Exhibits

to Fond du Lac Band of Lake Superior Chippewa's
Comments on the NorthMet Mining and Land Exchange Final Environmental Impact Statement (FEIS) and in response to the Army Corps of Engineers' Notice for the PolyMet Mining Inc, Section 404 Permit Application MVP-1990-05528-JKA
December 18, 2015

Nancy J. Schuldt

Director, Fond du Lac Office of Water Protection: responsible for planning, administering and implementing a comprehensive tribal water quality protection program, including physical, chemical and biological monitoring of reservation lakes and streams, data management and analysis, grant writing, developing and implementing restoration projects, environmental review and regulatory oversight.

Professional Preparation

B.S., BIOLOGY YEARS ATTENDED: 1975-1979
University of Dayton *Dayton, Ohio*

M.A., AQUATIC ECOLOGY YEARS ATTENDED: 1993-1997
University of Kansas *Lawrence, Kansas*

Appointments:

1997-present: Director, Office of Water Protection, Fond du Lac Reservation Environmental Program

1993-1997: Graduate Research Assistant, Graduate Teaching Assistant, University of Kansas Department of Systematics and Ecology (now Department of Ecology and Evolutionary Biology)

1985-1993: Full time parent, founding member of Overland Park Citizens Advisory Council on Environmental Issues, Overland Park, Kansas

1983-1984: Pharmacy Laboratory Technician, Home Health Care of America, Fairfield, New Jersey

1979-1982: Microbiology Laboratory Technician, Cincinnati Health Department Laboratories, Cincinnati, Ohio

Relevant Activities:

- Implementing a tribal water quality program through the development of a comprehensive monitoring project to address water quality parameters of reservation lakes and streams listed in tribal water quality standards. Developed a database of physical, chemical and biological data collected in ongoing, long-term monitoring program, which is used to determine attainment or impairment of designated and aquatic life uses of reservation waterbodies, and assess nonpoint source impacts to reservation waters
- Demonstrated success in acquiring federal (EPA) grant funding for tribal base water program (18 years); additional project grant funding (EPA's Great Lakes National Program Office) for two sediment quality assessment projects; cooperative partner with MN Dept. of Health, MN Sea Grant; State of Minnesota Clean Water Partnership grants; multi-year tribal capacity grant funding through the EPA Great Lakes Restoration Initiative; National Environmental Information Exchange Network funding for regional tribal wild rice monitoring consortium
- Coordinating a multi-stakeholder (tribal and non-tribal) partnership to consider, select, fund and construct appropriate wastewater collection and treatment alternative for heavily developed reservation lake

- Coordinated comprehensive hydrologic study of Stoney Brook watershed, which includes the Reservation's wild rice lakes; partnered with NRCS, USGS in data acquisition and hydrologic model development to guide watershed management plan
- Presented invited talks to North American Benthological Society's annual symposia (1999, 2006)
- Presented talks at North American Lake Management Society annual symposia (2002, 2003)
- Invited instructor at National Biocriteria Workshop (April 2003)
- Presented invited talk at EPA's National Science Forum (June 2004) about tribal mercury monitoring activities
- Presented case studies and helped facilitate two tribal Water Quality Standards Academies through EPA (2005, 2011)
- Facilitated day-long session on tribal water quality standards program development at first National Tribal Science Forum (2006)
- Gave invited presentation on tribal water quality protection program at regional American Institute of Architects conference (2007)
- Presented at annual EPA Region 5 state/tribal water quality program conference on a collaborative tribal/state bioassessment of the St. Louis River (2007)
- Gave invited overview presentation ("Water Quality 101") to Carlton County Waters Summit, a community outreach event (2008)
- Presented on cumulative impacts of mining to tribal resources in northeastern Minnesota at tribal mining conference "The Land, Sky, Water and Culture" (2008)
- Gave invited presentation to EPA Cumulative Risk Assessment Workshop on Protecting Traditional Tribal Lifeways by Protecting the Resources (2009)
- Gave invited presentation to the Izaak Walton League on tribal participation in mining review (2009)
- Gave invited presentation to the Hubert Humphrey Institute (University of Minnesota) Water Symposium on tribal water protection and policy (2009)
- Co-team leader for the Recreational/Spiritual/Cultural team for the state of Minnesota's Water Sustainability Framework (2010)
- Guest lecturer in Dr. Deb Swackhammer's graduate Water Policy course at the University of Minnesota (2010, 2012, 2013, 2014, 2015); also in Dr. Rebecca Teasley's graduate Water Policy course at the University of Minnesota Duluth (2014, 2015)
- Invited presenter at 2011 Minnesota Lakes and Rivers Conference (tribal response to sulfide mining projects)
- Presented at 2011 International Association of Great Lakes Research (IAGLR) on mining impacts to tribal trust resources in the Lake Superior Basin
- Presented at 2012 National Water Quality Monitoring Conference on a watershed hydrologic study, in partnership with NRCS, USGS
- Presented Lake Superior update to the 2011 State of the Lakes Ecosystem Conference (SOLEC) on behalf of the Lake Superior Binational Program Work Group
- Coordinated multiagency technical team in developing a Restoration Concept Plan for Spirit Lake in the St. Louis River Estuary, in conjunction with a Great Lakes Legacy Act remedial investigation/feasibility study for the former US Steel site (2012)
- Presented invited talk at the St. Louis River Estuary Summit on mining impacts to the headwaters (2013)
- Presented at 2014 National Water Quality Monitoring Conference on "Using Cloud Computing to protect Ecology, Economy, and Tradition through the Wild Rice Wetlands Water Quality Data Sharing Project"
- Presented invited talk at BIA Partners in Action Conference (2014) on sulfate, wild rice and mining in Minnesota

- Invited panelist at Midwest Chapter of the Native American Fish and Wildlife Society Symposium (2014) regarding Mining Impacts and Tribal Response
- Guest lecturer in J. Reyer's Environmental Policy class at the University of Wisconsin Superior (2014)
- Presented invited webinar on Tribal Water Governance to the University of Minnesota Certified Watershed Specialist online course (2015)
- Presented at 2015 St. Louis River Estuary Summit on an Ecosystem Services Valuation for the St. Louis River watershed
- Presented at Tribal Lands and Environment Forum on the development of lake-specific nutrient criteria for reservation fisheries lakes (2015) and the SLR ESV
- Presented at the annual Minnesota Water Resources Conference on the St. Louis River Ecosystem Services Valuation (2015)
- Active participant in local and regional workgroups: Lake Superior Binational Partnership, St. Louis River TMDL Partnership (Chairman, Board of Directors), tribal trustee for Natural Resource Damage Assessment at St. Louis River Interlake/Duluth Tar Superfund site; Biological Technical Advisory Group for the site; member of Strategy Work Group for the Minnesota statewide mercury TMDL implementation plan; member of University of Minnesota Sea Grant Advisory Board; USEPA Region 5 representative on National Tribal Water Council since 2008
- Active in educational outreach to reservation, local and regional community

Collaborators and other Affiliations

Peter Cooper, P.E., USDA Natural Resources Conservation Service (Stoney Brook Hydrology Study)

Perry Jones, US Geologic Service Hydrologist (Stoney Brook Hydrology Study)

Mark LeBaron, GoldSystems (*Region 5 Tribal Consortium for Protecting Manoomin (wild rice),* EPA-OEI-13-01

Dr. Amy Myrbo, University of Minnesota Lacustrine Core Repository (*Manoomin, investigating the past, the present, and the future conditions of wild rice lakes on the Fond du Lac Band of Lake Superior Chippewa Reservation,* NSF OEDG 2009-2014)

Dr. John Pastor, University of Minnesota Duluth (*Wild Rice Population and Nutrient Dynamics,* NSF 2002-2006; *Wild rice population oscillations, allocation patterns, and nutrient cycling*, NSF 2007-2011)

Dr. Diana Dalbotten, University of Minnesota (*REU Site on Sustainable Land and Water Resources: A Community-Based Participatory Research Experience for Undergraduates,* NSF OEDG 2015-2019)

Dr. Ann St. Amand, President, PhycoTech (*Development of Lake-specific Numerical Nutrient Criteria for Water Quality Standards in Fond du Lac Reservation Lakes: Analysis of the Phytoplankton Rapid Assay Results 1998-2012 compared to Southern MN lakes.*) Final report submitted to EPA Region 5 2015.

GREAT LAKES INDIAN FISH AND WILDLIFE COMMISSION

P. O. Box 9 • Odanah, WI 54861 • 715/682-6619 • FAX 715/682-9294

• MEMBER TRIBES •

MICHIGAN	WISCONSIN		MINNESOTA
Bay Mills Community	Bad River Band	Red Cliff Band	Fond du Lac Band
Keweenaw Bay Community	Lac Courte Oreilles Band	St. Croix Chippewa	Mille Lacs Band
Lac Vieux Desert Band	Lac du Flambeau Band	Sokaogon Chippewa	

Name and Address:

John Coleman
Great Lakes Indian Fish & Wildlife Commission at the Land Information & Computer Graphics Facility, University of Wisconsin - Madison
550 Babcock Drive
Madison, Wisconsin 53706
608 263-2873 (office) 608 262-2500 (fax)
e-mail:jcoleman@glifwc.org

Position:

Honorary Fellow, Land Information and Computer Graphics Facility, U.W. - Madison. 1995 to present.
Environmental Modeler, Great Lakes Indian Fish and Wildlife Commission. 1994 to present.
Environmental Section Leader, Great Lakes Indian Fish and Wildlife Commission. 1997 to present.

Education:

Ph.D. in Wildlife Ecology; minor in Statistics, 1994 U. of Wisconsin., Madison.
M.S. in Fisheries and Wildlife Science, 1985 Virginia Polytechnic Institute and State University (VPI & SU).
B.S. in Wildlife Management, 1980 University of Maine, Orono.

Professional Experience:

Mining and water quality specialist, Great Lakes Indian Fish and Wildlife Commission. Reviewed and commented on mining and mining exploration permit applications in the Chippewa Ceded Territories, of Wisconsin, Michigan, and Minnesota. Development of groundwater models for characterization of groundwater hydrology at multiple mine sites. Instructor in cooperation with USGS staff for groundwater modeling training focused on mine sites. Participated in development of non-ferrous mining regulations for Michigan. Participated as member of a cooperating agency on two federal EISs, providing advice on water quality, water quantity modeling, and fugitive materials control. Developed and implemented baseline water quality sampling programs at two mine sites. Developed and implemented sampling of biota at multiple mine sites to establish baseline concentrations of metals in biota.

Environmental data modeler, Great Lakes Indian Fish and Wildlife Commission. Collected and modeled data on surface and sub-surface natural resources in the Chippewa Ceded Territories of Michigan,

Wisconsin, and Minnesota. Emphasis on relationship between mineral development and surface plant and animal resources. Statistical modeling of spatial, temporal, and physical relationships. Mapping of spatial relationships. 1994 - present.

GIS Manager and Data Modeler, Great Lakes Indian Fish and Wildlife Commission and University of Wisconsin - Madison cooperative project. Modeled spatially referenced data to predict suitable habitat for pine marten and fisher. 1993 - present.

Research assistant, University of Wisconsin - Madison. Conducted a study of small mammalian predators. Focus on predation of songbirds. Collected, analyzed, and modeled data concerning the effects of landscape characteristics on predator behavior using feral domestic cats as a model species. 1988 - 1993.

Laboratory researcher in molecular genetics labs, Laboratoire de microbiologie, Lyon, France and Dept. of Zoology, U. of Leicester, England. Applied molecular techniques to wildlife conservation and biology. 1987 - 1988.

Wetlands manager, Florida Game and Fresh Water Fish Commission. Monitored changes in fish and vegetation species during restoration of a large channelized river. 1986.

Computer analyst, Virginia Polytechnic Institute and State University. Developed digital habitat maps from USGS, GIRAS geographic data base for a study of bald eagle movements and habitat use on the Chesapeake Bay. Helped develop and wrote documentation for radio-telemetry analysis software 1985-1986.

Researcher assistant, VPI & SU and the National Park Service. Planned, supervised, and collected data in a study of the ecology of black and turkey vultures in Pennsylvania. 1983 - 1985.

Publications and Presentations:

Coleman, J., Chiriboga, E. 2009. GIS based methods for estimation of indirect hydrologic impacts to wetland plant communities due to mine dewatering. Society of Wetland Scientists - Wisconsin Wetlands Association 2009 Joint Conference.

Coleman, J., Chiriboga, E. 2007. GLIFWC Crandon Mine Technical Review: State of the Site report. Great lakes Indian Fish and Wildlife Commission.

Coleman, J. S., DeWild, J. F., David P. Krabbenhoft, D. P., 2003.Cooperative Mercury Sampling of Surface Waters Near the Site of the Proposed Crandon Mine. American Water Resources Association. Wisconsin Annual Conference.

Coleman, J. S., Chiriboga, E. 2003. Establishing Baseline Environmental Quality Information at a Proposed Mine Site. U.S. EPA Workshop on

Mining Impacted Native American Lands. Reno, Nevada
Coleman, J. S., Chiriboga, E. 2003. Uncertainty in Prediction of Impacts to Groundwater Flow and Level from a Proposed Base Metal Mine. U.S. EPA Workshop on Mining Impacted Native American Lands. Reno, Nevada
Coleman, J. S., Chiriboga, E. 2003. Environmental Monitoring at the Proposed Crandon Mine Site. SETAC Conference.
Coleman, J. S. 1998. Visualizing the conceptual basis and results of a groundwater flow model using a Geographic Information System. American Water Resources Association, Wisconsin Annual Conference
Coleman, J. S. 1998. The importance of independence: Correctly identifying the independent variable when calculating rating equations. American Water Resources Association, Wisconsin Annual Conference
Coleman, J. S., J. Gilbert, J. Probst, and S. Ventura. 1995. Modeling suitable fisher habitat at a landscape scale in Wisconsin. Abstract, Second International *Martes* Symposium. Edmonton, Alberta.
Coleman, J. S. and S. A. Temple. 1993. A survey of owners of free-ranging domestic cats in rural Wisconsin. Wildl. Soc. Bull. 21:381-390.
Coleman, J. S. and J. D. Fraser. 1990. Southeast distribution and status of black and turkey vultures. Pages 78-88 in B. G. Pendleton, ed. Proc. Southeast raptor management symposium. National Wildlife Federation.
Coleman, J. S. and J. D. Fraser. 1989. Northeast distribution and status of black and turkey vultures. Pages 73-82 in B. G. Pendleton, ed.. Proc. Northeast raptor management symposium. National Wildlife Federation.
Coleman, J. S. and J. D. Fraser. 1989. Habitat use and home ranges of black and turkey vultures. J. Wildl. Manage. 53:782-792.
Coleman, J. S. and J. D. Fraser. 1989. Growth and age estimation of black vultures (Coragyps atratus) and turkey vultures (Cathartes aura). Wilson Bull. 60:197-208.
Coleman, J. S. and J. D. Fraser. 1988. Hematocrit and protein concentration of black vulture and turkey vulture blood. Condor. 90:937-938.
Coleman, J. S. and J. D. Fraser. 1987. Food habits of black and turkey vultures in Pennsylvania and Maryland. J. Wildl. Manage. 51:733-739.
Coleman, J. S. and L. Perrin. 1986. Preliminary analysis of changes in floating and submergent vegetation in the Kissimmee River demonstration project: some effects of water fluctuation and flow. Florida Game and Fish Comm. 8pp.
Coleman, J. S. and J. D. Fraser. 1986. Predation on black and turkey vultures. Wilson Bull. 98:600-601.
Coleman, J. S. and A. B. Jones III. 1986. User's guide to TELEM: Computer analysis system for radio- telemetry data. Dept. Fisheries and Wildlife, VPI & SU, Blacksburg, VA. 46pp.
Sweeney, T. M., J. D. Fraser, and J. S. Coleman. 1985. Further evaluation of

marking methods for black and turkey vultures. J. Field Ornithology. 56:251-257.

Coleman, J. S., J. D. Fraser, and C. A. Pringle. 1985. Salt-eating by black and turkey vultures. Condor 87:291-292.

Coleman, J. S., and J. Willmarth. 1980. Death Canyon, Grand Teton National Park, Wyoming (hack site report). The Peregrine Fund's western report 1980. pp. 57-66.

EPA Approved QAPPs

Quality assurance project plan for: Testing of fish for mercury under the Great Lakes Indian Fish and Wildlife Commission EPA STAR grant: "Reducing risks to the Anishinaabe from methylmercury." EPA Grant RD83104701/0, 2004. Involved development of an intervention program to reduce risks associated with subsistence-based consumption of walleye contaminated with methyl mercury.

Quality assurance project plan for: GLIFWC Testing of Fish for Mercury. EPA grant GL96540801-0 2004. Involved sampling of fish from inland lakes, testing of those fish for mercury and incorporation of the sampling results into GLIFWC's GIS based fish consumption advisory maps.

Quality assurance project plan for: Tribal Monitoring of Stream Flow in Swamp Creek, Forest County Wisconsin. EPA grant X-995574-01, 2003. Involved installation and operation of stream gages in cooperation with one of our member tribes and the USGS.

Quality assurance project plan for: Mercury in Surface Waters Testing Project Near the Crandon Potential Mine Site in Northern Wisconsin. EPA grant X995574-01-02), 2001 and 2002. Involved sampling and analysis of mercury and other metals in surface waters in cooperation with the Wisconsin DNR and the USGS.

Quality assurance project plan for: the Great Lakes Indian Fish and Wildlife Commission wild rice, mussels and fish contaminant monitoring near potential mine sites in northern Wisconsin. EPA grant X 995574-01-02, 2001. Involved field acquisition of plant and animal tissues for contaminant analysis, statistical analysis and spatial mapping of the contaminant results over multiple years.

Quality assurance project plan for: Great Lakes Indian Fish and Wildlife Commission Water Quality Baseline Sampling in Watersheds Potentially Impacted by Mining Activity. EPA grant GL00E00613-0, 2011. Involved field acquisition of water quality data through water samples, field measurement and automated data logging.

RESUME

Richard D. Gitar
Water Regulatory Specialist/Tribal Inspector
Fond du Lac Reservation
Office of Water Protection
1720 Big Lake Road
Cloquet, Minnesota 55720
Phone: 218-878-7122/Fax 218-878-7168
Email: richardgitar@fdlrez.com

Education:
B.S. Biology/Journalism, University of Wisconsin – Superior
M.S. Environmental Biology, University of Minnesota – Duluth

Research Experience:

Investigation of Cycad Chloroplast Pigments, UW-Superior	1990
Monocot Venation Study Techniques, Smithsonian Institution	1991
SEM Analysis of Hamamelidaceae Seeds, UM-Duluth	1993
Cladistic Analysis of Tofieldieae (Liliaceae), UM-Duluth	1993-1994

Field Experience:

Urban Forester, City of Superior, WI Tree Survey	1990
Field Botanist, Various Floras and Plant Surveys	1990-1996
Contract Botanist, Millennium Seed Bank Project	2007-2009

Teaching Experience:

Teaching Assistant, UW-Superior	1991-1992
Adult Extension Summer Faculty, UW-Superior	1992-1997
Lecturer, UW-Superior, Dept. of Biology	1992-1996
Guest Lecturer/Speaker, various organizations	1990-Present

Employment:

Student Assistant, UW-Superior, Dept. of Biology	1989-1990
Laboratory Assistant, UW-Superior, Dept. of Biology	1990-1991
Research Intern, Smithsonian Institution, Washington, DC	1991
Teaching Assistant, UW-Superior, Dept. of Biology	1991-1992
Collections Manager, UW-Superior Herbarium	1991-1996
Lecturer, UW-Extension Summer Faculty	1992-1997
Lecturer, UW-Superior, Dept. of Biology	1993-1996

Environmental Consultant/Owner, BioScene Env. Consulting	1995-2000
Wetland Specialist, Fond du Lac Environmental Program	1998-2004
Water Regulatory Specialist, Fond du Lac Environmental Program	2004-Present

Additional Coursework/Training:

Introduction to Groundwater Investigations, U.S. EPA	1998
GIS & GPS Training, Bureau of Indian Affairs	1999
Wetlands for Wastewater/Stormwater Treatment, UW-Madison	1999
Environmental Review Procedures Training, U.S. HUD	1999
Minnesota Routine Assessment Method (MnRAM) Training, Tribal	1999
Hydric Soils, USDA/BWSR	1999
Wetland Delineation and Management Training, Private	2000
Compensatory Wetland Mitigation Training, Tribal	2000
Wildlife and Oil Spill Response Training, U.S. Coast Guard	2001
Identification of Sedges, Grasses and Rushes, U.S. Army Corps of Engineers	2002
Storm Water Pollution Prevention Plan Training, IECA	2002
Storm Water BMP Implementation Training, IECA	2002
Hydric Soils in Red Superior Lobe Till, NRCS	2002
EPA Storm Water Training, U.S. EPA	2003
Advanced Wetland Delineation and Management Training, Private	2003
Basic Inspector Training, NETI	2004
Phase I Environmental Site Assessment Training, BIA/EPA	2000, 2004, 2008, 2012
National Environmental Policy Act Training, BIA/EPA	2000, 2004, 2008, 2012
Clean Water Act/NPDES Inspector Training, NETI	2004
EPA 24-Hour Health & Safety Training w/ refreshers, U.S EPA	2004-2015
Tribal Environmental Crime Investigation Training, U.S. EPA	2008
40-Hour Hazardous Materials Technician Training w/ refreshers, Private	2008
Mitigation Banking & In-Lieu Fee Training, EPA/USACE	2009
Clean Water Act Section 404 Regulatory Training, U.S. EPA	2010
Tribal Water Quality Standards Academy Training, U.S. EPA	2010

Awards:

National Wetland Award, Environmental Law Institute, Washington, DC	2009
Environmental Stewardship Award, St. Louis River Alliance	2014

Boards and Committees:

Association of State Wetland Managers At-Large Board Member
St. Louis River Alliance Board Member
St. Louis River Alliance Habitat Work Group Chair
Minnesota Interagency Wetland Group

Minnesota Routine Assessment Method (MnRAM) Development Work Group
City of Duluth – Environmental Advisory Council
Peer Review Team – USACE Midwest Regional Suppliment
Assumable Waters Subcommittee – NACEPT – U.S. EPA

Professional Organizations:
Association of State Wetland Managers
Society of Wetland Scientists

References:
Wayne Dupuis
Environmental Program Manager
Fond du Lac Reservation
1720 Big Lake Road
Cloquet, Minnesota 55720
(218) 878-7106

Doug Norris
Wetlands Program Coordinator
Minnesota Department of Natural Resources
500 Lafayette Road, Box 25
St. Paul, Minnesota 55155-4025
(651) 296-0779

Jeanne Christie
Executive Director
Association of State Wetland Managers
32 Tandberg Trail, Suite 2A
Windham, Maine 04062
(207) 892-3399

JOY WIECKS

EXPERIENCE

May 1999-present Fond du Lac Environmental Program Cloquet, MN

Air Quality Technician

Started a dedicated Reservation Air Program with existing program grant from EPA.

- Coordinate with national, regional, state, local, and tribal agencies and workgroups to implement air quality control activities and programs and to encourage tribal participation in these areas.
- Review draft air emissions permits and Environmental Impact Statement-related documents for sources near the Reservation or in the Ceded Territories of the Band and write comments to the permitting authority, as appropriate.
- Review Federal Register notices of interest to Fond du Lac. Research any issues of concern and write comments to the EPA, as needed.
- Instruct or present at various tribal air quality training courses and Environmental Protection Agency (EPA) conferences.
- Purchase, operate, and maintain ambient air quality monitors, as needed. Wrote numerous Quality Assurance Project Plans for monitors.
- Write grant applications for continued funding and submit quarterly and annual reports to EPA.
- Was the 2011 recipient of the Virgil Masayesva Excellence Award from the National Tribal Air Association.
- Have served on EPA's Clean Air Act Advisory Committee since 2010. Currently serve on the CAAAC's Mobile Sources Technical Review Subcommittee's workgroup on ports emissions.
- Served as the Secretary/Treasurer of the Policy Oversight Group for the Central Regional Air Planning Association and was a participating member of CenRAP from 2001-2010. Was very active in achieving tribal participation in this group, which addressed regional haze in nine Midwestern states.

1998–1999 New Hampshire Dept. of Environ. Quality Concord, NH

Title V Permit Writer

- Reviewed Title V permit applications, calculations, and state and local regulations to coordinate input into draft and final permits.
- Coordinated and addressed comments from the public, EPA and other state agencies.
- Worked with Enforcement, Modeling, Emission Inventory, and other air quality staff to write and enforce permits.

Exhibit 4
to Fond du Lac Band's Comments on FEIS and CWA §404 Permit for PolyMet
December 18, 2015

1997–1998 Wisconsin Dept. of Natural Resources Madison, WI

Research Assistant (in conjunction with Master's Degree program)

- Worked on state's response to Indian Class I redesignation requests.
- Performed modeling runs to study effects of Class I redesignation on potential industrial facilities.

1994-1997 RMT (Environmental Consulting Firm) Madision, WI

Staff Engineer

Completed Title V permit packages for various industrial clients. Performed calculations and regulatory analysis, filled out permit forms, coordinated permit package completion with word processors, map makers, report production employees, and other technical staff.

Worked on Prevention of Significant Deterioration permit packages for industrial clients.

Performed annual air emission inventories for various clients.

Toured various facilities in order to better prepare emission inventories or permit applications.

EDUCATION

1997–1999 University of Wisconsin Madison, WI

Master's Degree in Land Resources (Air Resource Management)

1989-1994 University of Wisconsin Madison, WI

B.S. – Chemical Engineering

Brian D. Borkholder

Resource Management Division, Fisheries Section
Fond du Lac Band of Lake Superior Chippewa
28 University Road, Cloquet, MN 55720

Phone: 218-878-7104
Fax: 218-878-7130
Email: brianborkholder@fdlrez.com

EDUCATION

Master of Science, Fisheries Science, February 1993
Virginia Polytechnic Institute and State University, Blacksburg, Virginia

Bachelor of Science, Honors Biology, Cum Laude, May 1990
University of Illinois, Champaign, Illinois

Certified Fisheries Professional, American Fisheries Society, Bethesda, MA. January 1999 - Present.

Professional Training / Continuing Education

Aging and Tagging of Sturgeons. October 2015. North American Sturgeon and Paddlefish Society, Oshkosh, WI. 4.0 C.E.U.

Hydroacoustic Assessment Workshop. January 2011. BioSonics Corporation, Seattle, WA.

Introduction to "R" Using Basic Fisheries Methods. March 2011. Minnesota Chapter, American Fisheries Society, Continuing Education Workshop.

Applied Fluvial Geomorphology. October 2009. Wildland Hydrology, Inc., Instructed by David Rosgen.

An Introduction to Mark-Recapture Methods used in Fisheries Management. February 2006. Minnesota Department of Natural Resources, Continuing Education Workshop.

From Local to Global: Discussing the Forces Shaping Fish Communities in North Temperate Systems and Outlining Strategies for Success, January 2006. Minnesota Chapter, American Fisheries Society, Continuing Education Workshop.

Radio Telemetry for Freshwater Fish Studies, August 2004. American Fisheries Society, Continuing Education Workshop. Madison, WI.

Principles of Leadership, August 2002. American Fisheries Society, Continuing Education Workshop.

Fluvial Geomorphology and Stream Classification Workshop, June 2002. Minnesota Chapter, American Fisheries Society, Continuing Education Workshop.

Getting the Word Out: Disseminating Natural Resource Information to the Public, January 2000. Minnesota Chapter, American Fisheries Society, Continuing Education Workshop.

Fisheries Management, March 1999. Office of Training and Education, U.S. Fish and Wildlife Service. 2.4 C.E.U.

The Fine Lines of Ethics: Ecology, Money, Tradition, and Conscience, January 1999. Minnesota Chapter, American Fisheries Society, Continuing Education Workshop.

Principles and Techniques of Electrofishing, October 1993. Office of Training and Education, U.S. Fish and Wildlife Service. 2.4 C.E.U.

WORK EXPERIENCE

Inland Fisheries Section Leader, August 1993 - Present
Fond du Lac Resource Management Division, Section of Fisheries, Cloquet, MN
- Responsible for developing and managing the fisheries program for the Fond du Lac Band.
- Organized and managed several field projects and investigations, including walleye population assessments, creel surveys, stream trout assessments, stream surveys, lake sturgeon assessments and radio-telemetry, and a study investigating the feasibility of removing a harmful exotic fish.
- Worked on several interagency projects, including a brook trout restoration project, a lake sturgeon restoration project, and the Lake Superior Fisheries Management Plan.
- Responsible for managing Treaty-regulated fish harvest, including working with the State of Minnesota and other Tribal natural resource agencies to model and determine Total Allowable Harvest and Safe Harvest figures, manage the Band for these harvest goals, assist with modeling and determining regulations for State anglers, and conducting assessments to monitor exploited populations.
- Several committee assignments, including: the Brook Trout Subcommittee of the Lake Superior Technical Committee; Lake Sturgeon Subcommittee of the Lake Superior Technical Committee; the 1837 Fisheries Technical Committee; the 1854 Fisheries Technical Committee.

Research Associate, January 1993 - August 1993
Virginia Polytechnic Institute and State University, Blacksburg, Virginia
- Managed a laboratory and supervised two technicians.
- Managed the records, helped coordinate the activities of others, and worked on a multi-institutional study of Peregrine Falcon ecology and genetics.
- Worked on a research project investigating taxonomic differences between black bear populations in the Southeastern United States.
- Worked on a project investigating populations of Brook Trout in the Southern Appalachian Mountains.

Graduate Research Assistant, August 1990 - December 1992
Virginia Polytechnic Institute and State University, Blacksburg, Virginia
- Conducted a two year research project investigating loss of genetic variability due to inbreeding in an aquaculture species, *Carassius auratus*.
- Utilized starch gel electrophoresis and DNA fingerprinting techniques.
- Experience in an intensive recirculating aquaculture facility producing striped bass and hybrid striped bass.

Laboratory Technician, May 1990 - August 1990
Institute for Environmental Studies, Champaign, Illinois
- Assisted in an examination of interspecific hybridization in cottonwood species using DNA fingerprinting.
- Assisted in the study of the feeding ecology of Brown Bats

Research Assistant, January 1987 - May 1990
Illinois Natural History Survey, Champaign, Illinois
- Responsible for maintenance of research pond facilities.
- Assisted with the State Fisheries Genetic Research Program, DJ-F53R, an examination of the genetics of largemouth bass.
- Assisted with starch gel electrophoresis and mtDNA extraction.
- Assisted in standard fisheries field and lab work, including seining and electrofishing, gut content analysis, age analysis using scales and otoliths, and behavioral observations.
- Conducted an individual research project on largemouth bass recruitment.

PUBLICATIONS

Borkholder, B.D., S.D. Morse, H.T. Weaver, R.A. Hugill, A.T. Linder, L.M. Schwarzkopf, T.E. Perrault, M.J. Zacher, and J.A. Frank. 2002. Evidence of a year-round resident population of lake sturgeon in the Kettle River, Minnesota, based upon radio-telemetry and tagging. North American Journal of Fisheries Management 22:888-894.

Borkholder, B.D., and A.J. Edwards. 2001. Comparing the use of dorsal fin spines with scales to back-calculate length-at-age estimates in walleyes. North American Journal of Fisheries Management 21:935-942.

Borkholder, B.D., and B.G.M. Parsons. 2001. Relationship between electrofishing catch rates of age-0 walleye and water temperature in Minnesota Lakes. North American Journal of Fisheries Management 21:318-325.

POPULAR ARTICLES

Borkholder, B.D. 1998. Age and growth of smallmouth bass in Basswood Lake. The Boundary Waters Journal, Spring 1998.

Borkholder, B.D., and E.M. Hallerman. 1996. Broodstock management in the tropical fish industry: A case study on fancy strains of goldfish. Tropical Fish Hobbyist.

SELECTED TECHNICAL REPORTS (Full list available upon request)

Schloesser, J.T., H.R. Quinlan, T.C. Pratt, E.A. Baker, J.V. Adams, W.P. Mattes, S. Greenwood, S. Chong, E. Berglund, W.M. Gardner, J.P. Lindgren, C. Palvere, P. Stevens, **B.D. Borkholder**, A.J. Edwards, G. Mensch, E.J. Isaac, S.A. Moore, C. Abel, T. Wilson, P. Ripple, and A. Eccestone. 2014. Lake Superior Lake Sturgeon Index Survey: 2011 Status Report. A report of the Lake Superior Lake Sturgeon Work Group to the Great Lakes Fishery Commission, Lake Superior Technical Committee, and Binational Program Aquatic Community Committee.

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Borkholder, B.D., and J. Herrick. 1998. Age and growth of smallmouth bass in Basswood Lake, Minnesota / Ontario. Fond du Lac Reservation Resource Management, Technical Report No. 19. Cloquet, MN.

Borkholder, B.D., H.T. Weaver, S.D. Morse, A.T. Linder, R.A. Hugill, L.M. Schwarzkopf, T.E. Perrault, and M.J. Zacher. 1997. Movements of lake sturgeon in the Kettle River, Minnesota, based upon radio-telemetry.

Minnesota Dept. Natural Resources, Section of Fisheries Completion Report, Study 4, Job 418.

Borkholder, B.D. 1997. Effects of Water Temperature on the Catchability of Age-0 Walleye in Minnesota using Standardized Electrofishing Gear. Fond du Lac Reservation Resource Management, Technical Report No. 18. Cloquet, MN.

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Borkholder, B.D. 1996. Catch and effort as determined by a roving creel survey on seven Northeast Minnesota lakes during the 1995 ice fishing season. Fond du Lac Ceded Territory Technical Report, No. 11. Cloquet, MN.

Borkholder, B.D. 1994. Activities and opinions of Fond du Lac Band members related to the fisheries of the 1854 ceded territory. Fond du Lac Ceded Territory Technical Report, No. 1. Cloquet, MN.

Hallerman, E.M., and **B.D. Borkholder**. 1993. Genetic characterization of Brook Trout of the Wine Spring system of Nantahala National Forest. Project Completion Report submitted to the U.S. Forest Service.

PRESENTATIONS

Schmalz, P., M. McInerny, D. Staples, and **B. Borkholder**. 2015. Relating walleye abundance to assessment gill net catches in Minnesota lakes. 48th Annual Meeting of the Minnesota Chapter of the American Fisheries Society, Brainerd, Minnesota. January 2015.

Borkholder, B. and P Schmalz. 2014. Comparing methods for setting harvest quotas on lakes in NE Minnesota. 1837 Fisheries Technical Committee, October 2014.

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Borkholder, B.D., and A.J. Edwards. 2004. History of Fisheries for the Three 1854 Ceded Territory Bands of Minnesota. 134th Annual Meeting of the American Fisheries Society, Madison, WI. August 2004.

Edwards, A.J., and **B.D. Borkholder**. 2002. Co-Operative Tribal / State Fisheries Management Activities in the 1854 Ceded Territory. 35th Annual Meeting of the Minnesota Chapter of the American Fisheries Society, Duluth, Minnesota. January 2002.

Borkholder, B.D., and A.J. Edwards. 2001. Comparing the use of dorsal fin spines and scales to back-calculate length at age estimates in walleye (Stizostedion vitreum). Joint meeting between the Minnesota, Dakota, and Mid-Canada Chapters of the American Fisheries Society, Fargo, South Dakota. March 2001.

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Borkholder, B.D., and B.G.M. Parsons. 2000. Relationship between electrofishing catch rates of age-0 walleye and water temperature in Minnesota Lakes. The Native American Fish and Wildlife Society, Annual Meeting, September, 2000, Lac du Flambeau, Wisconsin.

Borkholder, B.D. 2000. Use of dorsal fin rays to age and back-calculate length-at-age for walleye. Minnesota Department of Natural Resources Bi-annual Training Session, St. Cloud, Minnesota. January 2000.

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Borkholder, B.D. 1994. Physical characteristics of several North Shore streams and the implications for Coaster Brook Trout reintroductions. Brook Trout subcommittee meeting of the Lake Superior Technical Committee, Nipigon, Ontario. October 1994.

Borkholder, B.D. 1993. Genetic marker frequency differences among goldfish strains. Virginia Polytechnic Institute and State University, Blacksburg, VA. February 1993.

ACTIVITIES & PROFESSIONAL AFFILIATIONS

Member, American Fisheries Society, 1990 - Present

Member, Minnesota Chapter of the American Fisheries Society (MNAFS), 1993 – Present

MNAFS Activities:

Executive Committee Open Representative, 1996, 1997, 1999, and 2000

President Elect, 2001 (MN Chapter wins NCD's *Most Active Chapter Award*)

Chapter President, 2002 (MN Chapter wins NCD's *Most Active Chapter Award*, and AFS Parent Society's *Outstanding Chapter Award*)

Immediate Past-President, 2003 (MN Chapter wins NCD's *Most Active Chapter Award*, and AFS Parent Society's *Outstanding Chapter Award*)

Fund Raising Committee, Chair, 2000 – 2012

Ad Hops Committee, Chair, 2000 - Present

General Meeting Co-Chairman for the 2012 National AFS Meeting, St. Paul, MN.

North Central Division of the AFS, Website Manager, July 2015 - Present

Virginia Tech Chapter of the American Fisheries Society, 1990 - 1993

Aquarium Committee Chairman. 1990-1993. Responsible for maintaining and collecting fishes for public display and education.

Mudbass Tournament Co-chairman. 1992, 1993. Assisted in the organization of the annual carp

Member, Native American Fish and Wildlife Society, 1993 - Present

Michael W. Schrage

Wildlife Biologist, Fond du Lac Resource Management Division:

Education

B.S., WILDLIFE RESOURCES, 1990
University of Idaho, Moscow, Idaho

M.S., FISH AND WILDLIFE SCIENCES, 1994
Virginia Tech, Blacksburg, Virginia

Professional Experience:

1995-present: Wildlife Biologist, Fond du Lac Resource Management Division

Responsible for helping the Fond du Lac Band of Lake Superior Chippewa manage their wildlife resources and exercise their treaty rights on the Fond du Lac Reservation and in the 1854 and 1837 Ceded Territories of Minnesota. Among the various responsibilities are recommending season, bag limits and appropriate harvest regulations to the Band's Reservation Business Committee, collecting and reporting harvest data, writing and reviewing of plans affecting tribal wildlife resources and liaison work with state, tribal and federal agencies. Additional responsibilities include conducting research and survey work on wildlife populations, wildlife disease work, habitat management and public outreach on a variety of topics.

Relevant Professional Activities and Awards:

- 1995-present: Set up and continued on an annual basis the collaboration of the Fond du Lac Band with the Minnesota Department of Natural Resources on the annual northeast moose survey.
- 1997-present: Conducted wood turtle field work in northeastern Minnesota.
- 1999: Co-chair of the organizing committee for the 35th North American Moose Conference and Workshop in Grand Portage, MN.
- 2001: Completed training and task book requirements for Wildland Firefighter Type 1.
- 2001: Assisted in the organization and planning of a multi agency northern Minneosta annual small mammal populations survey.
- 2002: Organized tribal natural resource staff to survey Duluth, MN area for Chronic Wasting Disease in coordination with larger statewide effort.
- 2002-2013: Partnered with the Minnesota Department of Natural Resources, the 1854 Treaty Authority and the US Geological Survey on moose population dynamics research in northeastern Minnesota. Obtained supplemental grant funding, conducted field work, gave public and professional presentations and co-authored published research.
- 2006: Invited speaker at Texas A&M University-Kingsville to talk with students, faculty and the public about Minnesota moose research.
- 2009: Served on the Moose Advisory Committee making recommendations to the Minnesota Department of Natural Resources for moose research and management.
- 2010: Assisted with the organization and planning of the 45th North American Moose Conference and Workshop in International Falls, MN.

- 2010: Elected by past recipients of the award as a Distinguished Moose Biologist.
- 2011: Established a phone and online harvest registration system for Fond du Lac hunters.
- 2012-present: Led the organization of a cooperative annual aerial moose habitat use survey and annually reported results.
- 2012-present: Served as a referee reviewing papers submitted for publication to the journal *Alces*.
- 2013-present: Organized collaboration with the Minnesota Department of Natural Resources on wolf research in and around the Fond du Lac Reservation.
- 2014: Invited speaker by Manitoba Conservation and Water Stewardship to discuss tribal moose management and Minnesota moose research findings with Manitoba Conservation and Black River First Nation community.
- 2015: Organized a partnership with the University of Minnesota and the Rocky Mountain Elk Foundation on a successful grant submission to the Legislative-Citizen Commission for Minnesota Resources to study the feasibility of restoring elk populations to eastern Minnesota.

Peer Reviewed Publication Collaborations:

Wu¨ nschmann, A., A.G. Armien, E. Butler, M. Schrage, B. Stromberg, J.B. Bender, A.M. Firshman, and M. Carstensen. 2015. Necropsy findings in 62 opportunistically collected free-ranging moose (*Alces alces*) from Minnesota, USA (2002-2013). *Journal of Wildlife Diseases*, 51(1).

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Lenarz, M.S., R. G. Wright, M. W. Schrage, and A. J. Edwards. 2011. Compositional analysis of moose habitats in northeastern Minnesota. *Alces* 47. 135-149.

Peterson, R.O., J. A. Vucetich, D, Beyer, M. Schrage, and J. Räikkönen. 2011. Phenotypic variation in moose: the island rule and the moose of Isle Royale. *Alces* 47. 125-133.

Lenarz, M.S., J. Fieberg, M.W. Schrage, and A.J. Edwards. 2010. Living on the edge: viability of moose in northeastern Minnesota. *Journal of Wildlife Management* 74(5): 1013-1023

McGraw, A.M., R. Moen, A. Edwards, M. Schrage, G. Wilson, L. Cornicelli, L. Frelich, D. Becker, and M. Lenarz. 2010. An advisory committee process to plan moose management in Minnesota. *Alces* 46: 189-200.

Lenarz, M.S., M.E. Nelson, M.W. Schrage, and A.J. Edwards. 2009. Temperature mediated moose survival in northeastern Minnesota. *Journal of Wildlife Management* 73(4): 503-510.

Edwards, A.J., M.W. Schrage, and M.S. Lenarz. 2004. Northeastern Minnesota moose management- a case study. *Alces* 40:23-31.

Schrage, M. W. and M. R. Vaughan. 1995. Population responses of black bears following oak mortality induced by gypsy moths. Ursus 10:49-54

THE WALL STREET JOURNAL.
MARKETS

Copper Swoon Presses Glencore, Other Miners

Sector-wide decline shows little sign of abating as copper falls to fresh six-year low

Glencore's stock has shed 68% for this year so far. *PHOTO: ALESSANDRO DELLA BELLA/BLOOMBERG NEWS*

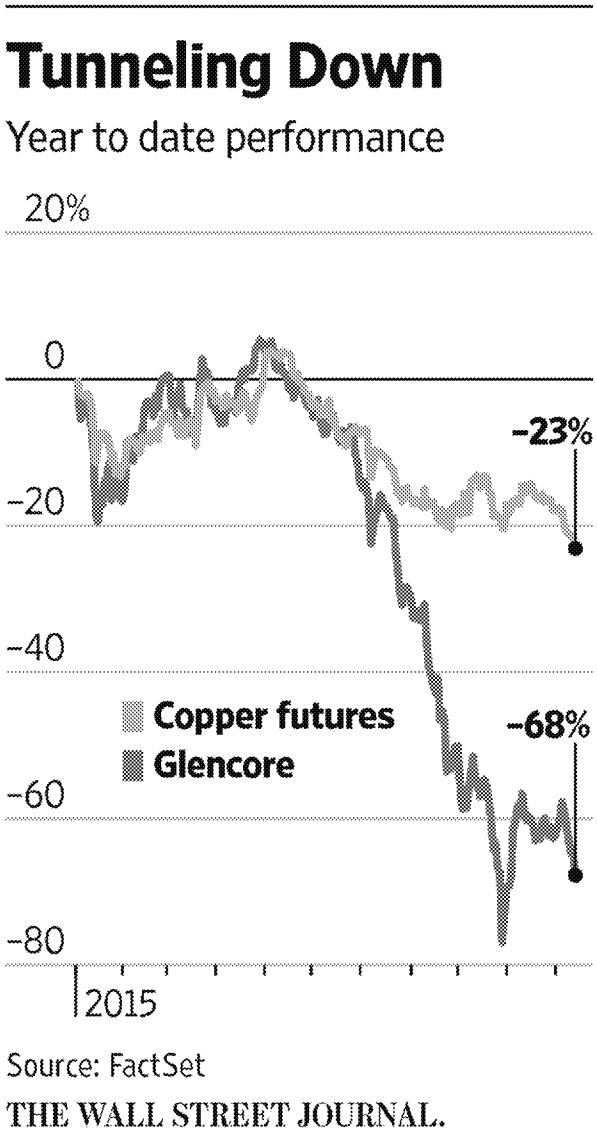
By SCOTT PATTERSON And IRA IOSEBASHVILI
Updated Nov. 12, 2015 7:59 p.m. ET

Shares of Glencore PLC and other large miners plunged anew, as a slump in copper prices revived worries about companies' ability to shoulder large debt loads.

Glencore's stock fell 7.6% to close below £1 for the first time in more than a month, Glencore declined to comment on Thursday.

Other big mining companies also took a hit, extending a sector-wide swoon that shows little sign of abating. Anglo American PLC, the fifth-largest miner by market value, slid 8.7% and is down 63% so far this year. Freeport-McMoRan Inc., one of the world's largest copper producers, fell 5.8%.

Lower copper prices "drive the earnings of these companies down and push the shares lower," said Jack Ablin, chief investment officer at BMO Private Bank. "These companies tend to get overly punished in down markets and overly rewarded in up markets."



Copper prices stabilized in October after several miners, including Glencore, announced production cuts that investors hoped would ease a global supply glut. But the industrial metal, which is used in everything from iPhones to air conditioners, resumed its decline amid downbeat economic indicators out of China, the world's biggest copper consumer.

In the U.S., November copper fell 2% to $2.1730, the lowest level since July 2009.

In a research note dated Wednesday, Goldman Sachs analysts predicted copper prices will fall further by the end of 2016 and stay low through 2018 due to abundant supplies and weak demand.

"There may be a lot of cuts coming, but the market isn't sure if they are permanent in nature, or if they are enough to make up for the slowing demand," said Edward Meir, a strategist at INTL FCStone. "China's industrial sector appears to be in a recession."

The copper market has also been rattled by a strengthening dollar, which can further depress global demand by making dollar-denominated copper relatively more expensive for buyers outside the U.S.

Moody's Investors Service, a credit-ratings firm, in September had highlighted copper below $2.20 a pound as a particular threat to Glencore. Since then, the company has raced to assure investors it is ready to withstand lower prices.

Glencore has laid out a plan to reduce its net debt by $10 billion to about $20 billion, by cutting its dividend, issuing$2.5 billion in new stock and selling assets, including the sale of the rights to some of its silver production last month.

The Wall Street Journal reported in October that Glencore executives were aiming to cut even more debt than announced in a bid to secure a credit-rating increase, in a nod to investor sentiment.

Glencore is unique among miners in that it has a huge trading arm that requires billions of dollars in short-term debt. In the first half of 2015, it also had about $30 billion in long-term net debt, much of it derived from its acquisition of mining giant Xstrata in 2013.

Investors have worried that the company's credit rating—two notches above junk status—could be hit if metals' prices continue marching downward. Glencore has a high credit rating for traders, but it is much lower than mining peers such as BHP Billiton Ltd. and Rio Tinto PLC.

Prices of several bonds issued by mining companies also slid on Thursday. Glencore bonds maturing in 2021 fell to about 88 cents on the dollar to yield 7.22%. At the start of the year, they were trading at
$1.06 on the dollar.

A dent in the company's credit rating could spell trouble for its debt-fueled trading arm. The company has said that even if its credit rating was lowered, the added costs would be negligible.

Separately, Anglo American on Thursday announced a management shake-up, including the departure of its iron-ore chief. Chief Executive Mark Cutifani has launched a turnaround plan aimed at driving operating efficiency at the U.K. company's mines, slashing costs and selling unwanted assets.

Write to Scott Patterson at scott.patterson@wsj.com and Ira Iosebashvili at ira.iosebashvili@wsj.com

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The New York Times

ENERGY & ENVIRONMENT

If It Owns a Well or a Mine, It's Probably in Trouble

By **CLIFFORD KRAUSS and IAN AUSTEN** DEC. 8, 2015

The pain among energy and mining producers worsened again on Tuesday, as one of the industry's largest players cut its work force by nearly two-thirds and Chinese trade data amplified concerns about the country's appetite for commodities.

The full extent of the shakeout will depend on whether commodities prices have further to fall. And the outlook is shaky, with a swirl of forces battering the markets.

The world's biggest buyer of commodities, China, has pulled back sharply during its economic slowdown. But the world is dealing with gluts in oil, gas, copper and even some grains.

"The world of commodities has been turned upside down," said Daniel Yergin, the energy historian and vice chairman of IHS, a consultant firm.

"Instead of tight supply and strong demand, we have tepid demand and oversupply and overcapacity for commodity production. It's the end of an era that is not going to come back soon."

The pressure on prices has been significant.

Prices for iron ore, the crucial steelmaking ingredient, have fallen by about 40 percent this year. The Brent crude oil benchmark is now hovering around$40 a barrel, down from more than a $110 since the summer of 2014.

Companies are caught in the downdraft.

A number of commodity-related businesses have either declared bankruptcy or fallen behind in their debt payments. Even more common are the cutbacks. Nearly 1,200 oil rigs, or two-thirds of the American total, have been decommissioned since late last year. More than 250,000 workers in the oil and gas industry worldwide have been laid off, with more than a third coming in the United States.

The international mining company Anglo American is pulling back broadly, with a goal to reduce the company's size by 60 percent. Along with the layoffs announced on Tuesday, the company is suspending its dividend, halving its business units, as well as unloading mines and smelters.

The situation has darkened in recent months.

In July, the company outlined plans to cut 53,000 jobs after reporting a loss of $3 billion for the first half of the year. Now, Anglo American plans to reduce its current work force of 135,000, to 50,000 employees.

"Quite frankly we didn't expect the commodity price rout to be so dramatic and in all likelihood the next six months are going to be even tougher," Mark Cutifani, the company's chief executive, said at an investors' conference on Tuesday. "We have pulled costs out of the business, but we need to do more because prices continue to deteriorate."

Exhibit 7-b
to Fond du Lac Band's Comments on FEIS and CWA §404 Permit for PolyMet
December 18, 2015

China looms large in the commodities equation.

Between 2000 and last year, companies invested hundreds of billions of dollars to expand their production capacity to satisfy China in a period of rapid economic expansion. Much of the corporate growth was fueled by debt.

But the situation has proved unsustainable as demand has waned. Chinese copper imports are down nearly 3 percent from last year, while imports of steel products are down by more than 12 percent. The country's crude oil and iron ore imports are still up, but by rates that are slowing from previous years.

The economy's slowing growth rate is adding to the uncertainty. China reported on Tuesday that exports, the country's engine of growth, slipped 6.8 percent in November, compared with the same month a year ago. Imports were also weak, although the rate of decline was lower than in the previous month.

The weakening Chinese demand is hurting prices while production is overwhelming markets.

Even with prices falling rapidly, American oil production has only declined to 9.2 million barrels a day, from a record high of 9.6 million barrels a day in June. Momentum in drilling and production have been building over the last three years. Gulf of Mexico offshore production has been steadily increasing since the federal drilling moratorium that followed the 2010 BP oil spill.

Many international oil projects have been canceled and production should fall more rapidly next year. But it probably won't be quickly enough to stabilize prices. That is because companies are getting more production out of their investments as efficiency has improved. And some need to keep producing to keep up with their debt payments.

The commodity fallout has been global.

The Swiss company Glencore is scrambling to reduce its $30 billion debt by a third before the end of 2016 by slashing its copper-mining operations in Zambia and the Democratic Republic of Congo and selling much of its agricultural business. Kinder Morgan, the North American pipeline company, cut its dividend on Tuesday afternoon, prompting a sell-off in the stock after hours.

There have already been about 40 Chapter 11 bankruptcy filings by North American oil and gas producers this year, accounting for roughly $15 billion in secured and unsecured debt. And energy experts predict more bankruptcies in 2016 if oil prices remain below $40 a barrel, or even below $50 a barrel.

When one company topples, it reverberates broadly.

On Monday, Energy & Exploration Partners, a Fort Worth oil and gas driller, filed for Chapter 11 protection. In the bankruptcy, it listed debt of more than $1 billion owed to several service companies, including units of Schlumberger and Baker Hughes.

For some players, the mess creates opportunity. Scott Sheffield, chief executive of Pioneer Natural Resources, a major Texas oil company, predicts a wave of consolidations and corporate shake-ups because of financial strain from the commodity price collapse.

"There is about $150 billion of private equity out there looking for deals in the U.S.," he said.

Others are facing a period of prolonged problems.

Some energy experts are even beginning to express concerns that sovereign wealth funds of Saudi Arabia and other wealthy Persian Gulf and oil-producing countries will redeem their money from investment firms in the coming year to shore up their balance sheets. If they do, the moves could initiate more instability in global equity and debt markets.

Anglo American is drastically shrinking to remain viable.

Since he became chief executive in 2013, Mr. Cutifani said, not a single month has passed during which any of the products that Anglo American mines has risen in price. When he took the job, Mr. Cutifani signaled that the free-spending ways of the commodity price supercycle had ended by selling the corporate jet.

Now, everything is getting a second look. Anglo American will close its London head office and share space in the city with the headquarters of De Beers, its diamond mining unit. Over all, Anglo American plans to reduce operating costs over the coming year by $1.1 billion and cut capital spending by an additional $1 billion in the same period.

The company intends to focus operation in three areas: the diamond operations of De Beers; industrial metals like copper; and bulk commodities like coal. Details about the job cuts will not be announced until February, but it appears that they will probably focus on the firm's bulk commodities operations.

Mr. Cutifani said that Anglo American would simply shut money-losing mines rather than sell them at heavily discounted prices, although he did not entirely rule out asset sales. The nickel, coal and iron ore mines, he said, will have to show that they can reduce costs sufficiently to generate cash.

"If not, they won't be in the portfolio, it's as simple as that," he said. "In this sort of environment, nothing can be considered business as usual."

A version of this article appears in print on December 9, 2015, on page B1 of the New York edition with the headline: If It Owns a Well or a Mine, It's Probably in Trouble .

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The logo of Glencore is pictured in front of the company's headquarters in the Swiss town of Baar in 2012. REUTERS/Michael Buholzer

Polymet stockholder Glencore selling copper mines in Australia, Chile

By Reuters Media on Oct 13, 2015 at 5:16 p.m.

Switzerland-based Glencore, the single largest stockholder in the proposed PolyMet copper mine near Hoyt Lakes, is trying to sell copper mines in Chile and Australia.

The company announced this week that it wants to sell the mines as it faces increased pressure to slash its debt and keep the company's stock value above water as commodities prices continue to founder.

Glencore said it would sell its wholly-owned Cobar copper mine in Australia and Lomas Bayas copper mine in Chile after receiving interest from potential buyers.

"This will allow potential buyers to bid to purchase either one or both of the mines and may or may not result in a sale," Glencore said in a statement Monday.

A London-based analyst said the Cobar and Lomas Bayas mines together could fetch less than $300 million as they are small compared to other mining operations.

Cobar produces about 50,000 tons of copper in concentrate per year, while the Lomas Bayas mine's annual output is about 75,000 tons of copper cathode.

"When you've got $50 billion in gross debt, it (selling the two small mines) doesn't move the needle. But it's just another reminder that everything is potentially for sale at the right price," the analyst said.

Exhibit 7-c
to Fond du Lac Band's Comments on FEIS and CWA §404 Permit for PolyMet
December 18, 2015

Glencore – drastically scaling back expansion as it tries to cut debt amidst low prices for its products – also has pledged to cut capital expenditure, suspend dividend payments and raise $2.5 billion of new equity capital, with the share sale completed last month.

Glencore declined to say who had approached it with expressions of interest in the copper mines.

Despite its cutbacks elsewhere, however, Glencore came through on Oct. 1 with a planned payment of $6 million to PolyMet to keep the company moving toward operations as it awaits environmental approval. PolyMet reported Oct. 1 that Glencore AG, a wholly owned subsidiary of Glencore, made the payment as part of its $30 million loan to PolyMet that comes due March 31.

PolyMet President and CEO Jon Cherry said that the payment "demonstrates Glencore's continued support for PolyMet."

A source close to Glencore said that if the sale the two copper mines was to go ahead, it would be on top of the $2 billion the company plans to reap by selling a minority stake in its agricultural business and also the rights to precious metals extracted from its copper and zinc mines.

In an effort to boost commodity prices, the company is scaling back production of copper, coal and zinc – three of its largest products.

Glencore shares, which have dropped 56 percent this year, were down about 3 percent Monday. Glencore said last month its business remained operationally and financially robust and it was confident in the medium and long-term fundamentals of its commodities.

News Tribune reporter John Myers contributed to this story.