



CHRISTOPHER F. WRIGHT
CR Environmental, Inc. August 1999 to present
Years with Other Firms: 7
Citizenship: U.S.A.
Current Security Clearance: TWIC card

CERTIFIED HYDROGRAPHER
ECOLOGIST/ AQUATIC BIOLOGIST
ENVIRONMENTAL RISK ASSESSOR
GIS MAPPING / NAVIGATION
BIOLOGICAL STATISTICIAN

AREAS OF SPECIALIZATION

- Hydrographic Survey and Data Interpretation/QC, Sub-bottom, Side-scan and Magnetometer surveys
- Freshwater Macroinvertebrate Taxonomy and Ecology
- Ecological Risk Assessment
- GIS Mapping of Geophysical Data and Development of Bottom Classification Maps
- Eutrophication Evaluations

EDUCATION

- 2011 NSPS/ACSM Hydrographer Certification (April 25, 2011)
- 2010 Quester Tangent training Oct 26th URI School of Oceanography - Jon Preston primary developer QTC
- 2010 HYPACK Certification and HYSWEEP Multibeam Bathymetric System Certification October 13, 2010
- 2007 Univ. of New Hampshire CCOM-JHC/UNB OMG 43rd Shallow Water Multibeam Training Course (NOAA & The Hydrographic Society of America), Norfolk, VA
- 1994-98 Post-baccalaureate Limnology, Soil Mapping & Morphology, Wetlands Ecology, Environmental Microbiology
- 1995-present OSHA 40-Hour HAZWOPER Training (per 29 CFR 1910.120), Supervisor's Training and yearly 8-hr refresher courses. CPR and First Aid with AED
- 1994 UMASS at Lowell, B.A., cum Laude in Environmental Science (Conc. Biology), Award for Outstanding Achievement in Environmental Science, Sigma Gamma Epsilon Honor Society (Earth Science)

INSTRUMENTATION & SOFTWARE EXPERIENCE

- Multibeam bathymetric systems (All)
- Single beam systems & side-scan sonar systems (Edgetech, SyQwest, ODOM, Reson, Kongsberg, Marine Sonics, Klein)
- Sub-bottom profiling systems (Edgetech systems, Benthos CHIRP and SyQwest profilers)
- Swath bathymetry systems (GeoAcoustics)
- Magnetometers (Marine Magnetics, Geometrics)
- Acoustic Doppler Current Profilers (Sontek, TSS RDI)
- Side scan & Sub-Bottom sonar software (Chesapeake, HYPACK/Geocoder)
- GPS Systems and Software
- HYPACK, HYSweep Certified, Surfer, IVS3D Fledermaus, certified ESRI ArcView (GIS)

PROFESSIONAL AFFILIATIONS

- Hydrographic Society of America
- Massachusetts LSP Association

WORK HISTORY

- CR Environmental, Inc., E. Falmouth, MA Aug 1999 - present
- GZA GeoEnvironmental, Inc., Newton Upper Falls, MA Nov 1994 - Dec. 2000
- Veryfine Corporation (U. Mass. Lowell Research Foundation), Westford, MA May 1993 - Nov. 1993
- Mass. Department of Environmental Protection, Water Supply Division June 1992 - Oct. 1992

SUMMARY OF PROFESSIONAL EXPERIENCE

Mr. Wright is an environmental scientist with over twenty years of technical experience in hydrography and aquatic geophysical surveys, ecological risk assessments, water quality investigations, macroinvertebrate diversity studies/taxonomy, and eutrophication investigations. He works on aquatic mapping and remote sensing projects, ecological risk assessments and wetlands investigations. Mr. Wright has designed, planned and conducted over one hundred freshwater and marine hydrographic and geophysical surveys, most with engineering, ecological or archaeological components. These projects include major waterways on both U.S. coasts as well as scores of reservoirs, lakes and wetlands. His primary professional

interest is the integration of marine remote sensing technologies to shallow-water ecological investigations.

Recent activities include: hydrographic and geophysical surveys of the Coniwingo Reservoir in Pennsylvania, multibeam surveys of Army Corps of Engineers DAMOS sites in Connecticut, Maine and Massachusetts; multibeam and geophysical surveys of a tidal energy project in the Bay of Fundy; characterization of 1,000 square km of seafloor off the coast of Trinidad using QTC single-beam and side scan sonar; pre- and post-construction bathymetric surveys of the Colorado River directly downstream of the Hoover Dam; ecological risk assessments of dioxin laden sediment at a former mill in northwestern MA, and bathymetry and geophysical survey of several reaches of the CT River contaminated with coal tar. Mr. Wright is responsible for quality control in the production of CR's environmental/oceanographic maps and GIS/CAD/WWW deliverables.

REPRESENTATIVE PROJECT EXPERIENCE

Lead Hydrographer, Comcast/NSTAR Martha's Vineyard Hybrid Cable Project. Designed and executed surveys for the first submarine cable project reviewed under the Massachusetts Ocean Management Plan. Conducted comprehensive marine surveys and sampling consisting of multi-beam bathymetry, multi-beam side-scan sonar, sub-bottom seismic, magnetometer, underwater video, and sediment sampling. At key milestones in the project development and permitting, made presentations to the local, state, and federal regulatory agencies.

Lead Hydrographer, Deepwater Wind - Block Island Wind Farm. Conducted high resolution multibeam sonar surveys during planning, construction and completion phases of the wind farm to accurately map impacts to sensitive hard-bottom habitats. Documented impacts in near real-time to guide subsequent video and still camera inspections.

Hydrographer/Data Specialist, Neptune LNG Pipeline Monitoring Surveys, 2008-2011, Massachusetts Bay, MA. The project objectives were to document potential impacts to benthic habitats and diversity associated with the installation of a thirteen-mile long pipeline. Backscatter extracted from side scan sonar was modeled and correlated with sediment texture from grab samples, allowing quantitative comparison of backscatter time series. Combined with data from benthic biological samples, video observations and SPI imagery, the analysis demonstrated negligible impacts to benthic habitats.

Certified Hydrographer, U.S. Army Corps of Engineers New England District, DAMOS. Supported DAMOSVision LLC of which CR Environmental was a partner, and ENSR/AECOM and Battelle contracts with the NED U.S. Army Corps of Engineers under the DAMOS and Environmental Services Program. Since 2003, hydrographer in charge of ACOE NAE Disposal Area Monitoring System (DAMOS) inspections of offshore disposal sites and inshore CAD cells from Connecticut to Maine. Projects include monitoring of CAD cells, capped contaminated sediment deposits and other offshore disposal sites using high resolution multibeam sonar and other remote sensing instrumentation. The monitoring efforts require high spatial accuracy to allow meaningful comparisons between time series of survey data. Side scan data and modeled backscatter from multibeam sonar systems allow detailed mapping of the extent of veneers of disposed material which would otherwise be non-detectable using bathymetric data.

Certified Hydrographer, U. S. Army Corps of Engineers, NY District, Historic Area Remediation Site (HARS) Monitoring. Since 2013, conducted annual multibeam monitoring surveys of the 25 square mile Historic Area Remediation Site in NY Bight. Survey challenges include highly variable water column sound velocity due to freshwater inputs from the Hudson River and severe sea states. Data for each of these >1,000 line mile surveys has been processed, interpreted and delivered within 30 days of survey completion.

Project Manager, Evaluation of Nutrient Budget & Eutrophication Potential Long Sought for Pond, Westford, MA Conducted a two-year water quality evaluation of a glacial pond, including in situ measurements of several biological and chemical parameters, deep-core sediment sampling, historical analysis of lake conditions using diatom remains in sediment, and in-depth hydrological analysis. The aim of the project was to evaluate the potential for adverse impacts due to non-point source phosphorus inputs. The mass balance calculations presented in the report demonstrated potential risk of eutrophication due to phosphorus inputs. In a follow up investigation, he evaluated the current 2005 phosphorus loading for LSFP and expected water quality improvements following upgrade of wastewater treatment in the watershed.

Certified Hydrographer, Blackburn & Union Privileges Superfund Site, Walpole, MA Responsible for bathymetry and current measurements that were used along with CR sediment depth characterizations in the Lewis Pond reach of the Neponset River for use in planning dredge operations and site remediation by Woodard & Curran.

Certified Hydrographer, DSNY Southwest Brooklyn MTS, NYC

Conducted side scan sonar, sub-bottom and underwater video confirmation to identify the limits of cobble/riprap at the DSNY southwest Brooklyn Marine Transfer Station for HDR.

Certified Hydrographer. New Bedford Harbor Superfund Site Confirmatory Bathymetry/Marine Archaeological Surveys. Responsible for ongoing QA/QC and oversight of biweekly confirmatory bathymetry surveys for dredge volume calculations by Jacobs the contractor for NED-ACOE. Also conducted side-scan sonar, magnetometry and subbottom profiling for archaeological investigations for CR with DSRA. Currently conducting a multibeam survey of the Upper Harbor.

Lead Hydrographer, Ocean Renewable Power Company, LLC Bay of Fundy Tide Turbine Generation Projects.

Designed and executed clearance and engineering surveys of Cobscook Bay and the Western Passage using multibeam and single-beam bathymetry, side scan sonar, marine magnetics and sub-bottom profiling systems. Surveys were designed to address engineering, ecological and archaeological data requirements.

Certified Hydrographer, Newtown Creek Superfund Site, NYC, NY

Performed hydrographic and geophysical surveys of the Newtown Creek Phase 1 Remedial Investigation Study Area in Brooklyn and Queens, New York. Bathymetric surveys included multibeam, single beam, side scan, and sub bottom sonar. The collected data were processed and results delivered as GIS and CAD compatible products. The data provided Anchor QEA information needed to plan and more safely conduct upcoming sampling investigations. The most recent post-Sandy data suggested widespread distribution of anthropogenic debris in the Newtown Creek Study Area much of which may pose a hazard to navigation or sampling. Many submerged structures and obstructions were detected in previously dredged navigation channels.

Data Processing, Trinidad, Caribbean British Commonwealth

CR developed benthic habitat and bathymetric maps in the Gulf of Paria and off the eastern and southern coasts of Trinidad, of more than 1,000 square kilometers of the seafloor. The mapping effort was conducted to assist with avoidance and mitigation of disturbance to reef complexes associated with energy exploration and production. CR's approach to processing and analyzing was a multifaceted in that it utilized data collected with QTC-V single-beam based backscatter system, high-frequency side scan sonar, video sled recordings, and bottom grabs.

Field Manager/Senior Hydrographer, Susquehanna River / Conowingo Reservoir FERC Re-Licensing Investigations.

In 2010, under contract to Gomez & Sullivan, Inc. and directed by URS, Mr. Wright designed and implemented bathymetric and side scan sonar surveys to support re-licensing of the Conowingo Dam Hydroelectric Plant. Survey objectives included mapping bathymetry, sediment type and the distribution of aquatic vegetation along near shore portions of this 11-mile long impoundment. Data acquisition is complete and final data analysis is underway.

Field Manager / Senior Hydrographer, Colorado River/Hoover Dam Bathymetric Surveys.

Under contract to Ladd Construction, Inc., CR was charged with conducting pre- and post-construction bathymetric surveys of a reach of the Colorado River immediately downstream of the Hoover Dam, beneath the alignment of the new Hoover Dam Bypass Bridge which spans the Black Canyon between Arizona and Nevada. The goal of the surveys, conducted in 2005 and 2006, was to model the volume of material deposited in the river during blasting of the canyon walls for construction of anchoring structures. Project challenges included navigation to the Site from a launching point about 14 miles downstream, overcoming positioning uncertainty associated with work deep in the Canyon, and acquisition of reliable soundings in the highly irregular currents and variable depths below the Hoover Dam. Mr. Wright designed and executed a precision single-beam bathymetric survey which met the Project's needs and presented volume calculations which documented the relatively small volume of construction-related debris deposition. All work was approved by Project Engineers, the U.S. FHA and the BLM.

Field Manager/Lead Hydrographer, Bathymetric/sub-bottom Surveys, Benthic Flux and Sediment Evaluation, New York City DEP Reservoirs, Catskill and Delaware Watersheds GIS/MAPS Contract.

(Ashokan, Schoharie, Cannonsville, Pepacton, Neversink, Rondout, and West Branch Reservoirs)

Worked for GZA and then CR Environmental, Inc. on an EPA mandated ~\$620K eutrophication and hydrological study of seven large NYC reservoirs in the Catskill/Delaware range. Utilized state-of-the-science sampling methods, high-precision bathymetry and geophysical sub-bottom mapping to characterize nutrient dynamics and storage loss. Managed a field/lab staff of seven technicians and subcontractors during this five-month field effort, which was completed under budget and ahead of schedule. Directed the collection and analysis of ~1,000 sediment box core and grab samples, field-laboratory sediment oxygen demand and phosphorus-flux microcosm cores, generation of bathymetric and sediment isopach maps, and development of GIS DEMs for client.

Project Manager, Evaluation of Nutrient Budget & Eutrophication Potential Long Sought for Pond, Westford, MA

Conducted a two-year water quality evaluation of a glacial pond, including in situ measurements of several biological and chemical parameters, deep-core sediment sampling, historical analysis of lake conditions using diatom remains in sediment, and in-depth hydrological analysis. The aim of the project was to evaluate the potential for adverse impacts due to non-point source phosphorus inputs. The mass balance calculations presented in the report demonstrated potential risk of eutrophication due to phosphorus inputs. In a follow up investigation, he evaluated the current 2005 phosphorus loading for LSFP and expected water quality improvements following upgrade of wastewater treatment in the watershed.

Hydrographer, New York City DEP Reservoir Dredge Feasibility Studies.

Conducted high precision bathymetric surveys, side-scan and low-frequency sub-bottom sonar surveys, and magnetometer surveys of portions of the Ashokan and Schoharie Reservoirs to map sediment accumulation and identify underwater structures of interest to project engineers. Responsible for all data processing, map production, and report preparation. Later conducted bathymetric, ADCP measurements, and sub-bottom on the Kensico Reservoir for an alum investigation.

Field Manager / Senior Hydrographer, Penobscot River Restoration Project Studies: Great Works and Veazie Dam Removal; Howland Bypass Channel.

In 2007, under contract to Kleinschmidt Associates and the Penobscot River Restoration Trust's, CR and Mr. Wright supported FERC license transfer applications and NEPA analyses by documenting riverbed morphology and substrate composition in four river reaches which would be effected by removal or bypass of three dams. Project challenges included limited access, navigation in swift currents and acquisition of defensible data in very shallow water. Mr. Wright designed and implemented all aspects of the surveys and data analysis, which included 200-kHz bathymetric data, 500-kHz side scan sonar data, and 10-kHz sub-bottom sonar data. Extensive underwater video recordings were used to verify observations and to aid selection of appropriate sediment sample locations. Analysis of survey data required documentation of river gradients at each reach, and detailed analysis of tidal influence on river gradients below Veazie Dam. Hydrographic, geophysical and video data were analyzed using GIS. Maps classifying substrate composition were produced and provided in GIS format. Side scan sonar mosaics were created using a resolution of 10-cm. Models and maps representing bathymetry at 1.0 foot contour intervals were produced and delivered in CAD and GIS formats.

Field Manager / Senior Hydrographer, Bathymetric, Geophysical and Current Surveys of the Connecticut River near Holyoke, MA.

CR performed repeated surveys of a 3.5 mile long reach of the Connecticut River potentially impacted by historical coal tar releases for AECOM in 2008 and 2009. Survey components included bathymetry, side scan sonar, sub bottom sonar, and acoustic Doppler current profiling. High-resolution surface models, mosaics and maps of acoustic backscatter have been used to characterize benthic habitat structure and to identify the presence of coal tar on the riverbed. Advanced statistical analyses of sonar backscatter data were conducted using GeoCoder and QTC Sideview software to produce quantitative maps of habitat class distribution in potentially impacted reaches of the riverbed.

Field Manager / Senior Hydrographer, NOAA/NMFS Essential Fish Habitat Hydrographic & Geophysical Surveys.

The objectives of this project were to locate areas known by the fishing industry to support high fish productivity and then evaluate the physical and biological attributes of these sites to gain some insight as to why the areas might be considered essential fish habitat. Two sites were chosen based on the recommendations of fishermen and geophysical characteristics. These sites were surveyed using swath bathymetry, towed side scan sonar, sub-bottom profiling sonar, and CR's video sled. Mr. Wright was responsible for survey design, data acquisition & processing, and integration of all data into a coherent GIS database.

Field Manager / Senior Hydrographer, Lower Fox River Side Scan Sonar Archaeological Survey, De Pere, Wisconsin.

Under contract to Shaw Environmental, Inc., CR & Mr. Wright performed a pre-dredge side scan sonar survey of a very shallow Operable Unit in the Lower Fox River. Although water depths rarely exceeded two feet, an unconventional deployment of the towfish allowed reliable target identification and substrate characterization to about 10m range.

Field Manager / Senior Hydrographer, Hydrographic & Geophysical Surveys Supporting the East River Tide-Energy Project.

Between 2005 and 2006, Mr. Wright has led CR teams conducting bathymetric, side scan sonar and sub-bottom sonar surveys of the East River, NYC in support of the siting and installation of generation turbines for the initial pilot demonstration phase of this project. Other work is currently scheduled for expansion of the survey area in 2007.

Field Manager / Senior Hydrographer, "The Lake" at Central Park, NYC Hydrographic & Geophysical Surveys. As part of the New York City Central Park Conservancy's effort to restore The Lake, Mr. Wright lead a CR team which mapped the water depth and sediment thickness of this shallow urban pond.

Field Manager / Senior Hydrographer, Quinnipiac River Hydrographic & Geophysical Surveys. Under contract to URS, Inc., Mr. Wright led a survey team charged with measuring scour beneath an I-95 overpass in support of bridge design efforts, locating sub-sediment utilities, and exploration of the sub-surface along a proposed large utility alignment. Detailed bathymetric maps, side scan sonar mosaics and maps of magnetic anomalies were provided to project engineers shortly after completion of the field work.

Project Ecologist, Former Rutland State Hospital MCP Site, Rutland, Massachusetts. Designed and implemented a comprehensive Stage II Ecological Risk Characterization (per Massachusetts MCP) to address potential impacts to a stream and wetland exposed to several heavy metals. Using a triad approach to sediment quality assessment (bulk toxicity testing, AVS/SEM analysis & macroinvertebrate bioassessments), the ERC conclusively demonstrated that metals were unlikely to harm receptor organisms.

Project Ecologist/Taxonomist, Hampshire Chemical Company, Nashua, New Hampshire. Assisted in the design and implementation of a comprehensive ecological risk characterization program for the Merrimack River. The project was designed to evaluate potential impacts to fishery resources. The study incorporated extensive sampling of sediment boundary layer water, sediments and three rounds of quantitative and qualitative benthic macroinvertebrate sampling. The natural substrate of the river was sampled for invertebrates using a custom built dredge. Artificial substrates (rock baskets) designed to eliminate substrate variability were deployed at the river bottom, and grab samples were collected from near shore areas. As the principal invertebrate taxonomist/ecologist for the project, Mr. Wright met or exceeded EPA Science Advisory Board recommendations for taxonomic resolution. The project demonstrated that site-related impacts to fishery resources in the Merrimack River were unlikely.

Project Manager, Evaluation of Nutrient Budget & Eutrophication Potential Long Sought for Pond, Westford, MA. Conducted a two-year water quality evaluation of a glacial pond, including in situ measurements of several biological and chemical parameters, deep-core sediment sampling, historical analysis of lake conditions using diatom remains in sediment, and in-depth hydrological analysis. The aim of the project was to evaluate the potential for adverse impacts due to non-point source phosphorus inputs. The mass balance calculations presented in the report demonstrated potential risk of eutrophication due to phosphorus inputs.

Assistant Hydrographer/Sonar Technician, Jamaica Bay Bottom Classification & Mapping, Long Island, NY. Responsible for producing scaled plans from multi-beam sonar data, digital sidescan sonar mosaics, and bottom classification maps for the NY ACE.

Project Hydrographer & Limnologist, Lake Quinsigamond-Flint Pond Lake Drawdown Feasibility Study, Worcester/Shrewsbury./Grafton, MA. Produced maps of nuisance aquatic vegetation, water depth, and sediment thickness to evaluate the feasibility of vegetation control by water level manipulation. Used high frequency sonar to map underwater stands of milfoil and tapegrass that would not have been mapped using conventional methods.

Hydrographer/ Technical Advisor, Housatonic River Impoundment Bathymetry, Sediment Mapping, Lenox, MA. Conducted bathymetric, sub-bottom, and sediment probe surveys of two impounded ponds on the Housatonic River as part of a remedial investigation for PCBs. Responsible for data processing and interpretation, map production, and report preparation for an EPA sponsored study.

Hydrographer/ Technical Advisor, Allen Harbor Bathymetry, Narraganset Bay, RI. Conducted pre-dredge, mid-dredge and post-dredge bathymetric surveys while at CR Environmental for Foster Wheeler Environmental Corporation. Responsible for data processing and map production.

POSTERS, PRESENTATIONS

PIANC USA/COPRI Dredging Conference, San Diego, CA. October 2012. "*Integrated Interpretation of Dredged Material Placement Site Survey Data and Pre-dredge Clearance Survey Data using Multibeam Backscatter, Towed Side Scan, AUV Side Scan, and Sub-bottom Sonar*" C. Wright, et al.

PIANC USA/COPRI Dredging Conference, San Diego, CA. October 2012. "*How the Oldest Capped Mound Survived the Ages: Integrating Multibeam Acoustic Imaging with Optical Imaging to Read the Record of Brenton Reef Disposal Site.*" D. Carey, et al.

PIANC USA/COPRI Dredging Conference, San Diego, CA. October 2012. "*Aquatic Placement: Successful Dredged Material Management in Long Island Sound.*" D. Carey, et al.

Non-Destructive Bridge Inspection Techniques, Technical Exchange Conference, June 2007. Newington, CT. "*Integration of Aquatic Geophysical Survey Data with GIS*" C. Wright and J.H. Ryther, Jr. Conference hosted by ConnDOT, FHWA, and the Association for Bridge Construction and Design, NE Division.

USGS, NOAA, ASF and ESA Symposium on the Effects of Fishing Activities on Benthic Habitats: Tampa, FL 2002 Poster "*Effects of Smooth Bottom Trawl Gear on Soft Bottom Habitat*" Cogswell, C., B. Hecker, A. Michael, F. Mirarchi, J. Ryther, Jr., D. Stevenson, R. Valente, and C. Wright

PUBLICATIONS

Valente, Raymond M., Carey, Drew A.; Read, Lorraine B.; Wright, Christopher. 2007. Postdisposal Monitoring of Lobster Abundance at the Rhode Island Sound Disposal Site in 2005 Compared to the 1999 Predisposal Survey. DAMOS Contribution No. 174. U.S. Army Corps of Engineers, New England District, Concord, MA, 52 pp.

Wright, C; Carey, D.A. 2006. Monitoring Survey at the Buzzards Bay Disposal Site at Cleveland East Ledge, June 2005. DAMOS Contribution No. 170. U.S. Army Corps of Engineers, New England District, Concord, MA, 17 pp.

Ryther, J.H. Jr., S.G. Harris, and C.F. Wright. 1998. *New York Catskill Reservoir Surveys – Applications of Marine Technology to Freshwater Reservoirs; Surveys of and Bottom Samples from Seven Reservoirs Obtained. Inland Water Feature*. Sea Technology, Vol. 39, No. 5. pp. 23-29.

Schaffner, I.R., C.F. Wright, J.M. Wieck, and S.R. Lamb. 1998. *Enhanced Reductive Dehalogenation of CAHs: A Remedial Pilot Study*. In proceedings: The Fifth International Symposium on In-Situ and On-Site Bioremediation, Battelle Memorial Institute. (peer reviewed).

Schaffner, I.R., C.F. Wright. 1998. *Internet Resources for Bioremediation and Engineering*. In proceedings, 13th Annual Conference on Contaminated Soils, University of Massachusetts at Amherst.

Schaffner, I.R., J.M. Wieck, S.R. Lamb, C.F. Wright, and E.W. Pickering. 1997. *Microbial enumeration screening method for evaluating intrinsic bioremediation*, in proceedings, The Fourth International Symposium on In-Situ and On-Site Bioremediation, Battelle Memorial Institute, v. 2, p. 393-398. (peer reviewed).

Schaffner, I.R., J.M. Wieck, C.F. Wright, M.D. Katz, and E.W. Pickering. 1996. *Microbial enumeration and laboratory-scale microcosm studies in assessing enhanced bioremediation potential of petroleum hydrocarbons*, in proceedings, 11th Annual Conference on Contaminated Soils, University of Massachusetts at Amherst (Paper in peer review for Journal of Soil Contamination).