of keys provided by EPA. Quality Assurance/Quality Control (QA/QC) of the sorting and identification was conducted on 10% of the samples. Results are added to a custom Access database, which will calculate appropriate population metrics.

- From 2004 to 2006, GLEC processed over 300 benthic samples for EPA's National Wadeable Streams Assessment (NWSA) phase of the NARS. The work was completed following strict technical guidelines outlined by EPA's QAPP and Benthic Methods Manual. GLEC field teams collected the majority of the samples. The macroinvertebrates from the 500-organism sub-samples, including Chironomidae, were identified to genus. The samples identified were collected from all ecoregions of the conterminous United States.
- For an industrial client, as part of research at an Experimental Stream Facility, GLEC analyzed over 1,500 benthic and drift samples from 1995 to 2000. The organisms were identified to the genus level.
- In 1997, GLEC's benthic lab analyzed over 140 samples from New Jersey lakes as part of a lake macroinvertebrate protocol being developed by EPA's Region II. The organisms were identified to species level, where practical.
- From 1993 to 1995, for EPA, GLEC analyzed over 450 benthic samples as part of the agency's Environmental Monitoring and Assessment Program (EMAP). The organisms were identified to the species level, where practical. The project included samples from Northeastern states.
- In 2001 and again in 2002, GLEC analyzed over 60 lake and stream samples for a northern Michigan Indian tribe. The macroinvertebrates were identified to the species level, where practical.

TAXONOMIC REFERENCES

The following list includes the literature utilized by the GLEC Benthic Team to process benthic macroinvertebrate samples. All of these resources are currently available to GLEC staff and are available to use under this effort. Additional literature will be purchased, if required.

GENERAL WORKS

Brigham, et al. 1982. Aquatic Insects and Oligochaetes of North and South Carolina. Mahomet, IL: Midwest Aquatic Enterprises.

Merritt, R. W. and K. W. Cummins. 1996. An introduction to the aquatic insects of North America. 4th Ed. Dubuque, Iowa: Kendall/Hunt Publishing Co. 1158 p.

Peckarsky, B et al. 1990. Freshwater Macroinvertebrates of Northeastern North America. Cornell University Press. 442 p.

Pennak, R. W. 1989. Freshwater Invertebrates of the United States. Protozoa to Mollusca. 3rd Ed. John Wiley & Sons. 628 p.

OLIGOCHAETA

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

Klemm, D.J. (ed.) 1985. A guide to the Freshwater Annelida (Polychaeta, Naidid and Tubificid Oligochaeta, and Hirudinea) of North America.

Hirudinea

Klemm, D.J. 1982. Leeches (Annelida: Hirudinea) of North American. USEPA Environmental Monitoring and Support Laboratory. EPA-600/3-82-025. 170 p.

CRUSTACEA

Amphipoda

Holsinger, J.R. 1976. The freshwater amphipod crustaceans (Gammaridae) of North America. USEPA Water Pollution Control Research Series 18050 ELDO4/72. 89 p.

Decapoda

Hobbs, H.H. 1972. Crayfishes (Astacidae) of North and Middle America. USEPA Water Pollution Control Research Series 18050 ELDO4/72. 173 p.

Isopoda

Williams, W.D. 1972. Freshwater Isopods of North America. USEPA Water Pollution Control Research Series 18050 ELDO4/72. 45 p.

MOLLUSCA

Sphaeriidae

Burch, J.B. 1975. Freshwater Sphaeriacean Clams (Mollusca: Pelycypoda) of North America. Hamburg MI: Malacological Publications. 96 p.

Mackie, G. L. et al. 1980. A Guide to Freshwater Mollusks of the Laurentian Great Lakes with special emphasis on the genus Pisidium. EPA 600/3-80-068.

Mackie, G. L. 2001. Key to the Sphaeriidae of North America. In: Taxonomy and Systematics of the Freshwater Mollusks of North America: an introduction. NABS Technical Information Workshop.

Gastropoda

Burch, J.B. 1982. Freshwater snails (Mollusca: Gastropoda) of North America. USEPLA EPA-600/3-82-026.

Mackie, G. L. et al. 1980. A Guide to Freshwater Mollusks of the Laurentian Great Lakes. EPA 600/3-80-068.

Taylor, D.W. 2003. Introduction to the Physidae (Gastropoda: Hygrophilia); Biogeography, Classification, Morphology. International Journal of Tropical Biology and Conservation: 51(Suppl.1). 290 p.

HYDRACARINA

Cook, D. R. Water mite genera and subgenera. Memoirs of the American Entomological Institute 21. 860 p.

INSECTA

Coleoptera

General

Epler, J. 1996. Identification manual for the water beetles of Florida. Florida Department of Environmental Protection.

Dytiscidae

Larsen, et al. 2000. Predaceous Diving Beetles (Coleoptera: Dytiscidae) of the Nearctic Region, with Emphasis on the Fauna of Canada and Alaska. Ottawa, NRC Research Press. 982 p.

Elmidae

Brown, H. P. 1972. Aquatic dryopoid beetles (Coleoptera) of the United States. Biota of freshwater ecosystems identification manual no. 6. Water Pollution Control Research series, USEPA. 82 p.

Hilsenhoff, W. L. 1973. Notes on *Dubiraphia* (Coleoptera: Elmidae) with descriptions of five new species. Annals of the Entomological Society of America 66(1): 55-61.

Hilsenhoff, W. L. and K. L. Schmude. 1992. Riffle Beetles of Wisconsin (Coleoptera: Dryopidae, Elmidae, Luthrichidae, Pspheidae) with notes on Distribution, Habitat, and Identification. The Great Lakes Entomologist: 25(3): 191-213.

Halplidae

Hilsenhoff, W. L. and W. U. Brigham. 1978. Crawling Water Beetles of Wisconsin (Coleoptera: Halplidae).

Hydrophilidae

Archangelsky, M. 1997. Studies on the biology, ecology, and systematics of the immature stages of new world Hydrophiloidea. (Coleoptera: Staphyliniformia). Bulletin of the Ohio Biological Survey (n.s.) 12. 207 p.

Hilsenhoff, W. L. 1995. Aquatic Hydrophilidae and Hydraenidae of Wisconsin (Coleoptera). Vol. I. Introduction, key to genera of adults, and distribution, habitat, life cycle and identification

of species of *Helophorus* Fabricius, *Hydrochus* Leach, and *Berosus* Leach. (Hydrophilidae and Hydraenidae).

Hilsenhoff, W. L. 1995. Aquatic Hydrophilidae and Hydraenidae of Wisconsin (Coleoptera). Vol. II. Introduction, key to genera of adults, and distribution, habitat, life cycle and identification of species of Hydrobini and Hydrophilini.

Diptera

General

McAlpine, et al. (eds.). 1981. Manual of Nearctic Diptera. Vol. 1. Research Branch, Agriculture Canada. Monograph 27. 674 p.

Chironomidae

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

Wiederhom, T. (ed.) Chironomidae of the Holarctic Region. Keys and diagnoses. Pt. 1 Larvae. Entomological Scandinavica Supplement 19. 457 p.

Wiederhom, T. (ed.) Chironomidae of the Holarctic Region. Keys and diagnoses. Pt. 2 Pupae. Entomological Scandinavica Supplement 28. 482 p.

Simuliidae

Adler, P. H. 1986. The blackflies of Pennsylvania (Simuliidae: Diptera) Bionomics, taxonomy, and distribution. Pennsylvania State University Agriculture Experiment Station Bulletin 856. 88 p.

Ephemeroptera

General

Edmunds, G. F. Jr. et al. 1976. The mayflies of North and Central America. Univ. of Minnesota Press. 330 p.

Baetidae

Lugo-Ortiz, C.R. et al. 1998. A new North American genus of Baetidae (Ephemeroptera) and key to *Baetis* complex. Entomological News 109 (5) 345-353.

Morihara, D.K. and W.P. McCafferty. 1979. The *Baetis* larvae of North America (Ephemeroptera: Baetidae). Transactions of the America Entomological Society 105 (2): 139-221.

McCafferty, W.P, R.D. Waltz, J.M. Webb, L.M Jacobus. 2005. Revision of Heterocleon McDunnough (Ephemeroptera: Baetidae). Journal of Insect Science. 5:35

Heptageniidae

Webb, J.M. and W.P McCafferty. 2008. Heptageniidae of the World. Part II: Key to the Genera. Canadian Journal of Arthropod Identification Number 7.

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Jacobius, L.M. and W.P MacCaffery. 2008. Revision of Ephemerellidae Genera (Ephemeroptera). Transactions of the American Entomological Society 134 185-274

Ephemeridae

McCafferty, W. P. 1975. The burrowing mayflies (Ephemeroptera: Ephemeroidea) of the United States. Transactions of the American Entomological Society 101: 447-504.

Hemiptera

General

Bobb, M. L. 1974. The aquatic and semi-aquatic Hemiptera of Virginia. Virginia Polytechnic Institute and State University Research Division Bulletin 87. 195 p.

Corixidae

Hungerford, H. B. 1977. Corixidae of the Western hemisphere. Los Angeles: Entomological Reprint Specialist. 827 p.

Gerridae

Hungerford, H. B. 1954. The Genus *Rheumatobates* Bergroth (Hemiptera: Gerridae). The Univ. of Kansas Science Bulletin 31 (7): 529-588.

Veliidae

Smith, C. L. and J. T. Polhemus. 1978. The Veliidae (Heteroptera) of America north of Mexico – Keys and checklist. Proceedings of the Entomological Society of Washington 80 (1): 56-68.

Plecoptera

Stewart, K. W. and B. P. Stark. 1988. Nymphs of North American Stonefly genera (Plecoptera) Denton, TX: University of North Texas Press. 460 p.

Stark, B.P., Kondratieff, R.F. Kirchner, & K.W. Stewart 2011. Larvae of Eight Eastern North American Sweltsa (Plecoptera: Chloroperlidae). Illiesia, 7(4) 51-64.

Stewart, K. W. and B.P. Stark. 2011. Further Descriptions of Western North American Podmosta larvae and their separation from Ostracerca larvae (Plecoptera: Nemouridae). Illiesia, 7(10): 104-117

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Odonata

Needham, J. G. et al. Dragonflies of North America. 2000 Scientific Publishers. 938 p.

Westfall, M. J. and M. L. May. 1996. Damselflies of North America. Scientific Publishers. 649 p.

Trichoptera

General

Wiggins, G. B. 1996. Larvae of the North American caddisfly genera (Trichoptera), 2nd ed. Univ. of Toronto Press. 457 p.

Brachycentridae

Flint, O. S. Jr. 1984. The genus *Brachycentrus* in North America, with a proposed phylogeny of the genera of Brachycentridae (Trichoptera). Smithsonian Contributions to Zoology 398.

Hydropsychidae

Schuster, G. and Etnier, D. A. 1978. A manual for the identification of the larvae of the caddisfly genera *Hydropsyche* and *Symphitopsyche* Ulmer in eastern and central North America (Trichoptera: Hydropsychidae). EPA 600/4-78-060.

Leptoceridae

Floyd, M. A. 1995. Larvae of the caddisfly genus *Oecetis* (Trichoptera: Leptoceridae) in North America. Bulletin of the Ohio Biological Survey (n.s.) 10 (3): 1- 85.

Glover, J. B. 1996. Larvae of the caddisfly genera *Triaenodes* and *Ylodes* (Trichoptera: Leptoceridae) in North America. Bulletin of the Ohio Biological Survey (n.s.) 11 (2): 1-89.

Haddock, J. D. 1977. The biosystematics of the caddisfly genus *Nectopsyche* in North America with emphasis on the aquatic stages. American Midland Naturalist 98: 382-421.

Resh, V. 1976. The biology and immature stages of the caddisfly genus *Ceraclea* in eastern North America (Trichoptera: Leptoceridae). Annals of the Entomological Society of America 69: 1039-1061.

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Parker, C.R. and G. B. Wiggins. 1987. Revision of the caddisfly genus *Psilotreta* (Trichoptera: Odontoceridae). Royal Ontario Museum Life Sciences Contributions 144. 56 p.

GLEC INTERNAL QA/QC PROCEDURE

The text below summarizes GLEC's internal QA/QC procedure for the processing of benthic samples in the GLEC Benthic Laboratory.

I. QUALITY CONTROL

- 1.1 Macroinvertebrate sorters and taxonomists will open and work on one sample at a time, to ensure that specimens from different samples are not mixed.
- 1.2 Sorting. For each sorter, the benthic coordinator will periodically check randomly selected sorted samples as follows:

- 1.2.1 The material labeled "sorted residue" will be re-sorted, in its entirety, and any organisms found will be removed, counted, and added to the sample for identification.

- 1.2.2 Sorting efficiency for each sample is calculated using the following formula:

$$\frac{a}{a + b} \times 100 = \text{Sorting Efficiency}$$

where: a = # of organisms originally sorted
b = # of additional organisms found during re-sorting

- 1.2.3 A sorting efficiency of greater than or equal to 90% is considered acceptable. If the sorting efficiency is greater than or equal to 80% but less than 90%, the following corrective action will be taken: 1) The sorter will be retrained and, 2) All subsequent samples sorted by the sorter will be checked until two consecutive samples pass. If the sorting efficiency is less than 80%, the corrective action will consist of 1) and 2) above and 3) All samples previously sorted by the sorter which have not already been checked will be re-sorted.
- 1.3 Identification. The project reference collection will be verified by two GLEC taxonomists. If necessary, questionable specimens will be sent to an outside expert for verification. In addition, if required by a work plan, a percentage of the samples (e.g. 10%) will be identified in duplicate by a second taxonomist. The two taxonomists will then consult with each other and rectify any differences in identifications and counts. If the verification process reveals that some specimens may have been misidentified, all potentially effected samples will be checked and corrections made.
- 1.4 Data entry. All sorting and identification data will be entered on an appropriate bench data sheet (Figures 1 and 2). Since the alcohol used to preserve samples can cause ink to run and data to be lost, pencil is used for data entry on the bench sheets. Data sheets are completely filled out and signed by both the sorter and taxonomist. Entries into the project logbook will be made in ink. Data in spreadsheet format will be re-checked

against the bench sheets to insure accuracy of the data entered. The benthic coordinator verifies the accuracy of the data before it is sent to the client.

DESCRIPTION OF PRODUCT

GLEC will supply the West Virginia Department of Environmental Protection (WV-DEP) with all data generated by GLEC in the form of an Excel spreadsheet or Access database table conforming to the specifications of WV-DEP. In addition, GLEC will provide a copy of all paper bench sheets used during the identification process. GLEC will also provide, at WV-DEP's request, a current listing of the specimens in the reference collection, and the specimens themselves, for verification purposes. The time frame for the delivery of these products will be finalized if GLEC is awarded the work and will be based on WV-DEP guidance.

RESUMES

Michael Sergeant

Education

M.S., Zoology, Michigan State University, 2005
B.A., Biology, Western Michigan University, 1994

Professional Experience

Invertebrate Taxonomist – Great Lakes Environmental Center. Identified and enumerated benthic macroinvertebrates from USEPA National Rivers and Streams Assessment to generic levels as prescribed by USEPA protocols. Maintained and improved laboratory data collection system on an as needed basis. Worked on field crew for MDEQ project identifying invertebrates in the field.

Selected Projects

National Rivers and Streams Assessment
National Coastal Wetlands Assessment-QA/QC samples
Little Traverse Bay Band of Odowa Indians

Invertebrate Taxonomist – Dynamac Corporation. Identified and enumerated benthic macroinvertebrates to lowest taxonomic level possible with a focus on the family Chironomidae for USEPA contractor. Developed, maintained and improved laboratory information management system on an as needed basis.

Headwater Intermittent Stream Survey
Temporality Integrated Monitoring of Ecosystems
Green River Kentucky Benthic Monitoring Program

Invertebrate Taxonomist – UES, Inc. Identified and enumerated benthic macroinvertebrates of all taxa, to lowest taxonomic level possible with a focus on the family Chironomidae for USEPA contractor. Developed and maintained a laboratory information management system in Microsoft Access.

Invertebrate Taxonomist – SoBran, Inc. Identified and enumerated benthic macroinvertebrates of all taxa to lowest taxonomic level possible with a focus on Chironomidae for USEPA contractor. Developed and maintained taxonomic database in Microsoft Access and created a database for Principal Investigators to calculate metrics of their choosing.

Aquatic Biologist – King & MacGregor Environmental, Inc. Conducted quantitative and qualitative macroinvertebrate and fish surveys as part of Environmental Assessments. Identified collected macroinvertebrates, including Chironomidae, to lowest taxonomic level possible. Assisted in wetland restoration efforts and an MDOT project determining the best way to control canary reed grass without using herbicides.

Aquatic Biologist – Kalamazoo Nature Center. Designed and implemented aquatic macroinvertebrate portion of property-wide bioinventory project. Identified over 200 different taxa, including Chironomidae, down to lowest taxonomic level. Sampled all ponds, lakes, streams and rivers on property using appropriate methods.

Invertebrate Taxonomist – PhycoTech, Inc. Identification of zooplankton and macroinvertebrates from both freshwater and marine systems to lowest possible taxonomic level. Instrumental in the development of online counting program by implementing taxonomic information for all invertebrate and algae found in North America, incorporation of weight regression coefficients for estimating macroinvertebrate weights and development of reporting database.

Research Assistant – Michigan State University. Researched the effects of copper sulfate on the benthic macroinvertebrate community of Lake Leelanau, Michigan. Determined avian schistosome infection prevalence in pulmonate snails. Investigated the avian schistosome densities in the water column. Coordinated with State agencies to obtain application permits.

Certifications

NABS Certified Taxonomist

- Group 2 East-Ephemeroptera, Plecoptera, Trichoptera
- Group 2 West-Ephemeroptera, Plecoptera, Trichoptera

Member NABS 2004- present

Certified Open Water SCUBA, Certified SSI 2000

Publications

Coady, N.R., Muzzall, P.M., Burton, T.M., Sinder, R.J., Saxton, J. Sergeant, M.L. Sommers, A. 2006 Ubiquitous Variability in the Prevalence of *Trichobilharzia stagnicola* (Schistosomatidae) infecting *Stagnicola emarginata* in Three Northern Michigan Lakes. J. Parasitology, 92(1): 10-15

Muzzall, P.M., Burton, T.M., Snider, R.J., Coady, N.R., Saxon J, Sergeant M. Swimmer's itch in Michigan: another outlook from Michigan State University, Part II. Michigan Riparian. August 2000: 13-15

Presentations

Sergeant, M.L., T.M. Burton, P.M. Muzzall, R.J. Snider. 2002. Effects of Copper Sulfate on Benthic Macroinvertebrate Populations in Lake Leelanau, Michigan. North American Lake Managers Society, National Conference, Anchorage, AK. October 2002

Charles Neil Watson, Jr.

Education

- 1985 MS, East Tennessee State University, Johnson City, TN, Biological Sciences
Thesis title: "The diet of predatory midge larvae (Diptera: Chironomidae) in the littoral zone of an east Tennessee lake"
- 1980 BS, East Tennessee State University, Johnson City, TN, Biological Sciences
- 1975 BA, Washington and Lee University, Lexington, VA, Sociology and Anthropology

Specialized Training

Graduate course work in Entomology and Aquatic Biology, including Insect Taxonomy, Morphology, Ecology, Aquatic Insects, and Limnology. Clemson University, Clemson, SC, 1987 – 1989.

Identification of Larval Chironomidae, Tech Aqua Research Station, Center Hill Lake TN, July 1980.

Professional Skills

Taxonomy – Experienced in the identification of all groups of North American aquatic invertebrates, especially Chironomidae; sample preparation; slide mounting; preparation of reference collections; use of taxonomic literature. NABS certified for eastern Chironomidae, eastern EPT taxa, eastern Other Taxa, and Oligochaeta.

Project Management - Faunal surveys and stream bioassessment projects.

Report preparation, presentations, and publication.

Professional Experience

- 7/06 – Present Dynamac Corporation. Macroinvertebrate Taxonomist, supporting USEPA Office of Research and Development (ORD) projects. Identification of aquatic invertebrates from all regions of North America, development of procedures for identification and sample processing, data entry, QA/QC, train new taxonomists, prepare and maintain annotated list of taxonomic literature used for identifications.
- 10/05 – 6/06 UES, Inc., Dayton, OH. Macroinvertebrate Taxonomist. Duties same as above.
- 03/00 – 10/05 SoBran, Inc., Dayton, OH. Macroinvertebrate Taxonomist. Duties same as above.

- 08/94 - 03/00 Aquatic Resources Center, Franklin, TN. Project Biologist. Identification of aquatic invertebrates, project management for stream bioassessment and endangered species surveys, report writing, fieldwork.
- 10/90 - 08/94 Clemson University, Clemson, SC. Entomologist I. Laboratory and field work in support of Corn Earworm (Lepidoptera: Noctuidae) and Black Fly (Diptera: Simuliidae) research projects.
- 01/90 - 10/90 Plant Problem Clinic, Clemson University, Clemson, SC. Taxonomist. Identification of insect house and garden pests.
- 05/87 - present Private consultant. Aquatic invertebrate ID for a variety of clients, including private companies, academic researchers and state agencies.
- 01/87 - 10/90 Clemson University, Clemson, SC. Curatorial and teaching assistant.
- 06/84 - 12/86 East Tennessee State University, Johnson City, TN. Research Technician. Identifications, field work, report writing and presentation, data entry.
- 01/81 - 06/84 East Tennessee State University, Johnson City, TN. Graduate Assistant. Lab and field work in support of aquatic ecology research projects.

Professional Affiliations

Freshwater Mollusk Conservation Society, Kentucky Lepidopterist Society, Society for Freshwater Science.

Publications

Johnson, D. M.; P. H. Crowley; R. E. Bohanan; C. N. Watson and T. H. Martin. 1985. Coexistence of *Enallagma divagans* and *E. traviatum* (Zygoptera: Coenagrionidae) in BaysMountain Lake. *Advances in Odonatology* 2:57 - 70.

_____. 1985. Competition among larval dragonflies: an in situ enclosure experiment. *Ecology* 66: 119 - 128.

Johnson, D. M.; C. L. Pierce; T. H. Martin; C. N. Watson; R. E. Bohanan and P. H. Crowley. 1987. Prey depletion by odonate larvae: combining evidence from multiple field experiments. *Ecology* 68: 1459 - 1465.

Johnson, D. M.; C. N. Watson; T. Forsythe and C. N. Boehms. 1988. Larval damselfly coexistence with green sunfish. In D. H. Snyder, (ed.). *Proceedings of the first annual symposium on the natural history of the lower Tennessee and Cumberland River valleys*. Austin Peay State University; Clarksville, TN.

Watson, C. N. and J. H. Hyatt. 1988. Butterflies of northeast Tennessee. *Journal of the Lepidopterist Society* 42(1): 19-31.

Watson, C. N. and M. W. Hein. 1993. A preliminary survey of the Chironomidae of Costa Rica, with emphasis on the lotic fauna. *Netherlands Journal of Aquatic Ecology* 26(2-4): 257 - 262.

Adler, P. H.; S. R. Reitz and C. N. Watson. 1997. Distribution and abundance of *Eulonchus marialicae* (Diptera: Acroceridae) *Entomological News* 108 (3): 190-192.

Watson, C. N. 1999. Description of the larva of *Apsectrotanypus algens* (Coquillett) with a review of the generic placement of the species (Diptera: Chironomidae). *Journal of the Kansas Entomological Society* 71(3): 241-246.

Watson, C. N. 2001. Results of a survey for selected species of Hydrobiidae (Gastropoda) in Georgia and Florida, pp. 234 – 244. In: Tankersley, R. A.; D. I Warmolts; G. T. Watters; B. J. Armitage; P. D. Johnson and R. S. Butler (eds.). *Freshwater Mollusk Symposium Proceedings*. Ohio Biological Survey, Columbus, Ohio. 274 p.

Niitsuma, H. and C. N. Watson. 2009. *Bilyjomyia*, a new genus of the tribe Macropelopiini from the Holarctic (Diptera: Chironomidae). *Zootaxa* 2166: 57- 68.

Spies, M., J. Epler, T. Andersen and C. N. Watson. 2009. Family Chironomidae, pp. 437- 480. In: Brown, B.V. et al. (eds.), *Manual of Central American Diptera: Volume I*. NRC Research Press, Ottawa, Ontario, Canada. 714 pp.

Watson, C. N. 2010. The female of *Bethbilbeckia floridensis* Fittkau, 1988 with a review of the genus (Diptera: Chironomidae), pp. 334-341. In: Ferrington, L. C., Jr. (ed.). *Proceedings of the XV International Symposium on the Chironomidae*. Chironomidae Research Group, University of Minnesota, St. Paul, Minnesota 385 pp. +viii

Donald McNew

Education

B.S. University of Michigan School of Natural Resources, 1974.

Qualifications

Mr. McNew has over 25 years experience in the field of environmental science. Technical experience includes employment as a laboratory and a field technician relating to water resources, as well as project management experience. While employed as a park naturalist for many years, he gained considerable knowledge of the biology and taxonomy of the Great Lakes region's fauna and flora. He is especially skilled in the identification and ecology of plants, birds, wildlife, and benthic macroinvertebrates. This has enabled him to function as a key staff person in conducting ecological inventories and biological assessments as well as to serve as GLEC's benthic coordinator.

Relevant Experience

Benthic Taxonomy. For the past 15 years at Great Lakes Environmental Center, Mr. McNew has supervised the analysis of over 4500 benthic samples from rivers and lakes as part of various water quality projects. U.S. Environmental Protection Agency (EPA) projects include the *Wadeable Streams Assessment (WSA)* in 2004-2006 and the *Nation's Rivers and Streams Assessment (NRSA)* in 2009-2010. Other clients include the U.S. Department of Defense, the State of Michigan, Indian tribes, and various industrial clients. Mr. McNew is responsible for coordinating all aspects of processing benthic samples at Great Lakes Environmental Center including sorting, identification, data management, and quality control. Mr. McNew holds three certifications from the taxonomic certification program sponsored by the North American Benthological Society (NABS).

Biological Assessments. At Great Lakes Environmental Center, Mr. McNew has conducted field studies and literature searches during the preparation of numerous biological assessments. He has been the principal author of several assessments regarding communications towers and their impacts on migrating birds. He has also assisted in the preparation of assessments relating to the relicensing of hydroelectric facilities by providing expertise on impacts to wildlife. Most recently, in 2008, Mr. McNew assisted with a biological assessment for EPA regarding the effect of ship discharges on endangered species.

Mercury Sampling. In 2001 and 2002, for the State of Michigan, Mr. McNew trained and coordinated sampling crews from GLEC and two subcontractors to sample for low level mercury in lakes and streams across the entire state. Samples were collected using "clean" sampling techniques. Lake samples were collected from the surface and from near the bottom using a peristaltic pump. Samples were also collected to measure various other water quality parameters. Mr. McNew wrote an extensive report, which compiled the results and summarized findings.

Monitoring of Drinking Water. In 2000-2004 and again in 2007-2010, Mr. McNew played several roles in GLEC's support of EPA's *Unregulated Contaminant Monitoring*

Regulation Program. He assisted with the design of the several different sample collections kits that were distributed to small public water systems (PWS) across the county and wrote the sampling instructions for all sample kits used in the program. In addition, he wrote the scripts and coordinated the production of two instructional videos (for List 1 and *Aeromonas* sampling) that were distributed to PWS's. For *Aeromonas* sampling, he procured and tested the instruments contained in a Water Quality Measurement kit, which was used by PWS sampling personnel to measure pH, chlorine, and temperature.

Pesticide Monitoring. In 2003, Mr. New played a key role as GLEC provided support for USDA's Science and Technology Pesticide Data Program. As part of a program that monitored for the presence of Triazole pesticides in 5 food commodities, he supervised the design and testing of kits for the shipping of small quantities of bananas, grapes, peanut butter, milk, and eggs. The kits were specifically designed for each food item to insure they would arrive at the testing laboratories in suitable condition. Mr. McNew also wrote instructions for each kit describing how the food items were to be packed and worked closely with the county agents in California who collected, packed, and shipped the commodities. Following a sampling schedule established by USDA, he supervised the distribution the kits.

Ecological Surveys. Mr. McNew has participated in a number of ecological surveys in which he has observed and cataloged birds, mammals, reptiles, amphibians, and plants. At Great Lakes Environmental Center, projects include surveying waterfowl and breeding birds at hydroelectric reservoirs in Wisconsin and Michigan and conducting ecological inventories for land conservancies in Michigan. Mr. McNew also participated in ecological surveys while employed at Sleeping Bear Dunes National Lakeshore, Empire, Michigan. He recorded observations of significant species and updated the Lakeshore's official bird checklist.

Resource Management Plans. For a northern Michigan land conservancy, Mr. McNew co-authored management plans for several conservancy properties. Following detailed ecological inventories, the plans were developed to balance the conservancy's goals regarding use by the public and the preservation of significant resources.

Aquatic Toxicology. At Great Lakes Environmental Center, Mr. McNew has been involved in a variety of laboratory and field-based water quality tasks. He has cultured test organisms, conducted aquatic toxicity tests with those organisms, and performed effluent manipulations for industrial and municipal toxicity identification evaluations (TIEs). He has also been a key member of field teams, sampling a variety of chemical, physical, and biological parameters.

Natural History Interpretation. While with the National Park Service at Sleeping Bear Dunes National Lakeshore, Mr. McNew researched and presented programs to the public which interpreted the biological, geological, and historical resources of the park.

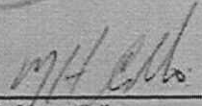
TAXONOMIC CERTIFICATION

This five year certification is awarded to

CHARLES WATSON

*In recognition of excellence for specimen identification to Genus for
Eastern Chironomidae*

NORTH AMERICAN BENTHOLOGICAL SOCIETY


Dr. Murray Colbo

May, 2016
Date of Expiry


TAXONOMIC CERTIFICATION

This certificate is awarded to

CHARLES WATSON

in recognition of the successful completion for
LEVEL 2 GROUP 1 EASTERN OTHER ARTHOPODS

NORTH AMERICAN BENTHOLOGICAL SOCIETY



Dr. Trevor Reynoldson

June 1, 2007
Date

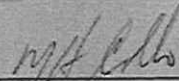
TAXONOMIC CERTIFICATION

This five year certification is awarded to

CHARLES WATSON

*In recognition of excellence for specimen identification to Genus for
Eastern Ephemeroptera, Plecoptera & Trichoptera*

NORTH AMERICAN BENTHOLOGICAL SOCIETY


Dr. Murray Colbo

May 2016
Date of Expiry

TAXONOMIC CERTIFICATION


This five year certification is awarded to

CHARLES WATSON

In recognition of excellence for specimen identification to Genus for

Oligochaeta

NORTH AMERICAN BENTHOLOGICAL SOCIETY



Dr. Murray Colbo

June, 2016
Date of Expiry

TAXONOMIC CERTIFICATION

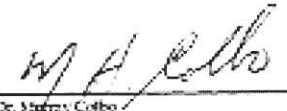
This certificate is awarded to

DONALD MCNEW

In recognition of excellence for specimen identification to Genus

Eastern Arthropods

NORTH AMERICAN BENTHOLOGICAL SOCIETY


Dr. Jeffrey Colbo

Date: June 2002

TAXONOMIC CERTIFICATION

This certificate is awarded to

DONALD MCNEW

in recognition of the successful completion for

LEVEL 2 GROUP 2 EASTERN EPHEMEROPTERA, PLECOPTERA and TRICHOPTERA

NORTH AMERICAN BENTHOLOGICAL SOCIETY



Dr. E. For Reynoldson

June 1, 2007
Date

TAXONOMIC CERTIFICATION

This certificate is awarded to

DONALD MCNEW

in recognition of the successful completion for

LEVEL 2 GROUP 2 EASTERN EPHEMEROPTERA, PLECOPTERA and TRICHOPTERA

NORTH AMERICAN BENTHOLOGICAL SOCIETY



Dr. Victor Reynoldson

June 1, 2007
Date

TAXONOMIC CERTIFICATION

This five year certification is awarded to

MICHAEL SERGEANT

In recognition of excellence for specimen identification to Genus for

Western

Ephemeroptera, Plecoptera & Trichoptera

NORTH AMERICAN BENTHOLOGICAL SOCIETY




Dr. Murray Colbo

June 2016
Date of Expiry

TAXONOMIC CERTIFICATION

This five year certification is awarded to

MICHAEL SERGEANT

In recognition of excellence for specimen identification to Genus for

*Western
Ephemeroptera, Plecoptera & Trichoptera*

NORTH AMERICAN BENTHOLOGICAL SOCIETY





Dr. Murray Colbo

June 2016
Date of Expiry