

## **C. DOUGLAS CRAFT** *Experienced Environmental Chemist and Consultant*

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### EDUCATION

BS Chemistry, BS Sciences Interdisciplinary, 1975, University of West Florida. 1,200+ total classroom hours of continuing education since graduation: 43% statistics and data analysis, 37% analytical and environmental chemistry, and geochemistry, 20% computers and programming.

### CURRENT POSITION

April 2008 - Present: CEO and Principal, *Craft Geochemistry Consulting, LLC*, Lakewood, Colorado.  
<http://www.CraftGeochemistry.com>

### FORMER POSITION

July 1976 - March 2008: Research Chemist, GS-14-10, [Fisheries and Wildlife Resources Group](#), Mail Code 86-68290, U.S. Bureau of Reclamation, Technical Service Center, PO Box 25007, Denver CO 80225-0007, (Steve Hiebert, Group Manager, 303-445-2206, [shiebert@do.usbr.gov](mailto:shiebert@do.usbr.gov)). Principal investigator for research projects related to fate and transformation of mercury and other environmental contaminants, chemistry of acid mine drainage, behavior and bioavailability of trace metals in natural waters, acid precipitation impact evaluation, and other environmental problems. In-house consultant on environmental and analytical chemistry, quality assurance and chemical analysis data validation, interpretation of environmental chemistry data, applied statistics, computer modeling, and seepage geochemistry. *Most Recent Activity*: Principal investigator on 3 Tracy Fish Facility Improvement Program studies, and 2 dam safety research program project; Technical Editor for Tracy Series Reports, Webmaster for Tracy Research and Fisheries and Wildlife Resources Group Websites; Project geochemist and team leader for dam safety seepage evaluation teams.

### TECHNICAL EXPERIENCE

Thirty year's experience as a research principal investigator and consultant working in a civil engineering/water resources management agency. Fate and transformation of environmental contaminants, especially mercury and trace metals, at the reservoir and watershed scale. Predicting pre-filling reservoir water quality using microcosm sediment-water simulation. Chemistry of sediment-water interface in thermally-stratified lakes and reservoirs and the behavior of trace metals under anaerobic conditions. Interpretation of dam seepage chemistry and assessment of mineral dissolution using chemical equilibrium models, statistics, groundwater flow models, and stoichiometric mass balance models. Equilibrium constants for reactions of trace metals with dissolved humic and fulvic acids. Lability and dissociation kinetics of trace metal complexes in natural waters, lab simulation of time-constrained biological uptake, and bioavailability of toxic compounds. Large-scale multi-basin evaluation of impacts to Western water resources from acid precipitation and other atmospheric pollution problems using a geographic information system. Assessment of chemical tests to identify dispersive clay soils for engineering purposes using multivariate statistics.

### KNOWLEDGE AND SKILLS

**ANALYTICAL CHEMISTRY** - significant experience with sample preparation and instrumental techniques (atomic absorption spectrophotometry, IR-UV-VIS spectroscopy, ion chromatography, gas chromatography, polarography, anodic stripping voltammetry, extractions, digestions), quality control and statistical process control (ANSI-ASQC-Q2, ISO-IEC Guide 25, ISO 9000, auditable continuous improvement QC programs, laboratory QA auditing, data validation), method selection (familiar with EPA, ASTM, AOAC, USGS, and AHPA-AWWA-WPCF *Standard Methods*), soil and solid sample preparation and fractional spooning subsampling, lab design and construction coordination, safety equipment specification, lab information management system design and specification, regulatory quality requirements (CERCLA, RCRA, Clean Water Act, NPDES).

**STATISTICS and DATA ANALYSIS** - working experience with applied statistics (descriptive statistics, experimental design, nonparametric methods, linear and nonlinear regression, ANOVA, and multivariate classification methods using SAS and SPSS systems), data presentation and graphing (Excel, MathCad, SigmaPlot, Surfer, AquaChem), application of neural network models (NeuroShell), application and interpretation of chemical equilibrium models (MINTEQA2, PHREEQE), development of mass balance models to interpret seepage chemistry data.

**RESEARCH and PROGRAM MANAGEMENT** - mature program management skills (problem identification and proposal writing, client marketing, planning and coordination, experimental design, budgetary control and reporting, management of field and lab crews, subcontracting and Federal Acquisition Regulations, use project management software, PERT and GANTT charts).

**COMPUTERS** - PC power user since 1982 (Excel, Access, Word, Powerpoint, SPSS, SigmaPlot, Aquachem, WordPerfect); programmer (HP technical BASIC, SAS, SPSS, macros, SQL, Visual Basic), scanning and editing of graphics (Photoshop, Snagit, TWAIN), web design and development (HTML, Adobe Dreamweaver and ColdFusion).

**FIELD SAMPLE COLLECTION** - extensive experience performing field studies and sample collection (Hydrolab and other multi-probe field instruments, Hach Kits, pumps, GPS, sampling devices for water, sediment, soil, and plankton, ultra-clean sampling protocols).

**TECHNICAL COMMUNICATIONS and EDITING** - excellent writing and data presentation skills, numerous published journal articles, technical reports, and oral presentations. Associate editor for journal *Chemical Speciation and Bioavailability*, and Reclamation research program technical series (familiar with Government Printing Office, American Chemical Society, and American Fishery Society style criteria).

**INTERPERSONAL SKILLS** - extensive experience as acting lab and group manager, mentor and coach to colleagues and subordinates, excellent verbal communication skills, proven leadership ability and maturity. Strong conflict resolution and problem solving skills. Ability to clearly convey technical results to non-specialists and the public.

**OTHER SKILLS** - Visual arts, illustration, technical photography, microphotography.

## ACCOMPLISHMENTS

*Who's Who in Frontiers of Science and Technology* (1985), *Who's Who in the West* (1987), *Who's Who in America*, 2000, 2005; ACS Division of Environmental Chemistry *Award of Merit* (1986), USBR performance awards or outstanding performance appraisals (1981, 1983, 1987, 1990, 1993-1999, 2002).

- 1979-81: Planned and executed a reservoir water quality simulation study using sediment-water microcosms for pre-impoundment Ridgway Reservoir, Ridgway, Colorado. Data from this study were used to justify outlet works design changes that saved over \$8,000,000 in construction costs.
- 1984: Developed and wrote laboratory information management software (LIMS) for the Bureau of Reclamation's Denver Chemistry Laboratory (DCL) using Hewlett-Packard technical BASIC microcomputers. By integrating sample tracking, data computation and reporting functions, this system allowed for cost-effective retrieval and monitoring of sample work flow during analysis, more efficient lab operations, and better client service. Served as Laboratory LIMS Coordinator 1984-1993.
- 1987: Wrote a *QA/QC Implementation Work Plan* for the Reclamation San Joaquin Valley Drainage Program at the request of the National Science Foundation and the Reclamation Mid-Pacific Regional Office.
- 1987-89 Organized Reclamation response and participation in the National Acid Precipitation and Assessment Program (NAPAP). Served as Reclamation representative and technical report reviewer for NAPAP. Performed and published a multi-disciplinary evaluation of 384 Reclamation storage reservoirs for vulnerability to acid precipitation.
- 1987: Organized and chaired a technical symposium, *Bioavailability of Trace Metals*, sponsored by the American Chemical Society's Division of Environmental Chemistry, held at the 195th National ACS meeting, New Orleans, Louisiana, 1987.

- 1987-92: Helped to organize and launch the Science and Technology Letters journal, *Chemical Speciation and Bioavailability*. Associate Editor 1987-92, Editorial Board Member 1992 to 1999.
- 1992-99: Served as Quality Control Officer for the Reclamation Denver Chemistry Laboratory, D-8240. Developed and implemented a continuous improvement quality assurance program to meet CERCLA regulatory and ANSI-ASQC-Q2 (ISO-9000) quality system requirements. Wrote and implemented lab *Quality Assurance Plan*. Wrote and implemented 14 *Good Laboratory Practices*, 4 *Good Measurement Practices*, and numerous *Standard Operating Procedures*. Trained and coached staff in QA Plan implementation, managed ongoing performance evaluation sample programs, resolved client quality problems, managed a corrective action program, a sub-contractor quality audit program, and performed internal lab quality audits. Developed and taught a 6-hour class in statistics and statistical quality control to lab staff.
- 1995-96: Developed and implemented a chemical analysis and quality program to investigate snowmelt runoff chemistry in the mine waste-contaminated National Priority List Superfund Site, California Gulch, Operable Unit 6, Leadville, Colorado. Organized and managed all aspects of chemical analysis, QC evaluation, and reporting of data, and provided technical advice to field crews during sample collection. Evaluated data using chemical equilibrium models and statistics, and wrote major technical report on runoff chemistry included in final report to Region VII EPA.
- 1995-99: Performed 4-year research study of mercury and water quality in Lake Owyhee, Oregon. Program involved reservoir sampling, watershed-level interactions, and remote sensing (AVIRIS imaging spectrometer).
- 1996-98: Established a calibration and maintenance program and web-searchable data base for water quality monitoring at the Tracy Fish Collection Facility, Tracy, California.
- 2001+ Designed and developed a technical website for the [Tracy Fish Facility Improvement Program](#). Site archives water quality data in Access/SQL data bases and allows ColdFusion queries by the public. Site provides other information and technical reports: [http://www.usbr.gov/pmts/tech\\_services/tracy\\_research/](http://www.usbr.gov/pmts/tech_services/tracy_research/)
- 2001+ Appointed Editor for [Tracy Technical Report Series](#). Designed report format and developed style guidelines to assist Tracy researcher authors. Edited and published 18 Tracy reports since 2001.
- 2006 Published milestone technical manual based on over 20 year's experience with seepage geochemistry investigations in leaking dams with soluble minerals: [Seepage Chemistry Manual](#), published by the Reclamation Dam Safety Office, Denver, Colorado.
- 2007+ Designed and developed website for [Fisheries and Wildlife Resources Group](#).

## PROFESSIONAL ACTIVITIES

Member American Chemical Society (Division of Environmental Chemistry) 1980-1992; Member American Society for Quality Control 1994-98; Member Chemometrics Society; Member Citizens Advisory Council, Colorado Craniosynostosis Project (1987-89); Reviewer, National Acid Precipitation Assessment Program annual reports (1987-89); Chairman and organizer, *Symposium on the Bioavailability of Trace Metals*, American Chemical Society National Meeting, New Orleans (1987); Journal Associate Editor, *Chemical Speciation and Bioavailability* (1987-92, Editorial Board, 1992-99); Manuscript reviewer, *Environmental Science and Technology* (1989 to present).

## PEER-REVIEWED JOURNAL PAPERS AND TECHNICAL REPORTS - [blue titles](#) are active web links to PDF files

- Bahner, L., Craft, D., and D. Nimmo. 1975. *A Saltwater Flow-Through Bioassay Method with Controlled Temperature and Salinity*. *Progressive Fish Culturist*, 37(3).
- Craft, Douglas, 1978. *Vacuum Filtration Versus Centrifugation for Sodium Adsorption Ratio Determinations*, *Geotechnical Testing Journal*. Vol. 1, pp. 237-238.
- Craft, Douglas, 1983. *A Microsystem Sediment-Water Simulation Study for the Proposed Jordanelle Reservoir, Heber City, Utah, U.S.* Bureau of Reclamation, Technical Report REC-ERC-83-14.
- Craft, D., and R. Acciardi, 1984. *Failure of Pore-Water Analyses for Dispersion*, *Journal of Geotechnical Engineering*, 110(4).
- Craft, Douglas, 1985. *Predicting water quality data in an unfilled reservoir using microcosm sediment-water simulation*, *Environmental Geochemistry and Health*, 7(4).
- Craft, Douglas, 1986. *A BASIC Program to Plot Stiff Diagrams*, *Environmental Science and Technology*, 12(1), 1986.

- Craft, Douglas, 1986. *The Application of Multivariate Statistics and Saturation Extract Data to Identify Dispersive Clay Soils*, ASTM Geotechnical Testing Journal, 9(1).
- Craft, Douglas, 1986. *The Lability of Trace Metal Complexes in Natural and Synthetic Waters using a Controlled Flow Rate Column Technique with Chelex 100 Resin*, Proceedings: 191st Meeting, ACS Division of Environmental Chemistry, New York NY, April 1986.
- Craft, Douglas, 1987. *Trace Metal Lability at Multiple Time Restraints using a Controlled-Flow Rate Chelex Column Technique*, Proceedings: 194th Meeting, ACS Division of Environmental Chemistry, New Orleans LA, September 1987.
- Craft, Douglas, 1988. *Evaluation of Chemical Tests for Engineering Soils using Discriminant Analysis*, Chemometrics and Intelligent Laboratory Systems, 3 (2).
- Craft, Douglas, 1988. *Interpretation of Chemical and Petrographic Data for Water and Soil Samples from Deer Flat Embankments With a Discussion of Dam Safety Implications*, Applied Sciences Technical Memorandum 88-3-5, U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado.
- Craft, Douglas, 1989. *Acid Precipitation and Bureau of Reclamation Water Resources: Potential Effects and Sensitivity of Storage Reservoirs*, U.S. Bureau of Reclamation, Technical Report R-89-09.
- Craft, Douglas, 1989. *Evaluation of Mineral Dissolution at Deer Flat Embankments - Arrowrock Division - Boise Project, Idaho, using Mass Balance and a Chemical Equilibrium Model*, Applied Sciences Technical Memorandum 89-3-1, U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado.
- Craft, Douglas, 1989. *Chemical Analyses on Bighorn Lake and Downstream Seepage Samples to Evaluate Potential Mineral Dissolution in Abutments at Yellowtail Dam, Pick-Sloan Missouri Basin Program, Yellowtail Unit, Montana*, Applied Sciences Technical Memorandum 89-3-6, U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado.
- Craft, Douglas, 1991. *Evaluation of Chemical Data from Seeps, Drains, and Observation Wells at Sanford Dam, Canadian River Project, Texas*, Applied Sciences Technical Memorandum 91-3-1, U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado.
- Craft, Douglas, 1991. *Chemical Analyses of Seepage and Reservoir Water and Petrographic Analysis of Suspended Materials in Water Samples Collected at Soldiers Meadow Dam, Lewiston Orchards Project, Idaho*, Applied Sciences Technical Memorandum 91-3-3, U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado.
- Craft, Douglas, 1991. *Evaluation of 1990-1991 Seepage Chemical Data from Horsetooth Dam and Reservoir, Colorado-Big Thompson Project, Colorado*, Applied Sciences Technical Memorandum 91-3-2, U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado.
- Craft, Douglas, 1992. *Interpretation of Chemical Data from Seeps, Drains, and Reservoir at Glen Canyon Dam, Colorado River Storage Project*, Applied Sciences Technical Memorandum 3743-92-1, U.S. Bureau of Reclamation, Engineering and Research Center, Denver, Colorado.
- Craft, Douglas, 1995. *Summary and Interpretation of Chemistry Analysis Results from the 1995 Snowmelt Runoff Event, California Gulch National Priority List Superfund Site, Operable Unit 6, Leadville, Colorado*. Technical Memorandum D-8240-RES-1.10, U.S. Bureau of Reclamation, Technical Service Center, Denver, Colorado.
- Pearson, R., and D. Craft, 1996. *Phase I Feasibility Study - Water and Sediment Sampling and Hydrologic Measurement Program - Results and Findings - 1995 Spring Runoff for Operable Unit 6, California Gulch NPL Site, Leadville CO*, Report to EPA Region VIII, U.S. Bureau of Reclamation, Technical Service Center, Denver, Colorado.
- Craft, Douglas, 1999. [Summary and Interpretation of Chemistry Data for Reservoir, Seeps, and Groundwater from Horsetooth Dam, Colorado-Big Thompson Project, Ft. Collins, Colorado](#), Technical Memorandum D-8290-99-001, U.S. Bureau of Reclamation, Technical Service Center, Denver, Colorado.
- Sigfried, S, Craft, D., Hiebert, S., and M. Bowen, 2000. [Continuous Monitoring of Fish Eggs and Larvae at the Tracy Fish Collection Facility, Tracy California, February-June, 1994](#), , Tracy Fish Collection Facility Studies, California, Volume 6, U.S. Bureau of Reclamation, Technical Service Center, Denver, Colorado, and Mid-Pacific Region, Sacramento, California.
- Craft, Douglas, Mao, L., Fields, J., and B. Moore, 2000. [Chemistry and Water Quality at the Tracy Fish Collection Facility, Tracy, California](#), Tracy Technical Report Series, Volume 9, U.S. Bureau of Reclamation, Technical Service Center, Denver, Colorado, and Mid-Pacific Region, Sacramento, California.
- Craft, D., Cannon, N., Zimmer, D, Krill, K., and L. DiMattia, 2000. [Water Quality and Mercury in Lake Owyhee, Southeastern Oregon](#), Technical Report, U.S. Bureau of Reclamation Science and Technology Program, Denver, Colorado, and Pacific Northwest Regional Office, Boise, Idaho.

- Craft, Douglas, and J. Miller, 2001. [Reservoir Sediment-Water Simulation: Pre-impoundment Predictions vs. Observed Water Quality at Ridgway Reservoir, Ridgway, Colorado](#), Technical Report, U.S. Bureau of Reclamation Science and Technology Program, Denver, Colorado, and Upper Colorado Regional Office, Salt Lake City Utah.
- Craft, D., Housewright, R., Mao, L., and J. Fields, 2002. [Semi-Continuous Water Quality Measurements at the Tracy Fish Collection Facility, Tracy, California, April 2002 to March 2001](#), , Tracy Fish Collection Facility Studies, California, Volume 17, U.S. Bureau of Reclamation, Technical Service Center, Denver, Colorado, and Mid-Pacific Region, Sacramento, California.
- Craft, Douglas, and R. Pearson, 2002. [Horsetooth Seepage Chemistry: Analysis of Seepage Water Chemistry before and during Safety of Dams Modification Construction at Horsetooth Dam, Colorado-Big Thompson Project, Ft. Collins, Colorado, 1999-2001](#). Technical Memorandum D-8290-02-001, U.S. Bureau of Reclamation, Technical Service Center, Denver, Colorado.
- Pearson, R., Hurcomb, D., and D. Craft, 2002. *Gypsum Karst of the Lykins Formation and Effects on Colorado Front Range Water Projects; Horsetooth and Carter Lake Reservoirs*, Proceedings of the Annual Meeting of the Geological Society of America, Denver, Colorado, October 2002.
- Craft, D. and C. Liston, 2003. [Guidelines for Authors of Tracy Series Technical Reports](#), Tracy Technical Report Series, Volume 13, U.S. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.
- Craft, D., Housewright, R., and J. Fields, 2003. [Semicontinuous water quality measurements at the Tracy Fish Collection Facility, Tracy, California, April 2001 to March 2002](#), Tracy Technical Report Series, Volume 22. U. S. Bureau of Reclamation, MP Region and Denver Technical Service Center, 66 pp. including appendix.
- Craft, D., Housewright, R., and J. Fields, 2004. [Semi-Continuous Water Quality Measurements at the Tracy Fish Collection Facility, Tracy, California, April 2002 to March 2003](#), Tracy Technical Report Series, Volume 26, U. S. Bureau of Reclamation, MP Region and Denver Technical Service Center, 23 pp. including appendix.
- Craft, D., Fields, J., and N. Yoder, 2005. [Mercury in the Carson River Basin, California and Nevada](#), U.S. Department of the Interior, Bureau of Reclamation, Technical Service Center, TSC -2005-8290-001, 81 pp. + appendices.
- Craft, D. 2005. [Seepage Chemistry Manual](#), U.S. Department of the Interior, Bureau of Reclamation, Technical Service Center, Dam Safety Program Report DSO-06-03, 81 pp. + appendices.
- Craft, D., 2006. [Seepage Chemistry at Yellowtail Dam - A Geochemical Evaluation of Reservoir and Seepage Water and a Bacterial Residue Collected at Yellowtail Dam, Pick-Sloan Missouri Basin Project, Montana](#), Technical Memorandum 86-6829009, Dam Safety Office and Technical Service Center, U.S. Department of the Interior - Bureau of Reclamation, Denver, Colorado, 27 pp.
- Craft, D. Cain, C. and C. Sullivan, 2006. [Seepage Geochemistry and Mineral Dissolution at Clark Canyon Dam, Pick-Sloan Missouri Basin Project, East Bench Unit, Montana](#), Technical Memorandum 86-6829010, U.S. Department of the Interior - Bureau of Reclamation, Denver, Colorado, 48 pp.+ appendices.
- Craft, D., Del Hoyo, M., Housewright, R. and J. Fields, 2008. [Semi-Continuous Water Quality Measurements at the Tracy Fish Collection Facility - Seven-Year Summary](#), Tracy Technical Report Series, Volume 37, U. S. Bureau of Reclamation, MP Region and Denver Technical Service Center.
- Craft, D., Fowler, B., Housewright, R. Mao, L., and J. Fields, 2008. [Composite Sampling and Analysis of Low Concentration Organic Compounds and Trace Elements in Surface Waters at the Tracy Fish Collection Facility, Tracy, California](#), Tracy Technical Report Series, Volume 41, U. S. Bureau of Reclamation, MP Region and Denver Technical Service Center.

## REFERENCES - [blue email addresses](#) are active links that will automatically send email to address

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