

KANSAS FIELD CONFERENCE

FIELD GUIDE

2006 FIELD CONFERENCE

THE TRI-STATE REGION

BOUNDARIES AND NATURAL RESOURCES

JUNE 14–16, 2006

EDITED BY

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REPORT 2006–21

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KANSAS FIELD CONFERENCE

**The Tri-State Region
Boundaries and Natural Resources
2006 FIELD CONFERENCE**

June 14-16, 2006

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The Tri-State Region

Boundaries and Natural Resources

2006 FIELD CONFERENCE

June 14-16, 2006

PARTICIPANTS LIST

Name	Title	Affiliation	Business Address
Steve Adams	Natural Resource Coordinator	Kansas Department of Wildlife & Parks	1020 S. Kansas Ave. Topeka KS 66612 785/296-2281
Virginia Beamer	Representative 118 th District	Kansas House of Representatives / Utilities Committee	P.O. Box 85 Oakley KS 67748 785/672-4230
Gary Blackburn	Director of Bureau of Environmental Remediation	Kansas Department of Health and Environment	1000 SW Jackson, Suite 410 Topeka KS 66612-1367 785/296-1662
Constantine Cotsoradis	Assistant Secretary	Kansas Department of Agriculture	109 SW 9th St., 4th Floor Topeka KS 66612 785/296-3902
Susan Duffy	Executive Director	Kansas Corporation Commission	1500 S.W. Arrowhead Topeka KS 66604-4027 785/271-3166
Lon Frahm	Member	Geological Survey Advisory Council	PO Drawer F Colby KS 67701 785/460-6719
Marci Francisco	Senator 2 nd District	Kansas Senate / Natural Resources Committee	1101 Ohio Lawrence KS 66044 785/842-6402
Joe Fund	Chief Fiscal Officer	Kansas Water Office	901 S. Kansas Ave. Topeka KS 66612 785/296-0872
Mimi Garstang	Director & State Geologist	Division of Geology and Land Survey, Missouri Dept. of Natural Resources	PO Box 250 Rolla MO 65402 573/368-2101
Raney Gilliland	Assistant Director for Research	Kansas Legislative Research Department	300 SW 10th, Rm 545-N Topeka KS 66612 785/296-3181

Bob Grant	Representative 2 nd District	Kansas House of Representatives	407 W. Magnolia Cherokee KS 66724 620/457-8496
Kevin Gustavson	Grand Lake Project Coordinator / Writer	Oklahoma Conservation Commission	1731 S. Rockford Ave. Tulsa OK 74120 918/801-2150
Steve Hatfield	Operations Manager	Lafarge NA Aggregates	3500 N. West St. Wichita KS 67205 316/943-3500
Mike Hayden	Secretary	Kansas Department of Wildlife and Parks	1020 S. Kansas Ave., Suite 200 Topeka KS 66612 785/296-2282
Dave Heinemann	Chairman	Geological Survey Advisory Council	3826 SW Cambridge Ct. Topeka KS 66610 785/267-5033
Carl Holmes	Representative 125 th District / Chair	Kansas House of Representatives / Utilities Committee	P.O. Box 2288 Liberal KS 67905 620/624-7361
Mitch Holmes	Representative 114 th District	Kansas House of Representatives / Wildlife, Parks & Tourism Committee	211 SE 20th Ave. St. John KS 67576 620/234-5834
Steve Irsik	Chairman	Kansas Water Authority	5405 Six Rd. Ingalls KS 67853 620/335-5363
Dan Johnson	Representative 110 th District / Chair	Kansas House of Representatives / Agriculture Committee	P.O. Box 247 Hays KS 67601-0247 785/625-6476
Annie Kuether	Representative 55 th District	Kansas House of Representatives / Utilities Committee	1346 SW Wayne Ave. Topeka KS 66604 785/232-0717
Wayne Lebsack	President / Trustee	Lebsack Oil Production, Inc. / The Nature Conservancy, Kansas Chapter	603 S. Douglas Lyons KS 67554 620/938-2396
Janis Lee	Senator 36 th District	Kansas Senate / Utilities Committee	2032 90th Rd. Kensington KS 66951 785/476-2294
Earl Lewis	Operations Manager	Kansas Water Office	901 S. Kansas Ave. Topeka KS 66612 785/296-3185
Judy Loganbill	Representative 86 th District	Kansas House of Representatives / Economic Development Committee	215 S. Erie Wichita KS 67211 316/683-7382

Margaret Long	Representative 36 th District	Kansas House of Representatives / Utilities Committee	1801 N. 126 th St. Kansas City KS 66109 913/721-2322
Brad Loveless	Manager, Biology & Conservation Programs	Westar Energy / KACEE (KS Assoc. for Conservation and Environmental Education)	122 SW 2 nd St. Topeka KS 66603 785/575-8115
Ed Martinko	Director	Kansas Biological Survey	2101 Constant Ave. Lawrence KS 66047 785/864-1505
Peggy Mast	Representative 76 th District	Kansas House of Representatives / Utilities Committee	765 Road 110 Emporia KS 66801 620/343-2465
Carolyn McGinn	Senator 31 st District / Chair	Kansas State Senate / Natural Resources Committee	11047 N. 87 W. Sedgwick KS 67135 316/772-0147
Karl Mueledner	Director of Bureau of Water	Kansas Department of Health and Environment	1000 SW Jackson, Suite 420 Topeka KS 66612-1367 785/296-5502
Don Paxson	Vice Chair	Kansas Water Authority	P.O. Box 487 Penokee KS 67659 785/421-2480
Roger Pine	Senator 3 rd District	Kansas Senate / Utilities Committee	1783 E. 1500 Rd. Lawrence KS 66044 785/843-6949
David Pope	Chief Engineer	Division of Water Resources, Kansas Department of Agriculture	109 SW 9 th St., 2 nd Floor Topeka KS 66612 785/296-3710
Larry Powell	Representative 117 th District	Kansas House of Representatives / Agriculture Committee	2209 Grandview East Garden City KS 67846 620/275-6789
David Pruitt	Environmental Programs Manager, Water Quality Division	Oklahoma Department of Environmental Quality	PO Box 1677 Oklahoma City OK 73101 405/702-8154
Tracy Streeter	Director	Kansas Water Office	901 S. Kansas Ave. Topeka KS 66612 785/296-3185
John Strickler	Past Chairman / Trustee Board	The Nature Conservancy, Kansas Chapter / KACEE	1523 University Drive Manhattan KS 66502-3447 785/565-9731
J. D. Strong	Chief of Staff	Office of the Secretary of Environment	3800 N. Classen Blvd. Oklahoma City OK 73118 405/530-8998

Steve Thompson	Executive Director	Oklahoma Department of Environmental Quality	PO Box 1611 Oklahoma City OK 73101 405/702-7163
Mary Torrence	Senior Assistant Revisor	Revisor of Statutes Office	300 SW 10 th , Ste. 010-E Topeka KS 66612-1592 785/296-5239
Darrell Townsend	Director of Ecosystems Management	Grand River Dam Authority	PO Box 409 Vinita OK 74301 918/256-5545
Jim Triplett	Chairman	Biology Department Pittsburgh State University	1701 S. Broadway Pittsburg KS 66762 620/235-4732
Mike Wells	Deputy Director for Water Resources	Missouri Department of Natural Resources	PO Box 176 Jefferson City MO 65102 573/751-4732

BIOGRAPHICAL INFORMATION

Steve Adams

Title

Natural Resource Coordinator

Affiliation

Kansas Department of Wildlife & Parks

Address and Telephone

1020 S. Kansas Ave.

Topeka KS 66612

785/296-2281

stevea@wp.state.ks.us

Current Responsibilities

Natural Resource Coordinator, Wildlife & Parks

Experience

Fisheries biologist, Florida Game & Fish; Aquatic ecologist, Environmental Services, Kansas Department of Wildlife & Parks

Education

Northeastern State University – BS, 1980

Oklahoma State University – MS, 1983

Virginia Beamer

Title

Representative, 118th District

Affiliation

Kansas House of Representatives

Address and Telephone

P.O. Box 85

Oakley KS 67748

785/672-4230

cvbeamer@sbcglobal.net

Current Responsibilities

Member, Utilities; Transportation; Wildlife, Tourism and Parks; and Governmental Organization and Elections Committees

Experience

County Commissioner (Logan), Clerk of the District Court

Gary Blackburn

Title

Director of Bureau of Environmental Remediation

Affiliation

Kansas Department of Health and Environment

Address and Telephone

1000 SW Jackson, Suite 410

Topeka KS 66612-1367

785/296-1662

Current Responsibilities

Manage the Kansas environmental programs responsible for performing soil and ground-water monitoring and cleanup. Oversee coal mine reclamation and drycleaner and storage tank regulatory programs to prevent releases.

Experience

Started in 1979 as geologist, then became Northeast District Geologist, section chief of the Storage Tank Section, and Director of BER (since 1999)

Education

Emporia State University – BS, 1979

Constantine Cotsoradis

Title

Assistant Secretary

Affiliation

Kansas Department of Agriculture

Address and Telephone

109 SW 9th St., 4th Floor

Topeka KS 66612

785/296-3902

ccotsoradis@kda.state.ks.us

Current Responsibilities

Assist in the management of the agency, development of policy, and work with legislature and agency CIO

Experience

Program manager of KDA Laboratory, agricultural commodities assurance program, and weights and measures program

Education

Loyola College, Baltimore MD – Bachelors, 1979

University of Kansas – Masters, 2000

Susan Duffy

Title

Executive Director

Affiliation

Kansas Corporation Commission

Address and Telephone

1500 S. W. Arrowhead Road

Topeka KS 66604-4027

785/271-3166

s.duffy@kcc.state.ks.us

Current Responsibilities

Executive Director, Kansas Corporation Commission

Experience

26 years in state government

Education

Wichita State University – MS, 1980

Lon Frahm

Title

Geological Survey Advisory Council Member

Affiliation

Frahm Farmland, Inc.

Address and Telephone

PO Drawer F
Colby KS 67701

Current Responsibilities

Farm 11,000 acres irrigated and dryland crops, director of Midwest Energy

Experience

Groundwater Management Dist. #4 board member, Thomas County Historical Society Board, and many years on High Plains Public Radio Board

Education

Kansas State University – BS, 1980
Kansas State University – MAB, 2006

Marci Francisco

Title

Senator, 2nd District

Affiliation

Kansas State Senate and University of Kansas

Address and Telephone

1101 Ohio
Lawrence KS 66044
785/842-6402
maf@sunflower.com

Current Responsibilities

Member, Agriculture, Natural Resources, Utilities, and Arts and Cultural Resources (joint) Committees. Space Analyst for University of Kansas.

Education

University of Kansas– B.E.D., 1973
University of Kansas– B-Arch., 1977

Joe Fund

Title

Chief Fiscal Officer

Affiliation

Kansas Water Office

Address and Telephone

901 S. Kansas Ave.
Topeka KS 66612
785/296-0872
jfund@kwo.state.ks.us

Current Responsibilities

Management and oversight of agency budget, legislative activity, and Kansas Water Authority

Experience

Four years in current position. Four years at the Kansas Department of Health and Environment managing Legislative/Governmental Affairs

Education

Kansas State University – BS, 1993

Mimi Garstang

Title

Director & State Geologist

Affiliation

Division of Geology and Land Survey, Missouri
Department of Natural Resources

Address and Telephone

PO Box 250
Rolla MO 65402
573/368-2101
mimi.garstang@dnr.mo.gov

Current Responsibilities

Represent the state on geological, mineral resources, geologic hazards, earthquake risk, water contamination, and aquifer hydrology issues. Oversee Land Survey Program

Experience

Director, 2000-06; Deputy Director and Assist. State Geologist, DNR, 1994–2000; Environmental Geology, DNR, 1986-94; Mine Inventory Geology, DNR, 1982-86; White Engineering, 1972-75

Education

Missouri State University, 1972

Raney Gilliland

Title

Assistant Director for Research

Affiliation

Kansas Legislative Research Department

Address and Telephone

Rm 545-N, State Capitol
300 SW 10th
Topeka KS 66612
785/296-3181
raneyg@klrd.state.ks.us

Current Responsibilities

Staff House and Senate Agriculture Committees; House Environment Committee; Senate Natural Resources and Administrative Rules and Regulations Committees

Experience

Legislative Research, 28 years

Education

Kansas State University – BS, 1975
Kansas State University – MS, 1979

Bob Grant

Title

Representative, 2nd District

Affiliation

Kansas House of Representatives

Address and Telephone

407 W. Magnolia
Cherokee KS 66724
620/457-8496
grantbnl@ckt.net

Current Responsibilities

Member Commerce & Labor, Education Budget, Financial Institutions, Insurance, State Buildings Construction (Joint), and Special Claims Against the State (Joint) Committees

Experience

Self-employed bar and grill owner; Mayor of Cherokee for 16 years

Education

Labette Community College – AA, 1971
Pittsburg State University

Kevin Gustavson

Title

Grand Lake Project Coordinator/Writer

Affiliation

Oklahoma Conservation Commission

Address and Telephone

1731 S. Rockford Ave.
Tulsa OK 74120
918/801-2150
kevin.gustavson@okcc.state.ok.us

Current Responsibilities

Coordinate 319 implementation (Clean Water Act) project for Grand Lake Watershed and will coordinate larger-scale planning effort

Experience

Professor of Earth Science and Geology at Eastern Michigan University. Visiting professor of Geology at Earlham College (IN) and St. Norbert College (WI).

Education

Carleton College (MN) – 1993
University of Wisconsin-Madison – PhD, 1998
Michigan State Watershed Management Certificate Program – 2004

Steve Hatfield

Title

Operation Manager

Affiliation

Lafarge NA Aggregates

Address and Telephone

3500 N. West St
Wichita KS 67205
316/943-3500
steven.hatfield@lafarge-na.com

Current Responsibilities

Manage operations of aggregate plants (sand) in Wichita and Oxford, KS, and Coweta, OK. Member of the Geological Survey Advisory Council

Experience

Worked for former owners since 1968. Designed and built plants, management, sales, and marketing.

Education

Kansas Teachers College of Emporia – BA 1973

Mike Hayden

Title

Secretary

Affiliation

Kansas Department of Wildlife & Parks

Address and Telephone

1020 S. Kansas Ave., Suite 200
Topeka KS 66612
785/296-2282
mike.hayden@wp.state.ks.us

Current Responsibilities

Secretary of Kansas Department of Wildlife & Parks

Experience

President, American Sportfishing Assoc.; Assistant Secretary of Interior of Fish, Wildlife and Parks; Governor of Kansas, 1987-91; Speaker of the Kansas House, 1983-87

Education

Kansas State University – BS, 1966
Ft. Hays State University – MS, 1974

David Heinemann

Title

Chairman

Affiliation

Geological Survey Advisory Council

Address and Telephone

3826 SW Cambridge Court
Topeka KS 66610
785/267-5033
daveh123@cox.net

Current Responsibilities

Chairman of Geological Survey Advisory Council

Experience

State Representative, 27 years; General Counsel, KCC, 2 years; Executive Director, KCC, 2 years; Department of Revenue, Special Assistant to the Secretary, 5 years

Education

Augustana College – BA, 1967
University of Kansas – 1967-68
Washburn Law School – JD, 1973

Carl Holmes

Title

Representative, 125th District

Affiliation

Kansas House of Representatives

Address and Telephone

P.O. Box 2288
Liberal KS 67905
620/624-7361
repcarl@aol.com

Current Responsibilities

Chair, Utilities Committee; Vice-Chair, Joint Com-

mittee on Administrative Rules and Regulations;
Member, Agriculture & Natural Resources Budget
Committee; Chair, Kansas Electric Transmission
Authority; Chair, NCSL Energy & Electric Utilities
Committee; Member, N-Council on Electric Policy

Experience

Chair, House Energy & Natural Resources Commit-
tee; President, Kansas League of Municipalities

Education

University of Kansas, 1958-1960
Colorado State University – BS, 1962

Mitch Holmes

Title

Representative, 114th District

Affiliation

Kansas House of Representatives

Address and Telephone

211 SE 20th Ave.
St. John KS 67576
620/234-5834
rep@mitchholmes.com

Current Responsibilities

Member, House Wildlife, Parks & Tourism; Utilities;
Insurance; Public Safety Budget; and Veteran Affairs
Committees

Experience

Unskilled labor, skilled labor, tutoring, military, retail
sales, computer programming

Education

Hutchinson Community College – AA, 1984
Friends University – BS, 1988
De Paul University – Cert., 1995

Steve Irsik

Title

Chairman

Affiliation

Kansas Water Authority

Address and Telephone

5405 Six Rd.
Ingalls KS 67853
620/335-5363

Current Responsibilities

Chair Kansas Water Authority

Experience

Farmer, rancher, and entrepreneur

Education

Kansas State University – BS, 1969

Dan Johnson

Title

Representative, 110th District

Affiliation

Kansas House of Representatives

Address and Telephone

P.O. Box 247
Hays KS 67601-0247
785/625-6476
djohnson2@ruraltel.net

Current Responsibilities

Chair, House Agriculture Committee; Owner Johnson
Ranch

Experience

Instructor of Industrial Arts, Fort Hays State University,
1961-69. Automotive test equipment sales; 20 years in
Kansas Army National Guard (Retired Lt. Col.)

Education

Fort Hays State University – BS, 1958
Fort Hays State University – MS, 1968

Annie Kuether

Title

Representative, 55th District

Affiliation

Kansas House of Representatives

Address and Telephone

1346 SW Wayne Ave.
Topeka KS 66604
785/232-0717
kuet@aol.com

Current Responsibilities

Member, Utilities; General Government and Commerce
Budget (Ranking Democrat); and Higher Education
Committees

Experience

Administrative Assistant to Kathleen Sebelius; retail
sales; special education paraprofessional

Education

Bowling Green State University

Wayne Lebsack

Title

President / Trustee

Affiliation

Lebsack Oil Production Inc. /
The Nature Conservancy, Kansas Chapter

Address and Telephone

603 S. Douglas
Lyons KS 67554
620/938-2396

Current Responsibilities

Chair, Stewardship Committee, The Nature Conservan-
cy; Manage oil and gas exploration and development

Experience

Oil and gas exploration; ground-water exploration and
pollution research

Education

Colorado School of Mines – Geol. Eng., 1949
Colorado School of Mines – Pet. Geol., 1951
Colorado School of Mines – 2 years grad. studies

Janis Lee

Title

Senator, 36th District

Affiliation

Kansas State Senate

Address and Telephone

2032 90th Rd.
Kensington KS 66951
785/476-2294

Current Responsibilities

Asst. Minority Leader, Ranking Minority Member, Utilities; Ranking Member, Assessment and Taxation, Member, Natural Resources and Agriculture Committees; Member, KETA

Experience

Farmer and rancher

Education

Kansas State University – B.S., 1970

Earl Lewis

Title

Operations Manager

Affiliation

Kansas Water Office

Address and Telephone

901 S. Kansas Ave.
Topeka KS 66612
785/296-3185
elewis@kwo.state.ks.us

Current Responsibilities

Oversight of operations and technical work at Kansas Water Office

Experience

Seven years with Division of Water Resources in compliance, water use, water management, and interstate issues

Education

University of Kansas – B.S., 1992

Judith Loganbill

Title

Representative, 86th District

Affiliation

Kansas House of Representatives

Address and Telephone

215 S. Erie
Wichita KS 67211
316/683-7382
JudithLoganbill@msn.com

Current Responsibilities

Member, Economic Development, Education, Federal & State Affairs, and Kansas Security (Joint) Committees. Elementary teacher in Wichita.

Education

Bethel College – BS, 1975
Northern Arizona University – MA, Ed., 1981

Margaret Long

Title

Representative, 36th District

Affiliation

Kansas House of Representatives

Address and Telephone

1801 N. 126th St.
Kansas City KS 66109
913/721-2322

Current Responsibilities

Member, Utilities; Transportation; and Wildlife, Parks, and Tourism Committees

Experience

Accountant, TWA (40 years)

Education

Kansas City Kansas Community College

Brad Loveless

Title

Manager, Biology & Conservation Programs

Affiliation

Westar Energy / Kansas Association of Conservation and Environmental Education (KACEE)

Address and Telephone

122 SW 2nd St.
Topeka KS 66603
785/575-8115
brad_loveless@wr.com

Current Responsibilities

Responsible for environmental issues with transmission/distribution line design, construction, and maintenance and electrical generation-sensitive species interactions. Chair of Westar's Green Team volunteer group.

Experience

Biologist with Westar for 21 years

Education

The Ohio State University – BS, 1981
University of Kansas – MS, 1983

Ed Martinko

Title

Director / Professor

Affiliation

Kansas Biological Survey

Address and Telephone

2101 Constant Ave.
Higuchi Hall
University of Kansas
Lawrence KS 66047
785/864-1505
martinko@ku.edu

Current Responsibilities

Director of Kansas Biological Survey; Professor of Ecology

Education

College of Emporia – BS, 1967
University of Colorado – MA, 1970
University of Kansas – PhD, 1976

Peggy Mast

Title

Representative, 76th District

Affiliation

Kansas House of Representatives

Address and Telephone

765 Road 110
Emporia KS 66801
620/343-2465
pmast@ink.org

Current Responsibilities

Member, Utilities Committee

Experience

Twenty-six years working for oil-field servicing business

Carolyn McGinn

Title

Senator, 31st District

Affiliation

Kansas State Senate

Address and Telephone

11047 N. 87 W.
Sedgwick KS 67135
mcginn1@att.net

Current Responsibilities

Chair, Natural Resources Committee

Experience

County Commissioner, farmer

Education

Wichita State University – BBA, 1983
Friends University – Masters, 1998

Karl Mueldener

Title

Director, Bureau of Water

Affiliation

Kansas Department of Health and Environment

Address and Telephone

1000 SW Jackson St., Ste. 420
Topeka KS 66612-1367

Current Responsibilities

Director of Bureau of Water, KDHE; Water-quality programs for drinking and surface water

Experience

31 years with KDHE; Director, Bureau of Water since 1987

Education

Kansas State University – BS, 1973
Kansas State University – MS, 1974

Don Paxson

Title

Vice Chair

Affiliation

Kansas Water Authority

Address and Telephone

PO Box 487
Penoque KS 67659
785/421-2480
dpaxson@ruraltel.net

Current Responsibilities

Vice Chair, Kansas Water Authority

Experience

Farmer, irrigator, electrical and water contractor

Education

High School – 1956

Roger Pine

Title

Senator, 3rd District

Affiliation

Kansas State Senate

Address and Telephone

1783 E. 1500 Rd.
Lawrence KS 66044
785/843-6949
rogercpine@earthlink.net

Current Responsibilities

Member, Utilities, Agriculture, Assessment and Taxation, and Education Committees

Experience

Farmer

Education

Kansas State University – BS, 1961

David Pope

Title

Chief Engineer

Affiliation

Kansas Department of Agriculture,
Division of Water Resources

Address and Telephone

109 SW 9th St., 2nd Floor
Topeka KS 66612
785/296-3710
dpope@kda.state.ks.us

Current Responsibilities

Administration of water laws in Kansas

Experience

Manager of GMD #3; Extension Irrigation Engineer
for KSU in Manhattan and Garden City

Education

Oklahoma State University – BS, 1970
Oklahoma State University – MS, 1971

Larry Powell

Title

Representative, 117th District

Affiliation

Kansas House of Representatives

Address and Telephone

2209 Grandview East
Garden City KS 67846
620/275-6789
powell@ucom.net

Current Responsibilities

Member, Agriculture, Agriculture and Natural
Resources Budget, and Appropriations Committees

Experience

Rancher, custom cutter, implement dealer

David Pruitt

Title

Environmental Programs Manager,
Water Quality Division

Affiliation

Oklahoma Department of Environmental Quality

Address and Telephone

PO Box 1677
Oklahoma City OK 73101

Current Responsibilities

Program administration for water-quality programs:
public water supply, NPDES, and compliance

Experience

USGS hydrologic investigations, DEQ various
programs (permit writer, hydrologic investigations,
GIS, GPS, administration)

Education

Oklahoma State University – BS, 1984

Tracy Streeter

Title

Director

Affiliation

Kansas Water Office

Address and Telephone

901 S. Kansas Ave.
Topeka KS 66612
785/296-3185
tstreeter@kwo.state.ks.us

Current Responsibilities

Agency Head

Experience

State Conservation Commission Executive Director,
1995-2004

Education

Highland Community College – AS, 1983
Missouri Western State – BS, 1985
University of Kansas – MPA, 1993

John Strickler

Title

Trustee / Treasurer

Affiliation

The Nature Conservancy, Kansas Chapter / KACEE
(Kansas Association for Conservation and Environ-
mental Education)

Address and Telephone

1523 University Drive
Manhattan KS 66502-3447
785/565-9731
jstrickl@oznet.ksu.edu

Current Responsibilities

Board of Trustees, Kansas Chapter, The Nature Con-
servancy; Treasurer, KACEE

Experience

Chair, The Nature Conservancy, Kansas Chapter;
Executive Director, KACEE; Special Assistant for
Environment and Natural Resources to Gov. Hayden,
2 years; Acting Secretary, Kansas Department of
Wildlife and Parks, 1987 and 1995; Kansas State
and Extension Forestry, KSU, 33 years; U.S. Forest
Service, 4 years

Education

University of Missouri – BS, 1957
Kansas State University – MS, 1968

J. D. Strong

Title

Chief of Staff

Affiliation

Office of the Secretary of Environment

Address and Telephone

3800 N. Classen Blvd.
Oklahoma City OK 73118
405/530-8998
jdstrong@owrb.state.ok.us

Current Responsibilities

Public policy development, legislative affairs, public
relations, interagency and interstate coordination for
environmental cabinet

Experience

1996-present: Office of the Secretary of Environment; 1993-96: Oklahoma Water Resources Board

Education

Oklahoma State University – BS, 1993

Steve Thompson

Title

Executive Director

Affiliation

Oklahoma Department of Environmental Quality

Address and Telephone

PO Box 1611

Oklahoma City OK 73101

Current Responsibilities

Executive Director of Oklahoma Environmental Agency

Education

Oklahoma University – BA, 1970

Mary Torrence

Title

Assistant Revisor of Statutes

Affiliation

Revisor of Statutes Office

Address and Telephone

State House, Suite 010-E

300 SW 10th

Topeka KS 66612

785/296-5239

maryt@rs.state.ks.us

Current Responsibilities

Legislative staff; drafting legislation and legal advisor

Experience

Revisor of Statutes Office, 31 years

Education

University of Kansas – BA, 1971

University of Kansas – JD, 1974

Darrell Townsend

Title

Director of Ecosystems

Affiliation

Grand River Dam Authority

Address and Telephone

PO Box 409

Vinita OK 74301

Current Responsibilities

Director of Ecosystems Management, GRDA

Experience

Instructor of freshman biology, Tulsa Community College and Oklahoma State University

Education

Oklahoma State University – PhD, 2004

Jim Triplett

Title

Chair

Affiliation

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Current Responsibilities

Chair, Biology Department; Chair, Neosho Basin Advisory Council; Chair, Council of BAC Chairs; Member, Geological Survey Advisory Council; and Governor's Solid Waste Advisory Committee

Experience

1975-81, Ohio State Fisheries & Wildlife Division;

1981-present, PSU; 1984-present, Chair of Biology

Dept.; aquatic ecology

Education

Pittsburg State University – BA, 1966

Pittsburg State University – MS, 1968

University of Kansas – PhD, 1976

Mike Wells

Title

Deputy Director for Water Resources

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Missouri Department of Natural Resources

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Current Responsibilities

Represent the state in interstate water issues; oversee department staff responsible for drought and flood assessment, state water plan, water supply analysis, dam and reservoir safety, and department's soil and water conservation program

Experience

Joined MO DNR in 2001 as Deputy Div. Director & Chief of Water Resources in Div. of Geol. & Land Survey; before, worked 34 years at U.S. Dept. of Agriculture, Natural Resources Conservation Service

Education

Arkansas State University, BS – 1967

University of Arkansas, MS – 1978

KANSAS GEOLOGICAL SURVEY STAFF

Bill Harrison

Title

Director and State Geologist

Affiliation

Kansas Geological Survey

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Current Responsibilities

Plan and initiate major research programs; Assess scientific quality of current programs

Experience

Kansas Geological Survey, 9 years; Lockheed Martin Idaho Technologies; EG&G Idaho, Inc.; ARCO Exploration & Technology; University of Oklahoma/Oklahoma Geological Survey, Faculty/Staff Geologist

Education

Lamar State College of Technology - BS, 1966

University of Oklahoma – MS, 1968

Louisiana State University – PhD, 1976

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Public Outreach, Kansas Geological Survey

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Current Responsibilities

Supervise publication and public outreach activities, media relations, and non-technical communications

Experience

Kansas Geological Survey, 28 years; University-Industry Research, University of Wisconsin, 3 years; Salina Journal, 4 years

Education

Kansas Wesleyan University – BA, 1975

University of Wisconsin-Madison – MA, 1978

University of Wisconsin-Madison – MS, 1982

Cathy Evans

Title

Publication Assistant

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Kansas Geological Survey

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Current Responsibilities

Work with coordinator of field conference and guide-book; news releases; help produce non-technical or semi-technical publications

Experience

Kansas Geological Survey; University Press of Kansas; Spencer Museum of Art

Education

University of Kansas – BA, 1978

University of Kansas – MS, 1990

Shane Lyle

Title

Research Assistant

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Geology Extension, Public Outreach Section, Kansas Geological Survey

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Current Responsibilities

Geology Extension Coordinator; Kansas Field Conference

Experience

Kansas Geological Survey; Environmental and Engineering Geology, 12 years

Education

Kansas State University – BS, 1993

Jim McCauley

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Assistant Scientist

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Stratigraphic Research Section, Kansas Geological Survey

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Current Responsibilities

Geologic mapping, remote sensing, public inquiries

Experience

Kansas Geological Survey, 29 years; KU Remote
Sensing Laboratory, 6 years

Education

University of Kansas – BS, 1970
University of Kansas – MS, 1973
University of Kansas – PhD, 1977

Bob Sawin

Title

Research Associate

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Current Responsibilities

Geology Extension; Kansas Field Conference; geo-
logic mapping

Experience

Kansas Geological Survey, 14 years; Petroleum
Geology, 15 years; Engineering Geology, 6 years

Education

Kansas State University – BS, 1972
Kansas State University – MS, 1977

The Tri-State Region

Boundaries and Natural Resources

2006 FIELD CONFERENCE

June 14-16, 2006

Welcome to the 2006 Field Conference, co-sponsored by the Kansas Geological Survey (a division of the University of Kansas), the Kansas Department of Health and Environment, the Kansas Corporation Commission, the Kansas Department of Wildlife and Parks, the Kansas Water Office, the Grand River Dam Authority (Oklahoma), and the Division of Geology and Land Survey at the Missouri Department of Natural Resources. Previous Field Conferences have focused exclusively on natural resource issues facing the state of Kansas. This year's trip will attempt to do something slightly different—to examine those natural resource issues that cut across state lines.

In the late 1800's, famed geologist John Wesley Powell proposed using watersheds to guide the settling of the American West. Instead, political boundaries continued to dominate our thinking and our approach to natural-resource issues. Nonetheless, most natural resources and related problems do not obey political boundaries. Rivers and streams flow across state lines, ground water can move slowly from one state to another, contamination in one location can migrate underground and affect another location miles away. Through the last half of the 20th century, there was a growing realization that, when it comes to natural resources, political boundaries and natural boundaries are two very different things.

Yet political boundaries are very real. Regulatory requirements and laws vary dramatically from one state to the next. Knowledge of contaminant levels can differ considerably, according to the requirements for sampling from one place to another. Some states provide more support for natural-resource agencies, and natural-resource efforts, than others. In all, our understanding of, our support for, and our regulatory approach to natural-resource issues can be dramatically different within the space of a few miles.

The Tri-State region of Kansas, Oklahoma, and Missouri is an ideal place to consider all this. Not only do three states come together here, but the area has a long history of mining that has led to environmental

issues that they all share, like it or not. More recently, the three states are confronting common water issues. The purpose of this year's field trip is threefold: First, we will explore the natural-resource issues in each of these three states, particularly focusing on water, energy, and environmental contamination. Second, we will look particularly closely at those issues that cut across state lines, to help participants begin to think of these issues in terms of the natural units they obey (such as drainage basins) rather than the political distinctions that we have imposed. Finally, and perhaps most important, we hope to learn more about how other states approach the natural-resource issues that we all share, and perhaps learn techniques and methods that might be applicable in our own states.

A Preview

We will be spending the next two-and-a-half days in the Ozark Plateau Physiographic Region (the name, by the way, comes from the French name for the Arkansas Indians, whom the French called "Aux Arcs," which was Anglicized to "Ozarks"). This region is strongly identified with Arkansas and Missouri, but it also covers small parts of Kansas and Oklahoma. It is a hilly, densely forested area. Only about one-fourth of the area has been cleared for pasture and cropland. Humid, wet summers are typical and precipitation is generally greater than 40 inches per year.

The Ozark Plateau, or Ozark Mountains, is one of two mountainous areas (the other being the Black Hills) between the Appalachian Mountains to the east and the Rockies to the west. The Precambrian granite core of the Ozarks was covered by younger sediments that were deposited over the top of the granite. Subsequent uplift and erosion removed some of those sedimentary rocks, exposing the granite core of the Ozarks in some places, such as the St. Francis Mountains in Missouri.

These younger sedimentary rocks contain the minerals that led to much of the mining in the Tri-State district. Lead and zinc ore here is found in rocks of Mississippian age, deposited in a shallow sea about 345

million years ago. While these sedimentary rocks—mainly limestones and chert—are much younger than the underlying Precambrian rocks, they are still very ancient rocks. In fact, the Mississippian rocks that crop out in extreme southeastern Kansas are the oldest rocks exposed at the surface of Kansas.

After they were deposited, erosion attacked these Mississippian rocks and produced areas of caverns and sinkholes, a type of landscape known as “karst topography.” In later geologic time, mineral-laden solutions deposited zinc, lead, and other minerals in some of the karst features and in fractures in the Mississippian rocks. Some of these deposits were linear, some were curved, so that early miners here referred to these ore-rich zones as “circles and runs.” Also, some of these lead and zinc deposits occurred within the limestone and chert layers and were called “sheet ground deposits.”

Mining took place here for about 100 years, from about 1870 to 1970, and today the remains are primarily apparent in the huge piles of chat (see the photo on the cover of the field guide), or chert and limestone gravel, that were left behind after the ore was removed. These chat piles also contain traces of unrecovered lead and zinc. They were once common across the landscape here, but many have since been removed and used in a variety of construction projects.

We will begin examining the issues of the Tri-State region on the first day by discussing the legacy of that mining history. We will look at some of those historic mining areas and the way they were changed by mining, along with recent attempts to reclaim and improve those lands. Also we will look at the water-quality problems that are related to the mining and attempts at remediation.

On the second day we will explore more general water issues in the Tri-State district. We will discuss the area’s ground-water system, how water moves from place to place underground, and how it is being used and monitored. We will talk about the coalitions that residents have developed to attempt to deal with ground-water issues and the variety of governmental and non-governmental organizations that are involved with them. Then we will turn to surface-water issues, learning what the issues are and how water law differs from state to state in this area. We will also get a closer look at the local Mississippian-age rocks and one of the many caves that are found in the region. Then we will end the day on the Grand Lake O’ the Cherokees, where we will talk about the issues of water-quality,

siltation, and development, and how the lake is affected by the entire area that drains into it.

Finally, on day three, we will turn our attention to energy and economics. We will talk about the possible location of a new electrical power plant in this area. Later in the morning, we will visit about the long history of oil and gas exploration in this area and see how to deal with some of the wells that have been left behind. And, on this last morning, we will begin looking ahead, with a panel discussion of the economic future of the Tri-State area. With the perspective of the legacy of natural-resource use, we should be better equipped to consider the future of this region.

The result should be a new appreciation of the Ozark Plateau, with its unusual beauty and storehouse of natural resources. It should be a better understanding of how issues of natural resources and their use cut across state and local governmental boundaries, how individuals and organizations are attempting to deal with these issues, and what the future holds for this unique area.

About the Field Conference

Some issues are impossible to understand without seeing them first-hand. The 2006 Field Conference marks the 12th year the Kansas Geological Survey (KGS) has worked with co-sponsors to develop this opportunity for decision-makers to see and experience many of the natural-resource issues with which they grapple. Participants have been selected to provide a range of legislative, governmental, education, and private-business expertise. Local and regional experts in natural-resource issues will meet us at each site and describe the location and the issues related to it. The objective is to let participants see the results of their decisions and to talk with local, state, and federal governmental officials, environmental groups, business people, and citizens’ organizations. The result should give participants a broader, more-informed perspective useful in formulating policies. In addition, the Field Guide you are holding provides background on sites and issues and serves as a handy reference long after the Field Conference is over.

During the Field Conference, participants are expected to be just that—participants. We want you to contribute to the discussion, to ask questions, and to otherwise join in on deliberations. **The bus microphone is open to everyone, and we encourage everyone to participate.**

Please remember that in the course of the Field Conference, we do not seek to resolve policy or regulatory conflicts. We do try to provide opportunities to familiarize policymakers with resource problems. By bringing together experts who examine the unique technical, geographical, geological, environmental, social, and economic realities of this region, we hope to go beyond merely identifying issues. We want this combination of first-hand experience and interaction among participants to result in a new level of understanding of the state's natural-resource issues.

In doing this, we attempt to present, as nearly as possible, all sides of contentious issues. Please know that the opinions presented during the Field Conference are not necessarily those of the KGS or Field Conference co-sponsors. Nonetheless, we do believe it is important for participants to hear various viewpoints on complex issues.

The Kansas Field Conference is an outreach program of the Kansas Geological Survey, administered through its Geology Extension program. Its mission is to provide educational opportunities to individuals who make and influence policy about natural-resource and related social, economic, and environmental issues in Kansas. The Survey's Geology Extension program is designed to develop materials, projects, and services that communicate information about the geology of Kansas, the state's natural resources, and the products of the Kansas Geological Survey to the people of the state.

The Kansas Field Conference was begun in 1995 with the support of Lee Gerhard, then the Survey's director and state geologist. The Field Conference is modeled after a similar program of national scope, the Energy and Minerals Field Institute, operated by the Colorado School of Mines. The KGS appreciates the support of Erling Brostuen, Director of the Energy and Field Institute, in helping develop the Kansas project.

The KGS Field Conference has been recognized by

- The National Institute of Standards and Technology as among 50 Best Practices for Communication of Science and Technology for the Public, 2001; and
- The Division of Environmental Geosciences of the American Association of Petroleum Geologists, which presented the Field Conference with its Public Outreach Award in 1998.

The KGS appreciates your attendance at this year's Field Conference and your willingness to share your insights for its improvements. Your input has helped make the Field Conference a model that has been adopted by other state geological surveys.

SPONSORS

Kansas Geological Survey

Since 1889, the Kansas Geological Survey has studied and reported on the state's geology. Today the KGS mission is to study and provide information about the state's geologic resources and hazards, particularly ground water, oil, natural gas, and other minerals. In many cases, the Survey's work coincides with the state's most pressing natural-resource issues.

By statutory charge, the Survey's role is strictly one of research and reporting. The KGS has no regulatory function. It is a division of the University of Kansas. The KGS employs about 70 full-time staff members and about 80 students and grant-funded staff. It is administratively divided into research and research-support sections. KGS programs can be divided by subject into water, energy, geology, and information dissemination.

Water—Water issues affect the life of every Kansan. Western Kansas agriculture and industry rely heavily on ground water; in eastern Kansas, growing populations and industry generally use surface water. KGS water research and service include an annual water-level measurement program (in cooperation with the Kansas Department of Agriculture, Division of Water Resources), studies of recharge rates, water quality in the Arkansas River, depletion of the Ogallala aquifer, the interaction between streams and aquifers, and a variety of other topics.

Energy—Kansas produces more than \$4 billion worth of oil and natural gas each year. Because much of the state has long been explored for oil and gas, maintaining that production takes research and information. The KGS studies the state's coal resources and one newly developed source of energy, coalbed methane. The KGS does research on the state's petroleum reservoirs, new methods of providing information (such as a digital petroleum atlas), and new methods of exploring for and producing oil. The KGS is completing a multi-year study of the resources of the Hugoton Natural Gas Area and issues related to carbon dioxide sequestration. The KGS also has a branch office in Wichita, the Wichita Well Sample Library,

that stores and loans rock samples collected during the drilling of oil and gas wells in the state.

Geology—Much of the KGS's work is aimed at producing basic information about the state's geology, information that can be applied to a variety of resource and environmental issues. The KGS develops and applies methods to study the subsurface, such as high-resolution seismic reflection, undertakes mapping of the surficial geology of the state's counties, and studies specific resources, such as road and highway materials. The KGS reports on non-fuel minerals (such as salt, gypsum, aggregates, etc.) and is charged with studying geologic hazards, such as subsidence, earthquakes, and landslides.

Geologic Information—To be useful, geologic information must be disseminated in a form that is most appropriate to the people who need it. The KGS provides information to the general public, to policymakers, to oil and gas explorationists, water specialists, other governmental agencies, and academic specialists. Information is disseminated through a publication sales office, automated mapping, the state's Data Access and Support Center (located at the KGS), a data library, electronic publication, and Geology Extension.

KGS staff participating in the 2006 Field Conference:

Bill Harrison, Director and State Geologist
Rex Buchanan, Associate Director, Public Outreach
Jim McCauley, Assistant Scientist, Stratigraphic Research Section
Bob Sawin, Research Associate, Geology Extension
Shane Lyle, Research Assistant, Geology Extension
Cathy Evans, Publication Assistant

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Kansas Department of Wildlife and Parks

The Kansas Department of Wildlife and Parks is responsible for management of the state's living natural resources. Its mission is to conserve and enhance Kansas' natural heritage, its wildlife, and its habitats. The Department works to assure future generations the benefits of the state's diverse living resources; provide the public with opportunities for the use

and appreciation of the natural resources of Kansas consistent with the conservation of those resources; and inform the public of the status of the natural resources of Kansas to promote understanding and gain assistance in achieving this mission.

The Department's responsibility includes protecting and conserving fish and wildlife and their associated habitats while providing for the wise use of these resources and providing associated recreational opportunities. The Department is also responsible for providing public outdoor-recreation opportunities through the system of state parks, state fishing lakes, wildlife-management areas, and recreational boating on all public waters of the state.

In 1987, two state agencies, the Kansas Fish and Game Commission and the Kansas Park and Resources Authority, were combined into a single, cabinet-level agency operated under separate comprehensive planning systems. The Department operates from offices in Pratt, Topeka, five regional offices, and a number of state park and wildlife area offices.

As a cabinet-level agency, the Department of Wildlife and Parks is administered by a Secretary and is advised by a seven-member Wildlife and Parks Commission. All positions are appointed by the Governor with the Commissioners serving staggered four-year terms. As a regulatory body for the Department, the Commission is a non-partisan board, made up of no more than four members of any one political party, advising the Secretary on planning and policy issues regarding administration of the Department. Regulations approved by the Commission are adopted and administered by the Secretary.

Mike Hayden is the Secretary of Wildlife and Parks.

Kansas Department of Wildlife and Parks
Secretary
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1020 S. Kansas Avenue
Topeka, KS 66612-1327
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Kansas Department of Wildlife and Parks
Operations Office
512 SE 25th Ave.
Pratt, KS 67124-8174
316-672-5911
316-672-6020 (fax)
www.kdwp.state.ks.us

Kansas Water Office

The mission of the Kansas Water Office (KWO) is to provide the leadership to ensure that water policies and programs address the needs of all Kansans. The KWO evaluates and develops public policies, coordinating the water-resource operations of agencies at all levels of government. The KWO administers the Kansas Water Plan Storage Act, the Kansas Weather Modification Act, and the Water Assurance Act. It also reviews plans of any state or local agency for the management of the water and related land resources of the state. The KWO advises the Governor on drought conditions and coordinates the Governor's drought-response team. The Drought Monitoring Program collects climate data from a variety of sources, monitors drought activities, and publishes a weekly Drought Report during periods of drought.

The KWO develops the Kansas Water Plan, which is revised periodically and addresses the management, conservation, and development of the water resources of the state. Numerous water-related public and private entities, as well as the general public, are involved in its preparation and planning. The Water Plan is approved by the Kansas Water Authority, a 13-member board whose members are appointed, along with 11 non-voting *ex officio* members who represent various state water-related agencies. Besides approving the Water Plan, the Authority approves water-storage sales, federal contracts, administrative regulations, and legislation proposed by the KWO. Much of the input for the Water Plan comes via twelve Basin Advisory committees. These committees are composed of volunteer members from each of the drainage basins in the state. During this year's Field Conference, we will be in the Neosho River basin.

The Water Plan Projects Initiative, endorsed by the Kansas Water Authority, sets out projects to

- Conserve and extend the life of the Ogallala-High Plains aquifer
- Protect and restore Kansas watersheds
- Assure coordinated water-infrastructure development
- Trim debt for water storage in federal reservoirs

In addition, the KWO has the statutory responsibility to develop and maintain guidelines for water-conservation plans and practices, and to provide,

or arrange to provide, technical assistance for water users required to adopt and implement conservation plans and practices. The Water Conservation program has developed guidelines for municipal, industrial, and irrigation water use.

Tracy Streeter is the Director of the Kansas Water Office.

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Kansas Department of Health and Environment

In Kansas, health and environmental issues are regulated by this agency. Its mission is "to protect the health and environment of all Kansans by promoting responsible choices." The Kansas Department of Health and Environment is divided into two major divisions—health and environment—along with a branch of laboratory services. The Division of Environment, the part of the agency involved with this year's Field Conference, operates the following programs:

- The Bureau of Air and Radiation protects the public and the environment from radiation and air pollution.
- The Bureau of Environmental Remediation responds to environmental emergencies and manages environmental contamination through pollution-source control, containment, or remedial action.
- The Bureau of Environmental Field Services administers all environmental program operations at the six KDHE district offices and provides scientific, technical, and operational support for KDHE Division of Environment programs.
- The Bureau of Waste Management is responsible for programs associated with the handling and disposal of waste materials in Kansas.
- The Bureau of Water administers programs related to public water supplies, wastewater-treatment systems, the disposal of sewage, and nonpoint sources of pollution. Its programs are designed to provide safe drinking water, prevent water

pollution, and assure compliance with state and federal laws and regulations, such as the Clean Water Act and Safe Drinking Water Act. The programs cover geology, industry, livestock management, municipalities, public water supply, watershed management, technical services, and watershed planning and Total Maximum Daily Load (or TMDL) of pollutants in streams. The Bureau of Water is responsible for much of the regulation of the water-related issues in Kansas being discussed on this year's Field Conference, particularly those related to municipal water supplies, streamwater quality, watershed management, and TMDLs.

Roderick Bremby is Secretary of the Kansas Department of Health and Environment. Ronald Hammerschmidt is Director of the Division of Environment, Karl Mueldener is Director of the Bureau of Water, and Gary Blackburn is Director of the Bureau of Environmental Remediation.

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Bureau of Water
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Bureau of Environmental Remediation
1000 SW Jackson St., Suite 410
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Kansas Corporation Commission

The mission of the Kansas Corporation Commission (KCC) is to protect the public interest through impartial and efficient resolution of all jurisdictional issues. The agency regulates rates, service, and safety of

public utilities, common carriers, and motor carriers, and regulates oil and gas production by protecting correlative rights and environmental resources. The KCC has the responsibility of ensuring that natural gas, electricity, telephone, and transportation vendors provide safe, adequate, and reliable services at reasonable rates. It also houses the Kansas Energy Office and Kansas Energy Council.

Much of the responsibility for overseeing regulation of oil and gas production in the state rests with the KCC's Conservation Division, which is located in Wichita, where many of the state's oil and gas exploration business are headquartered. The Conservation Division establishes and enforces regulations related to drilling and completing oil and gas wells, storage and disposal of saltwater produced with oil and gas, and oversight of coalbed methane production. The Division is also responsible for remediating contaminated sites related to saltwater spills from oil and gas production and for locating and plugging abandoned wells, a particularly important issue in a state with a long history of oil and gas exploration. The Division also oversees the proration of oil and gas production, making sure that production is apportioned fairly among all mineral-rights owners in a field.

In addition to its headquarters in Topeka and offices in Wichita, the KCC has field offices in Dodge City, Chanute, and Hays.

The three-member Commission is appointed by the Governor with the approval of the Senate. Members serve staggered four-year terms. Law provides that no more than two of the three commissioners may belong to the same political party. Commissioners elect one of their colleagues as Chair. The Chair acts as agency head with input from the other members. The Commission acts independently as a quasi-judicial branch of the government with authority to render judgments and decisions on regulated utilities.

Current commissioners are Brian J. Moline (chair), Robert Krehbiel, and Michael Moffet. The KCC executive director is Susan Duffy. The director of the Conservation Division is M. L. Korphage.

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Topeka, KS 66604-4027
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Wichita, KS 67202-3802
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Division of Geology and Land Survey, Missouri Department of Natural Resources

The Division of Geology and Land Survey, located in Rolla, is part of the Missouri Department of Natural Resources. Its mission is to provide technical assistance, education, and guidance in the use and protection of Missouri's natural resources; interpret the state's geological setting and availability of its energy and mineral resources; evaluate and interpret geological hazards; and determine land boundaries.

The Division of Geology and Land Survey is organized into two sections. The Geologic Data Acquisition and Management Section acquires and maintains basic geologic data that are used by the other section and provides technical assistance to both the private and public sectors. The Environmental Geology Section conducts field investigations and provides services in determining the environmental hazards posed by waste-disposal practices and spills.

The Geologic Data Acquisition and Management Section, more specifically, is responsible for

- Providing maps and reports that identify, describe, and classify surface and subsurface rocks, fractures and faults, landforms, surficial material characteristics, stratigraphy, and paleontology;
- Examining drill cuttings and core and preparing written and graphic logs that describe the geologic characteristics of the rock, along with its potential for water resources, minerals resources, and environmental risk;
- Developing information regarding the potential for geologic hazards, including earthquakes, landslides, and sinkhole collapse;
- Determining the availability, quantity, and quality of the metallic, industrial minerals, and coal resources of the state;

- Providing technical assistance and geologic information to those who are developing, marketing, managing, or regulating the state's mineral resources;
- Maintaining production and value records for minerals and energy commodities produced in the state;
- Compiling and maintaining data bases containing information on drill logs, described sections, mineral prospects, abandoned underground mines, geologic mapping, and active mineral producers;
- Maintaining a repository of nearly 3,000 drill cores containing nearly three million feet of core;
- Conducting programs to improve the public's understanding of the geologic and mineral resources of the state and to increase the public's appreciation of geology and mining to our society.

The mission of the Environmental Geology Section is to apply geologic and hydrologic information to the protection of Missouri citizens and the environment from wastes and hazardous materials. This section is composed of three units. The Waste Management Unit provides technical assistance to the Hazardous Waste Program of the department's Air and Land Protection Division in the siting, monitoring, and clean up of hazardous-waste sites throughout the state. The Environmental Assistance Unit conducts geological evaluations on wastewater-treatment facilities and subdivisions in support of the Water Protection Program of the department's Water Protection and Soil Conservation Division. This unit also provides technical assistance to the Solid Waste Management Program of the department's Air and Land Protection Division in the permitting and monitoring of Missouri landfills. The Subsurface Investigations Unit performs hydrogeologic site investigations to determine groundwater contamination sources at selected sites in support of the Hazardous Waste Program. The Environmental Geology Section staffs and houses the Missouri Water Tracing Laboratory.

The Director and State Geologist of the Division of Geology and Land Survey is Mimi Garstang.

Division of Geology and Land Survey
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Grand River Dam Authority

The Grand River Dam Authority (GRDA) is an agency of the State of Oklahoma, created by the Oklahoma Legislature in 1935 to be a “conservation and reclamation district for the waters of the Grand River.” The legislation that created GRDA outlined its primary responsibilities this way:

- To control, store, and preserve, within the boundaries of the District, the water of the Grand River and its tributaries for any useful purpose and to use, distribute, and sell the same within the boundaries of the District.
- To develop and generate water power and electric energy within the boundaries of the District.

GRDA fulfills its responsibilities by operating three hydroelectric facilities, and managing two lakes, along the Grand River system. These facilities, along with the GRDA Coal-Fired Complex (thermal generation), combine for a total generation capability of 1,480 megawatts (MW). GRDA transmits and delivers this wholesale electricity across its 24-county service area in northeast Oklahoma via sophisticated energy-delivery systems. GRDA sells electricity to three customer classes: municipals, electric cooperatives, and industries.

The GRDA was created by the Oklahoma legislature in 1935. Construction on Pensacola Dam was begun in December 1938 and was completed in March 1940. By August the Grand Lake O’ the Cherokees was full. In January 1962 the GRDA began construction of the Robert S. Kerr Dam, which is completed in May 1964, creating Lake Hudson. Both dams provide flood control and hydroelectricity. In 1981 the GRDA began operating its own coal-fired electrical generating plant.

The GRDA mission is to provide low-cost, reliable electric power and related services to its customers and to be responsive to the interests and concerns of public power users, the communities it affects, and the people of the state of Oklahoma. The GRDA pledges to assist in area economic development and to help customers adapt to changes in their business environments, as well as making certain that GRDA lakes support recreational development, environmental awareness, and good safety practices to ensure the continued improvement of the quality of life for all of those who utilize GRDA resources.

The GRDA is governed by a seven-member board of directors composed of representatives from each GRDA customer class (municipals, electric cooperatives, and industrials) as well as the GRDA lakes area. Two at-large representatives also sit on the board. Appointments are made by the Oklahoma Governor, Speaker of the Oklahoma State House of Representatives, and President Pro Tempore of the Oklahoma State Senate. Two other board positions are *ex-officio* positions, filled by the general manager of the Oklahoma Association of Electric Cooperatives and the executive director of the Municipal Electric Systems of Oklahoma (or by their designees).

Members of the GRDA Board serve staggered, seven-year terms, with one position opening each year, to ensure continuity. Such customer representation on the GRDA Board is characteristic of GRDA’s status as a customer-owned, customer-controlled public power entity. The GRDA Board meets on the second Wednesday of each month, and meetings are open to the public.

The current chair of the GRDA is Jim Frasier of Afton. The Executive Director is Kevin Easley.

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SCHEDULE & ITINERARY

Wednesday June 14, 2006

7:00 am	Breakfast at the Comfort Inn, Pittsburg
7:20 am	Conference Overview <i>Bill Harrison</i> , Director, Kansas Geological Survey
8:00 am	Bus Leaves Comfort Inn for Site 1
8:30 am	SITE 1 —Subaqueous Disposal of Lead-Zinc Waste Demonstration Site, Waco, MO, and Lawton, KS <i>Mark Doolan</i> , U.S. Environmental Protection Agency Region 7 Missouri Dept. of Natural Resources
9:15 am	Bus to Site 2
9:30 am	SITE 2 —Oronogo-Duenweg Mining Belt (Jasper County, MO) Superfund Site <i>Mark Doolan</i> , U.S. Environmental Protection Agency Region 7 Missouri Dept. of Natural Resources
10:15 am	Bus to Site 3
11:00 am	SITE 3 —Hell's Half Acre and the Eagle Picher Smelter Sites, Galena, KS <i>Leo Henning and Gary Blackburn</i> , Kansas Dept. of Health and Environment <i>Dave Drake</i> , U.S. Environmental Protection Agency Region 7
12:00 pm	Lunch
1:00 pm	Bus to Site 4 and Site 5
1:30 pm	SITE 4 —Ballard Mine, Baxter Springs, KS
1:50 pm	SITE 5 —Early Bird Mine and Treese, KS <i>Leo Henning and Gary Blackburn</i> , KDHE <i>Dave Drake</i> , EPA Region 7
2:00 pm	Bus to Site 6
2:15 pm	SITE 6 —Tar Creek (Ottawa County) Superfund Site, Picher, OK <i>J. D. Strong</i> , Oklahoma Office of the Secretary of Environment
4:30 pm	Bus to motel
5:00 pm	Arrive Holiday Inn, Joplin
6:15 pm	Bus to dinner
8:30 pm	Bus to motel

Tri-State Lead and Zinc Mining Superfund Projects

The Tri-State mining district is a historic lead and zinc mining area that includes portions of Kansas, Oklahoma, and Missouri (fig. 3-1). Because of the threats to human health and the environment by mining-related releases of hazardous substances, the U.S. Environmental Protection Agency Superfund Program listed four sites in this area on the National

Priorities List: the Cherokee County Site, Cherokee County, Kansas, in 1983; the Tar Creek Site, Ottawa County, Oklahoma, in 1983; and the Oronogo-Duenweg Mining Belt Site (Jasper County) (1990) and the Newton County Mine Tailings Site (2003) in Missouri. Remedies have been implemented at some of the sites, while others are still in progress.

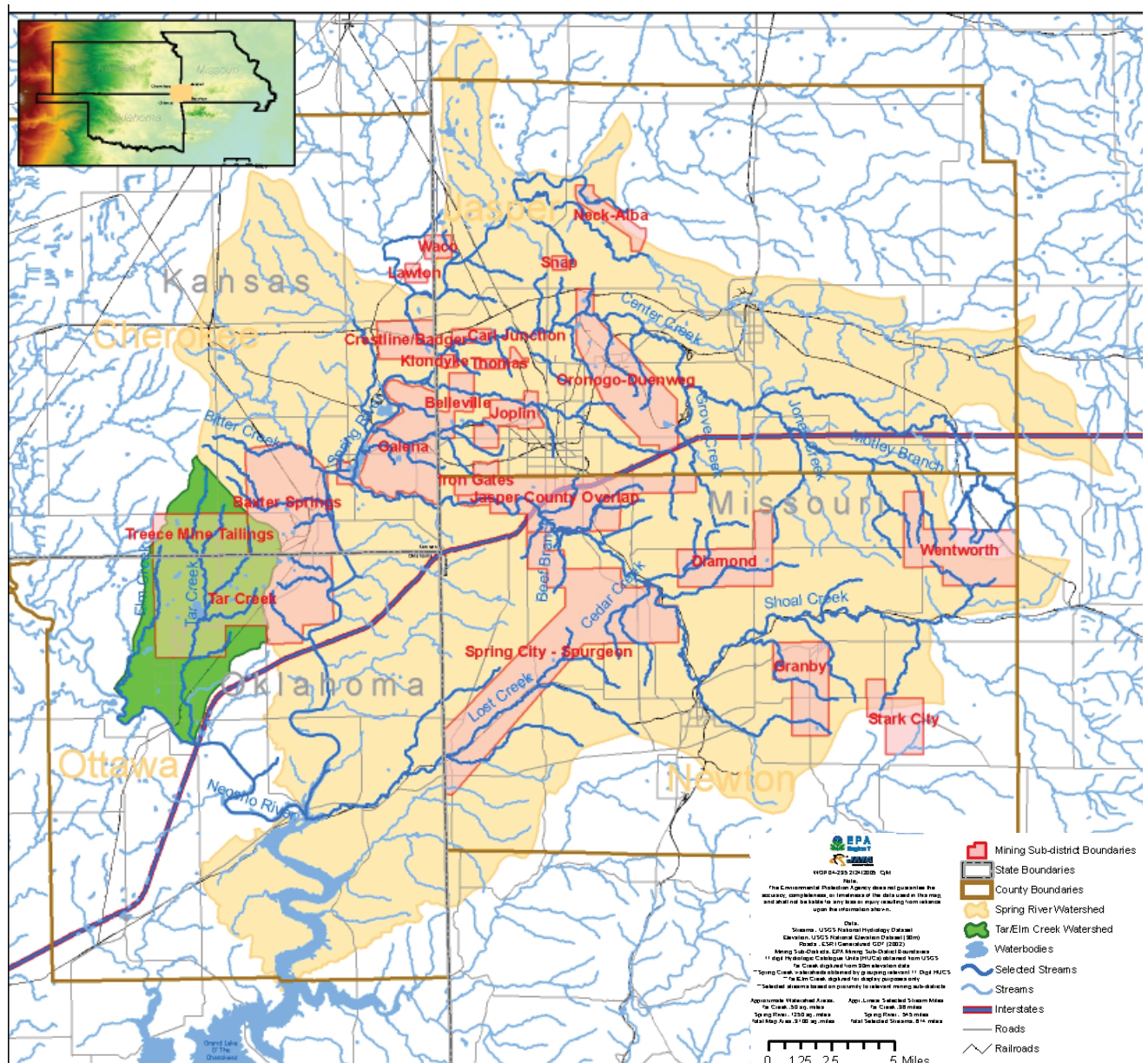


Figure 3-1. Map of the Tri-State mining district. Mining subdistricts are shown in red, the Spring River watershed is shown in tan, and the Tar Creek/Elm Creek watershed in green (U.S. Environmental Protection Agency).

Subaqueous Disposal of Lead-Zinc Waste Demonstration Project – Waco Subdistrict of Kansas and Missouri

The Waco subdistrict, 13 miles northwest of Joplin and 13 miles southeast of Pittsburg, straddles the Kansas-Missouri border between Waco, Missouri, and Lawton, Kansas. The subdistrict first opened in 1917 and produced over 300,000 tons of zinc concentrates and lesser amounts of lead concentrates before production ceased by the mid-20th century. Environmental problems created by decades of mining at the site are ongoing. To evaluate remedial alternatives for improving water quality in streams and reducing ecological risks, the U.S. Environmental Protection Agency (EPA) developed a feasibility study for the Waco site. One of the cleanup methods evaluated in the study was the subaqueous disposal of mill wastes in mine subsidence pits, the surface depressions formed after the collapse of underground lead-zinc mines.

The surface formation at the Waco subdistrict site is mainly Pennsylvanian shale, which has an average thickness of 40 to 60 feet. Ores were originally mined from two intervals in the Mississippian limestone—at 100 to 165 feet and 165 to 200 feet below the surface. Mining was eventually extended to over 300 feet below the surface. This layering of mined space caused the ground surface to become unstable and to subside. The resulting assortment of ponds, pits, and collapses—along with the mining shafts—eventually filled with surface and ground water.

In addition to the subsidence features, the site has thousands of cubic yards of mill waste, chat, and tailings left in piles on the surface. Chat is composed mostly of sand- to gravel-sized chert fragments from the crushing and milling of lead-zinc ore by gravity separation. Tailings are fine-grained sand and silt-sized particles from either gravity separation or from the flotation process. At this site, the mine waste contains trace amounts of sulfide minerals – pyrite (iron sulfide), galena (lead sulfide), and sphalerite (zinc sulfide) – and other materials. The piles of mill waste, chat, and tailings have been exposed to oxygen in the air for years, generating mine-waste acid that polluted the soil and water.

Subaqueous Disposal Demonstration Project

The EPA Region 7, the Missouri Department of Natural Resources, the Kansas Department of Health and Environment, and the Jasper County Respondents devised a demonstration project that utilized the subaqueous disposal of mill waste method of cleanup in a mine subsidence pit in the Waco subdistrict. A subsidence pit on the Kansas side, named P4 Pond, was selected by the EPA as the demonstration site. A central well (P4-Central well) was placed to the full depth of the backfilled pit (fig. 3-2), and surrounding ponds and pits (fig. 3-3) were used as monitoring locations.



Figure 3-2. Backfilled and revegetated subsidence pit at the demonstration site. The P4-Central well (arrow) is in the center of the photo (photo by R. S. Sawin).



Figure 3-3. Mine subsidence pit just east of the demonstration project site. This pit is analogous to the pit that was backfilled, and it was also used as a monitoring location during and after the demonstration project pit was backfilled (photo by R. S. Sawin).

Monitoring wells were installed to detect potential chemistry changes in the shallow aquifer. The contaminated mill wastes were backfilled into the flooded subsidence pit between March and July 2002, and capped with soil and vegetated to isolate the material from erosion and rainwater leaching. An estimated 58,000 cubic yards of tailings were placed in the pit, capped by 1.5 feet of topsoil.

Subaqueous disposal is designed to establish a stable environment for the mining waste by greatly reducing its exposure to oxygen. The maximum concentration of dissolved oxygen found in surface water is about 25,000 times lower than that found in the atmosphere. As the rate of sulfide oxidation partly depends on the concentration of oxygen, reduced rates of acid generation and metals release should occur in a subaqueous setting compared to having the mine waste exposed to the atmosphere in a surface setting. In addition, the rate of oxygen transfer through water is nearly 10,000 times slower than in air so that the reduced oxygen supply underwater might eventually result in anoxic conditions that would stabilize the sulfide minerals. If anoxic conditions were achieved,

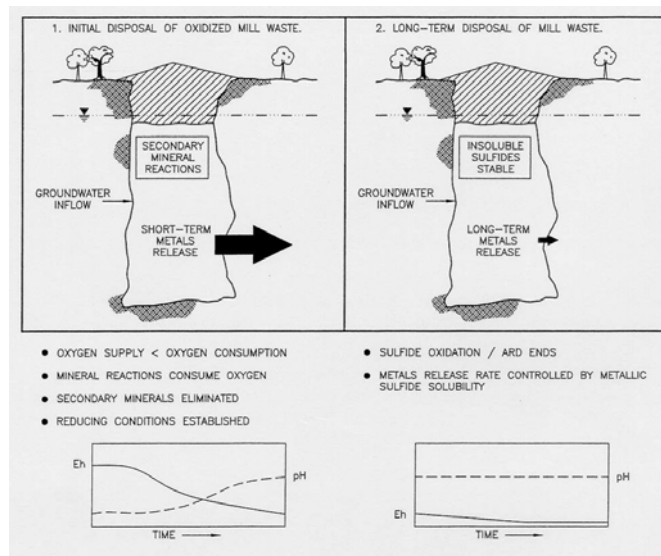


Figure 3-4. Geochemical reactions in a subaqueous setting, Jasper County, Missouri (from NewFields, 2003).

metals release from sulfide minerals would be controlled entirely by their very low solubility in water (fig. 3-4).

As expected, the placement of mill tailings in the P4 Pond caused large increases in the concentration of several constituents, as detected in the P4-Central well, notably calcium (10x), iron (350x), sulfate (15x), total dissolved solids (12x), and zinc (100x). Post-backfill sampling of the nearby subsidence ponds and monitoring wells did not identify any parameter increases that could be confidently attributed to backfilling the subsidence pit; the only exception was one pond that experienced increased calcium, hardness, magnesium, manganese, sulfate, total dissolved solids, and zinc concentrations. The increase may have been a result of runoff recharge, or impacts from the demonstration site, or both.

Reference

NewFields, 2003, Final Report – Subaqueous Mill Waste Disposal Demonstration Project, Waco Subdistrict, Jasper County, Missouri and Cherokee County, Kansas.

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Oronogo-Duenweg Mining Belt (Jasper County, Missouri) Superfund Site

Lead and zinc mining began in Jasper County in the mid-19th century and reached peak production around 1916. Hundreds of mines and 17 smelters were established in the county. Mining operations were principally underground and involved sinking shafts to subsurface ore bodies. The raw ore was brought to the surface and crushed in stages. Metals were separated by gravity separation or flotation and the waste rock, development rock, chat, and tailings materials were usually dumped at the surface in waste piles. Many wastes were re-milled as more efficient separation techniques became available.

Diminishing production led to the closure of the mining industry in Jasper County by 1957, although one smelter in the city of Joplin operated until the 1970's. While a substantial portion of the 150 million tons of the mine waste was eventually removed and used in aggregate for buildings and roads, approximately 9 million tons remain.

The waste piles were left uncovered and unstable, and runoff from the piles contaminated the soil, ground water, and surface streams with lead, zinc, cadmium, and other hazardous substances. Flooded mine shafts also led to contamination when ground water came in contact with ore and subsurface wastes. The estimated amount of contaminated ground water at the site range from 400,000 to 740,000 acre-feet. Airborne pollutants also affected the area. Smelters released metals directly into the air, and winds picked up hazardous materials from waste piles.

Unvegetated and partially vegetated mine wastes cover more than 3,600 acres of the Oronogo-Duenweg mining belt site. Soils within 200 feet of mine waste piles contain hazardous substances that are on average several times greater than normal. These contaminated soils within 200 feet of the waste piles cover approximately 4,000 additional acres at the site.

The principal drainage system for Jasper County is the Spring River and its tributaries, including Shoal Creek, Turkey Creek, Short Creek, and Center Creek. Turkey Creek, Center Creek, and Short Creek have been impacted by the release of hazardous substances. The other streams and adjacent intermittent drainages may be impacted as well.

Average concentrations of cadmium, lead, and zinc in the shallow aquifer of the Oronogo-Duenweg mining

belt site exceed background concentrations by up to 10 times. Mean cadmium, lead, and zinc concentrations in surface water can be even higher. High concentrations of cadmium, lead, and zinc are also found in the stream sediments.

Before cleanup began, approximately 500 homes on the east side of the site relied on private, shallow ground-water wells for drinking water. EPA identified at least 100 of these wells as containing lead and cadmium above safe levels. At least 2,500 residential yards were contaminated with lead above acceptable levels. A 1994 human-health exposure study by the Missouri Department of Health showed that 14 percent of the children under seven years old had blood-lead concentrations exceeding the health-based standard of 10 micrograms per deciliter. Investigations indicated the mining waste also caused risks to the flora and fauna, particularly fish and mammals. Concentrations of lead, zinc, and cadmium were elevated in fish and invertebrate tissues from organisms collected in Jasper County.

Remedial Actions and Environmental Progress

This site is being addressed through Federal and potentially responsible parties' (PRPs) actions. In 1991 the EPA signed an Administrative Order on Consent with the PRPs to investigate the mining waste. A Unilateral Administrative Order was issued to the PRPs to provide bottled water to residents in 1994. A second Unilateral Administrative Order was issued to the PRPs in 1994 to conduct additional private water-well sampling and provide bottled water where acceptable levels of contamination were exceeded. EPA signed an Administrative Order on Consent with the PRPs in 1995 to sample residential yard soil and prioritize areas for soil removal. A Consent Decree was completed in 1999 for the PRPs to install public water-supply systems.

EPA established four Operable Units (OUs) at the site to address the risks associated with contaminated soil and water. OU1 addressed mining-waste piles. OU2 addressed lead-contaminated residential-yard soils in the smelter area. OU3 addressed lead-contaminated residential-yard soils in the mining-wastes areas. OU4 addressed contaminated ground water.

In 2004 the EPA conducted a five-year review of the site and concluded that the remedies were functioning

as designed, and the immediate threats to people had been addressed. As part of the project, 50 mine shafts have been closed, 2,600 residential yards have been cleaned up, and 550 homes with contaminated private wells have been hooked up to the public water supply. Studies before and after the yard cleanup show a 78 percent reduction in the number of children with elevated lead levels in their blood. The 2004 EPA report emphasized, however, that for the remedy to work in the long term, institutional controls in the form of residential-development ordinances must be adopted by local governments to ensure safe development in contaminated areas.

While the most pressing dangers to the population had been remediated, the EPA review noted that the piles of mining waste, which had not been dealt with, were still a serious environmental problem. Although the risk assessment completed for the site concluded there was not a significant risk for people exposed to mine waste, the piles would continue to pollute the soil and water. Plans are underway for the Missouri Department of Transportation to use some of the waste for fill in highway construction, and negotiations are being conducted with the PRPs to ensure the cleanup of mine-waste source areas and stream-tributary sediments. Future plans include safely disposing of 7,000 acres of mine waste and monitoring the progress of site-streams cleanup and institutional controls. Several pilot studies are underway to assess innovative technology involving biosolids treatment and revegetation, phosphate-treatment bioavailability, and subaqueous disposal. These techniques could potentially result in significant cost savings over conventional cleanup methods.

References

Missouri Department of Natural Resources and U.S. Department of Interior, Preassessment Screen and Determination: Jasper County Superfund Site, Jasper County, Missouri
www.dnr.mo.gov/env/hwp/news/final-jasper-county-pas-tds-02-06-18.pdf

EPA Region 7, Oronogo-Duenweg Mining Belt, Missouri, EPA ID# MOD980686281
www.epa.gov/region07/cleanup/index_missouri.htm

EPA Region 7, March 2004, Five-Year Review Completed, Oronogo-Duenweg Mining Belt Site, Jasper County, Missouri
www.epa.gov/region07/superfund/index

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Cherokee County (Kansas) Superfund Site

The Cherokee County, Kansas, portion of the Tri-State mining district covers about 115 square miles. Mining operations were principally underground. Several small smelters were operated throughout Cherokee County, later being consolidated into a single site (the Eagle-Picher Smelter) at Galena, Kansas, in about 1920. This smelter remained in operation until 1970.

After 100 years of mining and smelting, chat piles, tailings sites, development and waste rock piles, and subsidence ponds are prominent features of the landscape. Much of the total volume of

surface-mine wastes has been removed over the last few decades to provide materials for building and roads. Approximately 94 percent of Kansas wastes have been removed; however, thousands of acres of wastes still remain on the ground surface. Much of this waste is highly contaminated with hazardous substances; of these, cadmium, lead, and zinc are the main contaminants because of their relative volume, concentration, or toxicity.

The Cherokee County Superfund site has been divided into six mining areas: Galena, Baxter Springs, Treece, Badger, Lawton, and Waco (fig. 3-5).

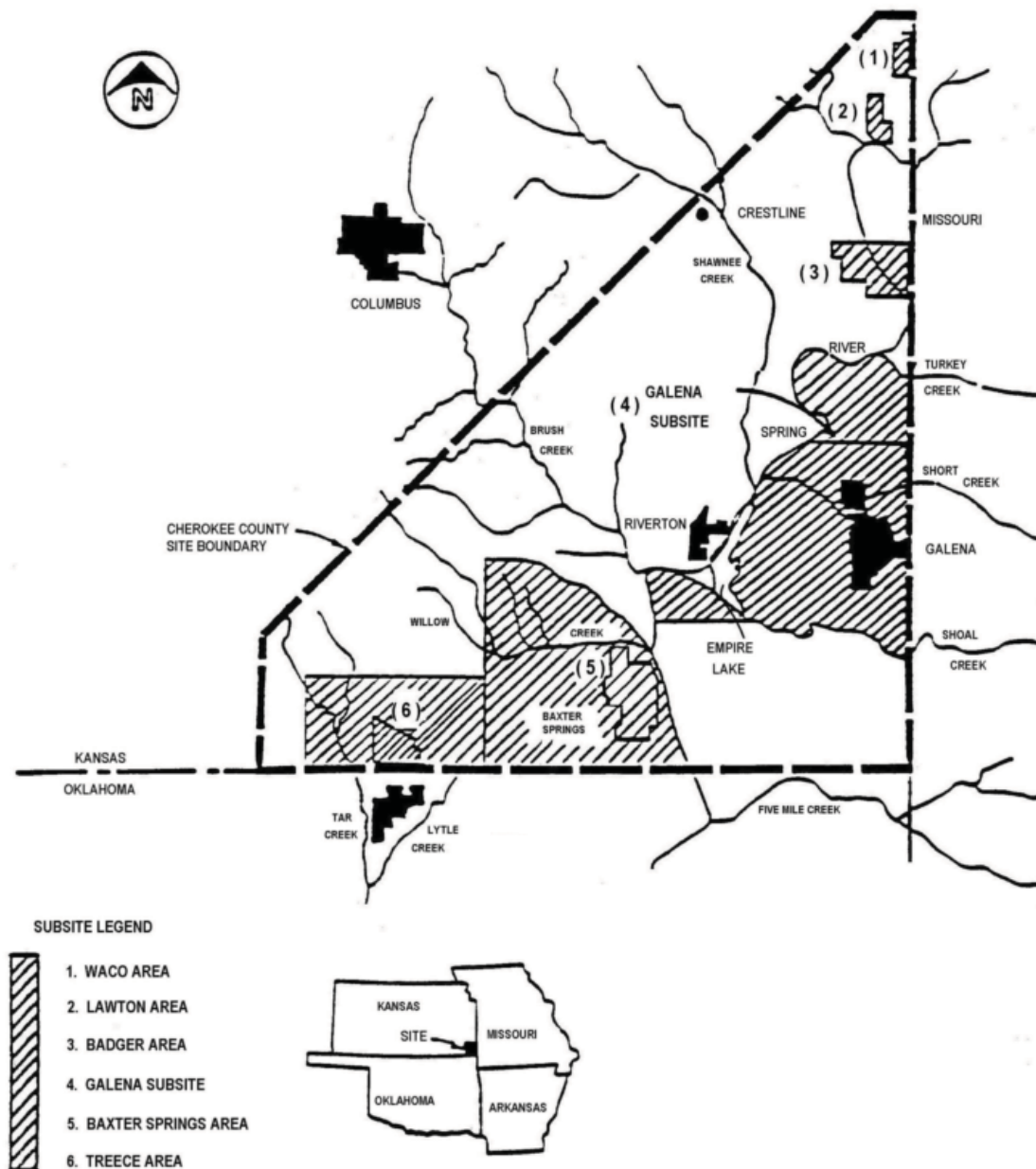


Figure 3-5. Cherokee County, Kansas, Superfund Sites (from http://mountain-prairie.fws.gov/nrda/CherCO_KS/cherokee_county_map_V2.jpg).

Hell's Half Acre – Galena, KS

The Galena Ground Water/Surface Water Operable Unit, better known as Hell's Half Acre (fig. 3-6), was the first mine-waste site remediated in the Cherokee County Superfund project. The remedial goal for this site was to keep the mine waste from eroding into streams. Remediation included leveling the mine waste, installing surface-water-handling structures (let-down structures), diverting surface water from mine shafts and subsidences, and establishing vegetation (warm season grasses) on the mine waste to prevent erosion.

The U.S. Environmental Protection Agency (EPA) has completed remediation and the site is in long-term operation and maintenance (O&M). The Kansas Department of Health and Environment (KDHE) has responsibility for managing the long-term O&M for this site. So far, KDHE has spent approximately

\$145,000 of state funds on O&M activities and has plans to spend an additional \$50,000 next year (2007). Operation and maintenance activities will continue in perpetuity. Recently, EPA has agreed to consider a Cooperative Agreement with KDHE to provide some additional funding to re-establish the vegetative cover and repair areas that have failed to establish a vegetative cover because they need additional amendments or are in areas that have a high potential for erosion.

KDHE's Surface Mining Section has plugged 34 mineshafts and vertical openings in the Cherokee County Superfund site at a total cost of approximately \$268,000. Currently, the Surface Mining Section has 114 mineshafts and vertical openings in their inventory to be repaired or plugged. The number of shafts that need plugging far exceeds the KDHE resources, so shafts are plugged based on priority.



Figure 3-6. Hell's Half Acre in the early 1980's. The Eagle-Picher Smelter is in the background (photo by Jim McCauley).

Eagle-Picher Smelter Site – Galena, KS

The Eagle-Picher smelter site has recently been abandoned through bankruptcy by Eagle-Picher Technologies. The smelter wastes around the facility, which are highly contaminated with lead, mercury, cadmium, arsenic, and zinc, are leaching into Short Creek. The wastes impact water quality and sediments in Short Creek, which does not support aquatic life. Only life forms that are highly tolerant to the heavy metals are present. Remediation at this site will include consolidation, sediment dredging, capping, and establishment of a vegetative cap.

KDHE has been actively seeking funds from the bankruptcy court to remediate this site. KDHE has negotiated the cost (\$6,566,667) to remediate the site, but the final legal document has not been completed. Because this site has been designated an orphan site (no known responsible party), KDHE will be required to perform the long-term operation and maintenance activities. KDHE was able to negotiate a portion of the settlement for long-term O&M. Had those negotiations been unsuccessful, Kansas taxpayers would have been responsible for funding the remedy and long-term O&M.

Ballard Mine – Baxter Springs, KS

The Ballard mine (fig. 3-7) is part of the Baxter Springs subsite that includes the Ballard, Hartley, Bruger, and portions of the Homestake mines. Remediation at the Ballard mine was recently completed. The responsible parties that have been identified for the Baxter Springs subsite include Sunoco, NL Industries, Phelps-Dodge, and ASARCO. The remedy at the Ballard mine included consolidation of mine waste, cleaning out the surface waterways, capping the mine waste with 6-18 inches of soil, and establishing a vegetative cover. The cost for these activities was a little over \$6,000,000.

Soil from a local borrow pit was transported to the site for the soil cap. The soil cap, which was not used at Hell's Half Acre, has greatly helped with establishment of the vegetative cover (warm-season native grasses). All future remedies in the Cherokee County site will include a soil cap over the waste because it helps prevent erosion and human contact, and it will greatly reduce the cost of long-term O&M.



Figure 3-7. Photo of the Ballard mine site taken in the early 1980's (photo by Jim McCauley).

Early Bird or Bendalari Mine and Treece, KS

The Early Bird mine is an example of the appearance of mine-waste areas before remediation. Here and around Treece, approximately 1,000 acres of mine waste have not been remediated, mostly because there is no responsible party. These sites will be cleaned up by EPA and KDHE. EPA will provide 90 percent of the funding to address these orphan sites, and KDHE will provide a 10 percent match and assume the long-term O&M activities. The cost for cleaning up the remaining sites at the Baxter Springs and Treece subsites is estimated at \$65,000,000. So, a conservative cost for KDHE to match EPA funds will be \$6,500,000. It will take an estimated 8-10 years to remediate the remaining sites.

Included in the latest proposed plan for the Treece and Baxter Springs subsites is the use of subsidence

pits as repositories for the mine waste. Two large subsidence pits at the Sunflower mine (fig. 3-8), located 0.5 mile southwest of the Ballard Mine and about 4 miles east of Treece, will be used for this activity. The plan calls for placing large amounts of mine waste in the subsidence pits, then capping the area with soil. These consolidating activities will greatly reduce the footprint of the mine waste and long-term O&M costs.

Concerns related to subsidence and exposure to mine-waste contaminants, and the May 4, 2006, announced buyout of residents in Picher, Oklahoma, have prompted residents in Treece, Kansas, to demand a buyout of their properties as well. Picher and Treece essentially border each other, separated only by the state line. This boundary, however, puts them in different EPA regions, and of course, representation by different state agencies, state legislators, and congressional representatives and senators.



Figure 3-8. One of two large subsidence pits at the Sunflower mine (photo by Jim McCauley).

In Treece, the responsible parties, under EPA and KDHE oversight, have cleaned up the residential yards by replacing the soil. Residents' immediate worries, however, are about subsidence. EPA and KDHE have acknowledged the residents' concerns, but EPA and KDHE cannot address these concerns because they are limited to dealing only with hazardous wastes and contaminants and cannot address safety issues.

References

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Cherokee County, Kansas, EPA ID# KSD980741862
[http://www.epa.gov/region7/cleanup/npl_files/
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Contaminants, Cherokee County, Kansas
[http://mountain-prairie.fws.gov/nrda/CherCO_KS/
CherokeeCounty.htm](http://mountain-prairie.fws.gov/nrda/CherCO_KS/CherokeeCounty.htm)

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Tar Creek (Ottawa County, Oklahoma) Superfund Site

Lead and zinc mining started in northeastern Oklahoma near Peoria, Ottawa County, in 1891. During the peak years of 1907 through 1946, nearly 2 million tons of lead and zinc were mined at a value of more than \$202 million. By the time the last mining company closed its doors in 1970, the Picher mining field had produced 1.7 million tons of lead and 8.8 million tons of zinc.

The mining and milling of lead and zinc ore left approximately 300 miles of underground tunnels, 165 million tons of tailings and chat, more than 1,320 mine shafts, and thousands of drill holes in the Oklahoma portion of the Tri-State mining district alone. Tangible natural-resource threats were first realized in 1979, when metals-laden mine water began discharging to surface streams in the Tar Creek watershed (fig. 3-9). The 40-square-mile site was added to the first National Priorities List when Congress created the Superfund program in 1983. The Tar Creek Superfund site includes the Old Picher Field lead and zinc mining area and the towns of Picher, Cardin, Quapaw, Commerce,

and North Miami. Approximately 19,556 people live in the area.

Early attempts to halt polluted mine seepage were largely unsuccessful, and the U.S. Environmental Protection (EPA) Agency was ready to give up on restoring and protecting the water quality of Tar and Lytle creeks. As interest in restoring the blighted area began to wane, a 1993 study of blood-lead levels conducted by the Indian Health Service showed that 34% of area Native American children exhibited blood lead levels above the thresholds considered dangerous to human health. This threat to human health propelled the Tar Creek Superfund site to the top of the National Priorities List, making it the highest-ranking Superfund site in the nation. To address the problems at the Tar Creek Superfund site, the EPA established five Operable Units (OU) – a discrete action that comprises an incremental step toward comprehensively addressing site problems – focusing on water quality, residential contamination, hazardous materials, and mine waste.



Figure 3-9. Tar Creek at Douthat Bridge, 1 mile south of Cardin, Oklahoma (photo by R. S. Sawin).

EPA Remediation

OU1 addresses surface- and ground-water issues. Surface water at the site was degraded by the discharge of acid mine water. Through remediation, diking and diversion structures were built to stop Tar Creek from entering two collapsed mine shafts in Kansas, which were identified as the main inflow points. Several diversion channels and dikes also were constructed at the Tar Creek site as part of the surface-water remedy. The discharges of acid mine water to Tar Creek, however, have not decreased significantly since the addition of the dikes and channels. Ground water from the Ozark aquifer (locally known as the Roubidoux aquifer), the regional water supply, was threatened by contamination as acid water migrated downward from the overlying aquifer through abandoned wells. Eighty-three wells were plugged to prevent the downward migration of acid mine water into the Ozark aquifer. A Long-Term Monitoring program for the Ozark aquifer is being conducted by the Oklahoma Department of Environmental Quality (ODEQ) to determine the effectiveness of the well-plugging program. Additional abandoned wells have been plugged by the ODEQ, and both the ODEQ and EPA continue to evaluate the need to plug more wells.

OU2 focuses on residential areas. As of January 2006, 2,179 residential yards and public areas have been remediated. Work on the final 100 properties began in December 2005 and is expected to be completed in 2006. EPA also is funding community health education and blood-lead screening for the five-city mining area, and the Ottawa County Health Department is working with local health professionals to provide education to the medical community. The October 2004 Report to Congress by the Agency for Toxic Substances and Disease Registry shows that children between the ages of 1 and 5 living at the Tar Creek site who had a blood lead level in excess of the 10 micrograms per deciliter level decreased from 31.2% in 1996 to 2.8% in 2003. The 2.8% level is only slightly higher than the findings of the National Health and Nutrition Examination Surveys for children in the United States.

OU3 involved the disposal of 120 deteriorating containers of lead-recovering chemicals at the Eagle Picher Industries mining laboratory in Cardin, as requested by the Quapaw Tribe. The project was completed in 1999.

OU4 addresses chat piles, mine and mill waste, smelter waste, and flotation ponds. The EPA entered

into an Administrative Order on Consent with three Potentially Responsible Parties (PRPs) to conduct a Remedial Investigation/Feasibility Study (RI/FS) for OU4, which is to be completed in 2006. After completion of the RI/FS and risk assessments, the EPA will evaluate the site condition and determine if any further actions are required.

OU5 addresses sediment and surface water. In this phase of the cleanup effort, EPA Region 6 will be working with EPA Region 7 as part of a multi-state effort to characterize sediment and surface water throughout the Spring and Neosho river basins. Initial sampling was to begin in spring of 2006.

Since 1993, Superfund remediation efforts have focused on the most apparent source of lead causing elevated blood-lead levels by excavating and replacing contaminated yards and recreation areas, removing lead-based paint, and initiating educational programs about the dangers of lead and the pathways of exposure. While progress had been made—primarily the 50% drop in the prevalence of elevated blood-lead levels—more work remained. Slow headway prompted then-Oklahoma Governor Frank Keating to establish a state Tar Creek Superfund Task Force in 2000.

In September 2005, the Environmental Protection Agency Region 6 completed its third Five-Year Review of remedial actions for the Tar Creek Superfund site. The review evaluated the ability of the remedy to protect public health and the environment. The results of the review indicate that, with the exception of the ineffectiveness of the OU1 plan to decrease acid mine water discharges into Tar Creek, the remedy is protecting human health and the environment in the short term and is functioning as designed.

References

Five-Year Review Report, Third Five-Year Review Report for the Tar Creek Superfund Site, Ottawa County, Oklahoma: Prepared by: CH2M Hill, prepared for: Region 6, United States Environmental Protection Agency, Dallas, Texas, September 2005

Governor Frank Keating's Tar Creek Superfund Task Force Final Report: Prepared by: Office of the Secretary of Environment, 3800 North Classen Boulevard, Oklahoma City, OK 73118, October 1, 2000; online at www.ose.state.ok.us/documents/TarCk/TarCreekTFFinalReport.pdf

Tar Creek (Ottawa County) Oklahoma, EPA Region 6,
updated: April 2006
epa.gov/region6/index.htm

Oklahoma Plan for Tar Creek
www.deq.state.ok.us/lpnew/tarcreek/Okplan.pdf

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SCHEDULE & ITINERARY

Thursday, June 15, 2006

- 7:00 am Breakfast at the Holiday Inn, Joplin
- 8:00 am **Bus Leaves Holiday Inn for Site 7**
- 8:15 am **SITE 7**—Ground Water Supply Issues, Wildcat Park, Joplin, MO
Allen Macfarlane, Kansas Geological Survey
Bob Nichols, Tri-State Water Resources Coalition
Jonathan Long, U.S. Army Corps of Engineers
David Pope, Kansas Dept. of Agriculture, Division of Water Resources
Walt Aucott, U.S. Geological Survey
- 9:30 am Bus to Site 8
- 10:00 am **SITE 8**—Surface Water Issues, Shoal Creek at Schermerhorn Park, Galena, KS
Tracy Streeter and Kerry Wedel, Kansas Water Office
Jaci Ferguson, U.S. Environmental Protection Agency Region 7
Karl Muedener, Kansas Dept. of Health and Environment
Ed Miller and Mike Hayden, Kansas Dept. of Wildlife and Parks
Mike Pope, U.S. Geological Survey
John Peck, School of Law, University of Kansas
- 11:30 am Tour Southeast Kansas Nature Center and Schermerhorn Cave
- 12:00 pm Lunch
- 1:00 pm Bus to Site 9
- 2:00 pm **SITE 9**—Grand Lake O' the Cherokees
Darrell Townsend, Grand River Dam Authority
J.D. Strong, Office of the Secretary of Environment (Oklahoma)
- 6:30 pm Refreshments and Dinner at the Arrowhead Yacht Club
- 8:00 pm Bus to Holiday Inn Express, Vinita, OK

Tri-State Region Aquifers

In the Tri-State region of southeast Kansas, southwest Missouri, and northeast Oklahoma, the Ozark Plateaus aquifer system is an important source of freshwater for municipal water supplies, industry, and agriculture. In this area, the Ozark Plateaus aquifer system consists of two aquifers—the Springfield Plateau and Ozark aquifers—separated by an impermeable zone known as the Ozark confining unit (fig. 4-1). The Springfield Plateau aquifer is above the confining unit and is in the same Mississippian-age rocks that have been mined for lead and zinc in the Tri-State region. Below the confining unit, the Ozark aquifer occupies Cambrian- and Ordovician-age rocks. It is locally referred to as the Roubidoux aquifer—named for the Roubidoux Formation, a significant water-producing zone within the Ozark aquifer.

Historically, the Ozark Plateaus aquifer system has been the single most important source of ground water in the Tri-State region. Ground water was primarily used for lead and zinc mining and milling activities and for coal-washing operations in the coal fields farther north. The Ozark aquifer was secondarily used for drinking water by public supplies. With the decline of the mining industry in the mid 20th century, the primary

use of water from the Ozark aquifer has been for public supplies of drinking water and for industries other than mining.

Ozark Aquifer

The Ozark aquifer is a thick sequence of water-bearing dolomites, limestones, and sandstones. The thickness of the Ozark aquifer in the Tri-State region varies from 800 to 1,500 feet. The recharge area for the Ozark aquifer is in the topographically higher region of southern Missouri where the aquifer's rocks crop out in an area that roughly coincides with the crest of the Ozark uplift south of Springfield, Missouri. Rainwater enters the aquifer through the outcrop area and moves by gravity in a westerly direction into the deeper part of the aquifer in southeast Kansas and northeast Oklahoma (fig. 4-2). There it encounters saltwater moving east from deeper rocks in western Kansas and Oklahoma, where the rocks are known as the Arbuckle Group. The Arbuckle is an important source of hydrocarbons farther west and is also used for waste disposal. Where these two water masses meet, a 20-30-mile-wide fresh-to-saline transition zone stretches northeast to southwest across the region (fig. 4-3).

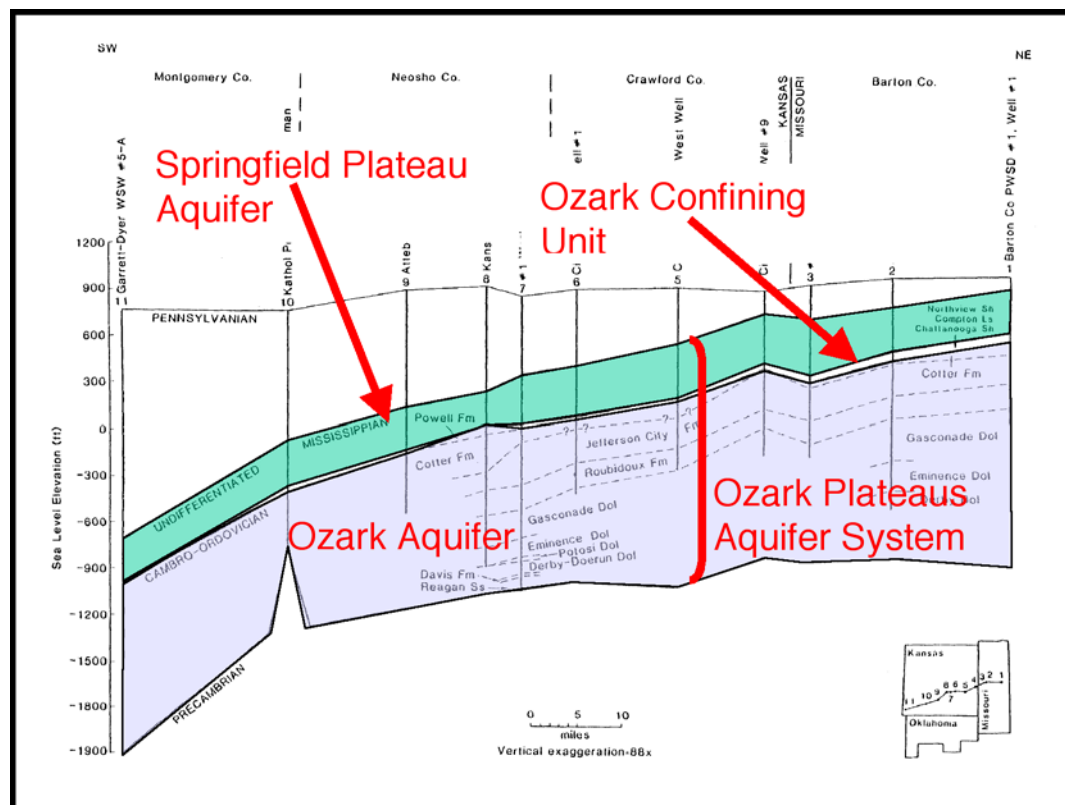


Figure 4-1. Cross section from southeast Kansas to southwest Missouri showing the aquifers and confining units that form the Ozark Plateaus aquifer system in the Tri-state region (from Macfarlane, 2005).

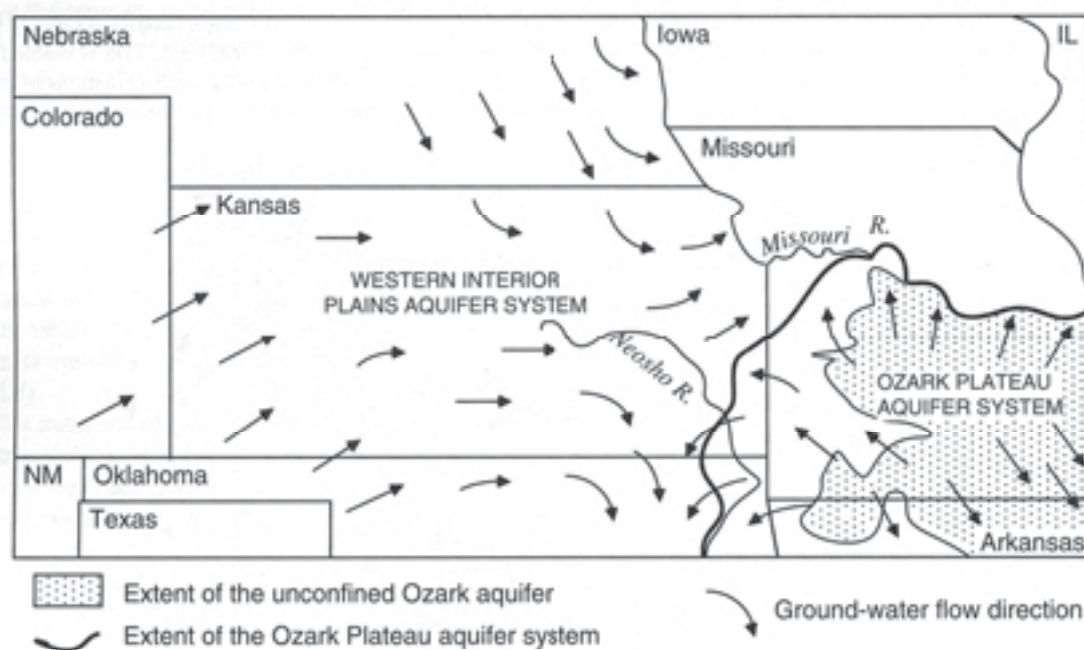


Figure 4-2. Ground-water-flow directions in the Ozark Plateaus aquifer system (from Macfarlane, 1998).

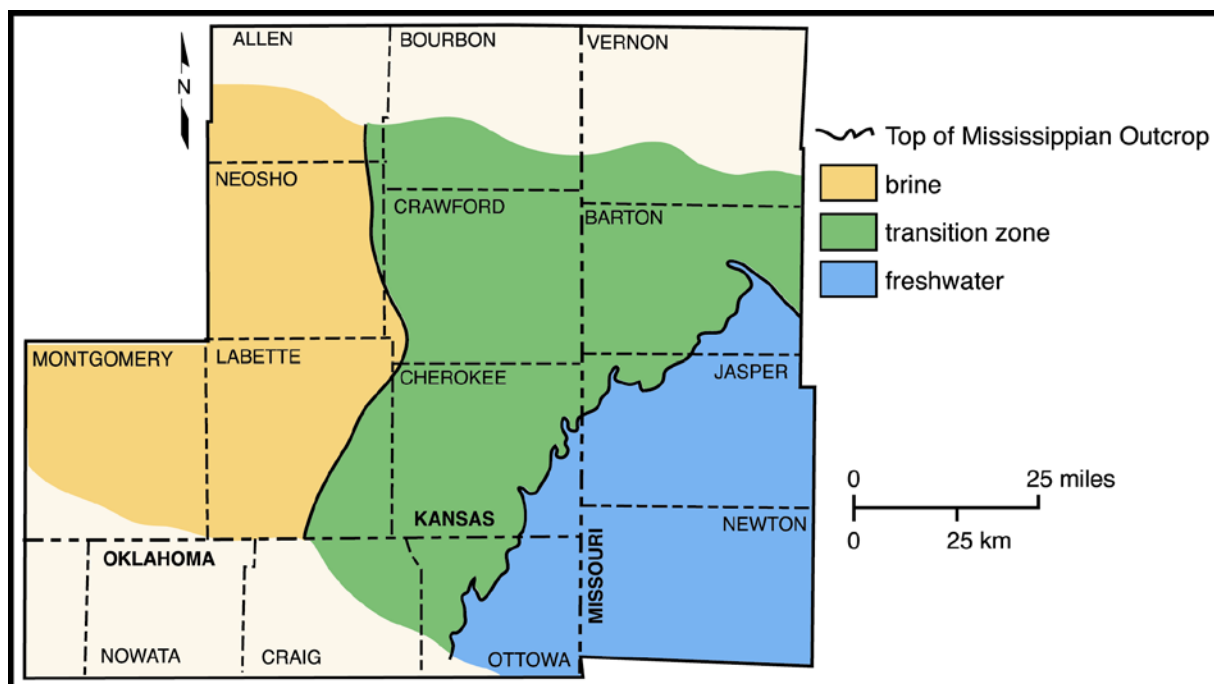


Figure 4-3. Water-quality characteristics of the Ozark aquifer in the Tri-State region (modified from Macfarlane, 2005).

Springfield Plateau Aquifer

The Springfield Plateau aquifer is composed of Mississippian limestones and cherts that range from 200 to 400 feet thick in the Tri-State region. These rocks are exposed at the surface in Missouri, extreme southeast Kansas, and parts of Oklahoma and are capped by Pennsylvanian shales farther to the west (see fig. 4-3). Most of the recharge to the Springfield Plateau aquifer rocks occurs when precipitation falls on the land surface where the rock units crop out, and underground movement is generally to the west where the aquifer discharges into the Spring and Neosho rivers. The aquifer is also recharged by surface water entering lead and zinc mining-related shafts and pits. Beginning in the late 19th century, the Springfield Plateau aquifer was pumped to dewater the mines. Dewatering allowed the sulfide minerals to oxidize, and when the mines refilled, the sulfide minerals were dissolved in the water resulting in higher concentrations of contaminants in local areas.

Ozark Confining Unit

The Ozark and Springfield Plateau aquifers are separated by the Ozark confining unit, composed of shale and dense limestones and dolomites that are Devonian and Mississippian in age. The Ozark confining unit forms an effective permeability barrier between the two aquifers except in small areas of the region (fig. 4-4), where the rocks that form the confining unit are missing. Where the two aquifers are in communication, the potential exists for mining-related contaminants in the overlying Springfield Plateau aquifer to enter the Ozark aquifer.

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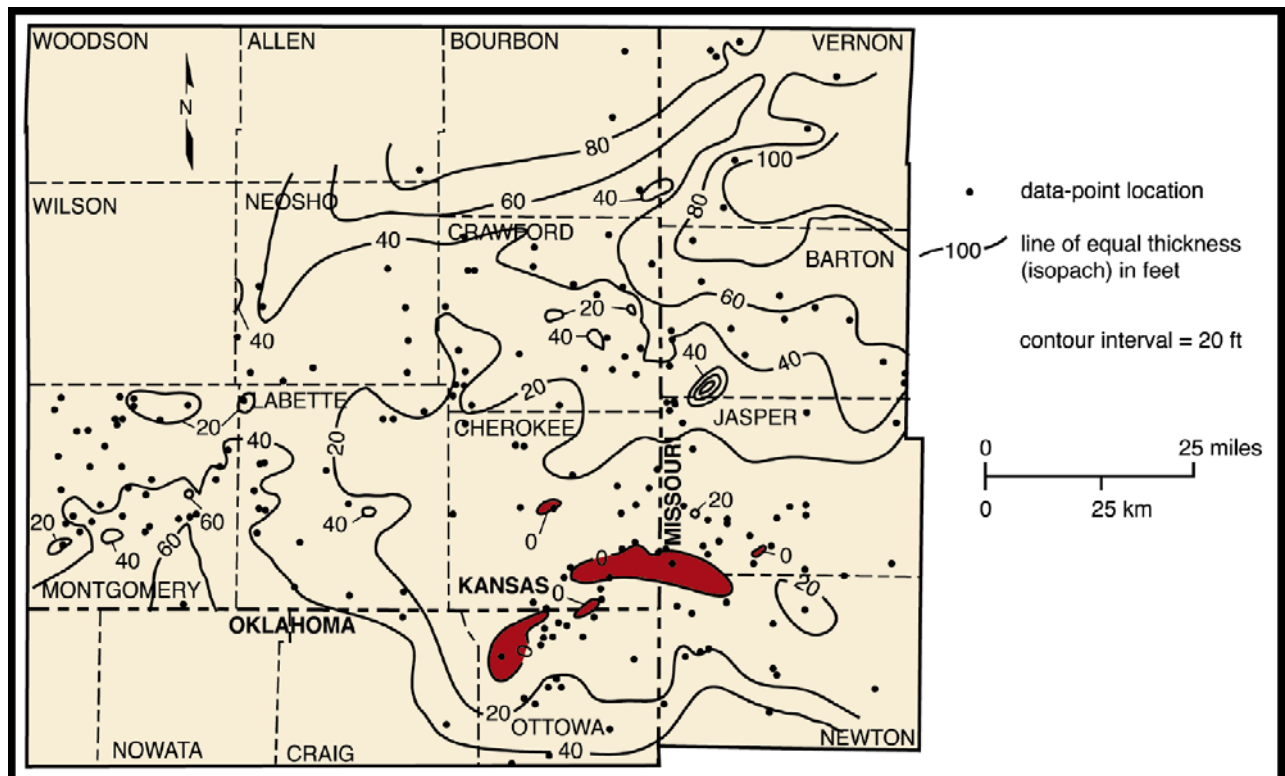


Figure 4-4. Thickness of the confining layer separating the Springfield Plateau aquifer from the underlying Ozark aquifer in the Tri-State region. The confining layer is absent in the red-shaded areas (from Macfarlane, 2005).

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Water Supply Issues

Demand for water in the Tri-State region continues to grow as the population increases, and as demand increases, more wells are being drilled into the Ozark aquifer, the primary source of water for most industries and municipalities. Three major concerns have been identified:

- Increasing reliance on the Ozark aquifer. Projected population growth will increase demands for water by public supplies and some industries, causing more wells to be drilled. More wells increase the likelihood that water levels and pumping rates will be affected in neighboring wells.
- Contamination of the Ozark aquifer from the overlying Springfield Plateau aquifer. Local contamination of the Springfield Plateau aquifer from mining and industrial activity can migrate downward as more water is pumped from the deeper aquifer.
- Saltwater encroachment from the west. As more water is pumped from the Ozark aquifer, saline water is drawn from the deeper aquifer into the freshwater zone, effectively shifting the transition zone (fig. 4-3) to the east. Some public water suppliers in western Crawford and Cherokee counties have abandoned the Ozark aquifer because of poor water quality.

The sensitivity of the Ozark aquifer to development suggests that management of the aquifer system should be coordinated across state lines to minimize the potential for depletion, contamination from the overlying aquifer, and saltwater encroachment. Recent studies suggest additional data and a cooperative effort are needed for reliable management of the ground-water resource to protect the Ozark aquifer.

Tri-State Water Resources Coalition

The Tri-State Water Resources Coalition, a non-profit group founded by economic development interests, was organized in 2002 to address water-supply issues in the region. The Coalition's goal is to develop a water resource for the area with adequate, good quality water to ensure the growth of the geographical area. Members of the Coalition include cities, water districts, private companies, regulatory agencies, and citizen and user groups from the three-state area.

The Coalition has contracted with a consultant, Black and Veatch, which is working with the U.S. Army Corps of Engineers to look for a place to construct a reservoir that will hold surface water for periods when demand is placed on the aquifer during a drought. The study should be completed in 2006.

Kansas Studies

The Kansas Department of Agriculture, Division of Water Resources, which regulates water usage in Kansas, has issued a moratorium on new water rights and the drilling of deep wells in southeast Kansas. The moratorium was designed to give the U.S. Geological Survey (USGS) enough time to complete a study of the aquifer. State water agencies are also working with the Kansas Geological Survey to establish a long-term ground-water monitoring network in southeast Kansas.

The USGS study, initiated in July 2005, will evaluate the long-term availability of ground-water supplies from the Ozark Plateaus aquifer system in the Tri-State region, and determine the effects of existing and proposed ground-water withdrawals on ground-water levels and water quality. The study should be completed in 2008 at a cost of approximately \$886,000. State and federal funds are contributing to the study, and an interstate technical advisory committee has been organized to provide input to the USGS. Results of the study will be used by water managers to determine the impacts of proposed water developments and assist in making long-term management decisions.

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Grand Lake O' the Cherokees Watershed

Grand Lake O' the Cherokees Watershed includes portions of Missouri, Oklahoma, Kansas, and Arkansas and encompasses an area of about 10,300 square miles (fig. 4-5). Major rivers that drain the watershed include the Elk River in Arkansas and Missouri, the Spring River in Missouri and Kansas, and the Neosho River in Kansas. All three of these river systems come together in northeast Oklahoma and form Grand Lake, the largest lake in the basin, which covers about 46,500 acres.

Neosho River Basin

The Neosho River Basin in Kansas covers approximately 6,300 square miles. The basin includes three federal reservoirs in Kansas: John Redmond, Council Grove, and Marion. In 2000, surface water use made up more than 80 percent of the water used in the Kansas portion of the basin. In the far southeast corner of the basin, ground water from the Ozark Plateaus aquifer system represents the primary water supply source. In Kansas, municipal use accounted for about half of the water used in 2000, followed by industrial use at about 32 percent.

The Neosho Basin Advisory Committee is an 11-member committee of basin residents that provides input to the Kansas Water Office and Kansas Water Authority on water-resource issues. The Neosho Basin Section of the Kansas Water Plan identifies basin priority issues of concern.

Kansas Water Plan Issues

In 2004, the state of Kansas developed the Kansas Watershed Restoration and Protection Strategy (KS-WRAPS) as part of the Kansas Water Plan Projects Initiative. This program is designed to provide support for locally driven stakeholder leadership teams in the development and implementation of watershed restoration and protection strategies (WRAPS) for individual watersheds.

The Kansas State University Cooperative Extension Service is facilitating the organization of stakeholder leadership teams and the WRAPS development process for watersheds in the lower portion of the Neosho River Basin in Kansas. The KS-WRAPS program

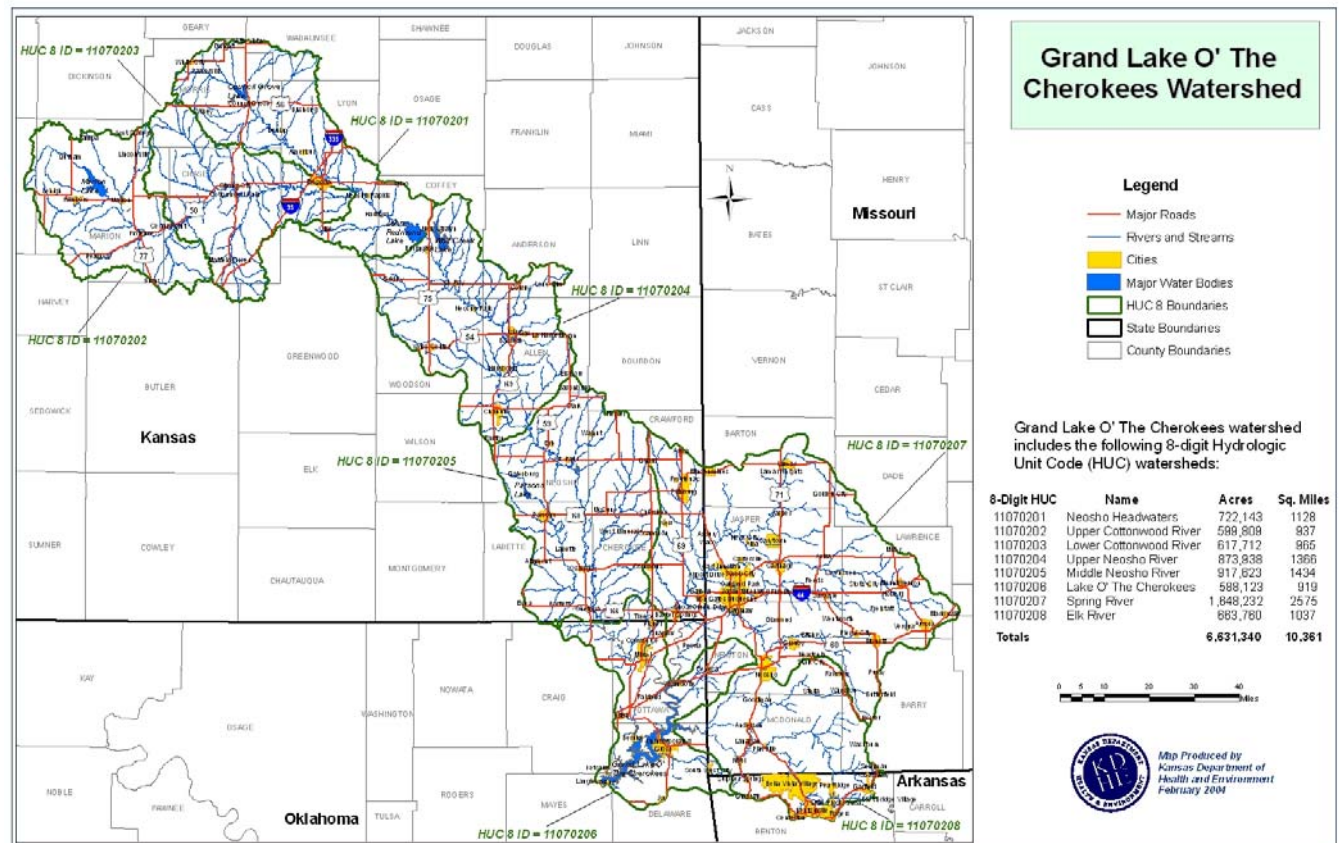


Figure 4-5. Grand Lake O' the Cherokees Watershed (map by Kansas Department of Health and Environment).

is administered by the Kansas Department of Health and Environment in conjunction with an interagency WRAPS Work Group.

The U.S. Environmental Protection Agency is conducting a watershed assessment and planning effort in the Spring River watershed with involvement from stakeholder groups in Kansas, Missouri, and Oklahoma. A WRAPS project is also being initiated to help organize local stakeholders and support future watershed planning and management activities.

Total Maximum Daily Loads (TMDLs) in the Kansas portion of the basin were established in 2002 and will be re-evaluated in 2007. Nine streams and three lakes have been identified as high priority for TMDL implementation. The primary stream impairment is low dissolved oxygen, although the Spring River is impaired by metals. Lake impairments include eutrophication (nutrient loading) and siltation. TMDLs in Kansas are developed by the Kansas Department of Health and Environment.

Water-quality issues affecting Grand Lake in Oklahoma, including eutrophication and siltation, represent an interstate watershed issue. Interagency cooperation has been initiated to address interstate water-quality concerns in the basin.

The Kansas Department of Health and Environment has worked with public water suppliers in the basin to complete source-water assessments in Kansas. Local nonpoint source pollution-management plans are being implemented through county conservation districts in sixteen Kansas counties in the basin, and county sanitary/environmental codes are being administered through county or multi-county health agencies in all but one county. Also, 17 local watershed districts have been organized in the basin.

The Neosho River is an area of high biological importance in Kansas. Priority issues include populations of freshwater mussels, sensitive species such as the Neosho madtom, and populations that have declined from historic levels, such as the paddlefish. Minimum Desirable Streamflow (MDS) values have been established on the Cottonwood, Neosho, and Spring rivers in Kansas.

The Kansas Department of Agriculture, Division of Water Resources, has conducted an assessment of instream flow for the Neosho River basin. This included an evaluation of historic flow, reservoir operations and management, water rights, and

consideration of options to meet instream needs for habitat and species protection, including water quality.

Drought is an ongoing concern in the region. All counties in the lower portion of the basin in Kansas are under a drought warning in 2006. In April 2006, the Spring River was under MDS administration by the Kansas Department of Agriculture, Division of Water Resources.

There are 111 public water suppliers in the Neosho basin in Kansas, including 56 rural water districts and six public wholesale water supply districts. The Cottonwood/Neosho Water Assurance District has 24 public water supply members and four industrial water-right holders as members who work with the Kansas Water Office and U.S. Army Corps of Engineers to operate the reservoirs as a system to meet members' needs during periods of low flow.

Interstate cooperation is underway to address the future availability of water from the Ozark Plateaus aquifer system, a major water-supply source for communities in the Tri-State region. The Kansas Department of Agriculture, Division of Water Resources, has imposed a moratorium on approval of new ground-water rights in southeast Kansas until after the U.S. Geological Survey completes a regional ground-water availability study. Interstate management of the Spring River is also an important long-term water supply consideration in the basin.

Source

Kansas Water Plan <http://www.kwo.org/Kansas%20Water%20Plan/Kansas%20Water%20Plan.htm>

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Legal Issues and Water

“Whiskey is for drinking, water is for fighting.” That may sound like a joke, but in parts of the country where water is in short supply, at least the second half of the sentence is true. And when issues become contentious in the U.S., they typically involve the law.

In this country, water issues are largely regulated by the states. While regulation differs from state to state, in very general terms, states can be grouped into those that have adopted eastern water law—those east of and along the Mississippi River that typically are more humid and have more substantial water supplies—and those states that have adopted western water law—those farther west, as the name implies, where water is increasingly in short supply.

Again, in very general terms, eastern states have adopted regulation based on riparian principles, rooted in common law from England. According to riparian doctrine, landowners adjacent to a stream own the river channel, can make reasonable use of the water in the stream, and are entitled to have the stream continue to flow past them in its natural condition. In general, these rights are attached to the land and not transferable or lost when they are not used.

Where water is less abundant, out west, most states adopted the doctrine of prior appropriation. This appropriation is often summed up as “first in time, first in right,” meaning that the first user to put water to a beneficial use has legal rights that supersede those of

later users. Although the water itself may belong to the state (as it does in Kansas), owners of water rights have the legal right to use water in order of priority. When water supplies are short and water use must be curtailed, the most recent water rights are the first to be curtailed. Older, or more senior rights, are the last to be affected. Under this doctrine, water rights are not tied to the land and can be severed from it. Water can be moved from its source—as it often is in irrigation—but rights can be lost if they are not used.

Nearly all states, either east or west, have developed standards and regulations for planning and utilizing water. Registration and permitting of water use has become more common. Thus, while states fall into two very broad categories of water regulation, each state goes about regulating water in different fashions. Both Kansas and Oklahoma have adopted the western, or prior appropriation, doctrine for water regulation, while Missouri follows eastern or riparian water law.

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Schermerhorn Park and Southeast Kansas Nature Center

Edgar Backus Schermerhorn of Galena donated land south of town on Shoal Creek (fig. 4-6) in 1922 for a city park. During the mid 1930's and early 1940's, the WPA built stone terrace walls and other structures in the park, including a Boy Scout cabin. The cabin has now been transformed into the Southeast Kansas Nature Center, which features exhibits of animals and plants native to the area and exploration drawers filled with hands-on materials. Environmental education classes and workshops are offered each month. The Southeast Kansas Nature Center Foundation is a not-for-profit organization founded to maintain an environmental resource center for area schools, educators, and the community at large.

Schermerhorn Park is the most accessible spot to view Kansas' oldest surface rocks. Deposited about 345 million years ago, outcrops of late-Mississippian limestone are found only in the southeastern tip of Cherokee County encompassed by a line running from Galena to Baxter Springs and along the Oklahoma and Missouri borders. The Spring River and its tributaries, including Shoal Creek that flows through the 24-acre park, helped shape this Mississippian landscape into rolling hills and steep river bluffs. The distinctive

features of this small triangular corner of Kansas make it part of the Ozark Plateau, more commonly associated with Missouri, Arkansas, and northeastern Oklahoma. Because this environment is different from the rest of the state, some of the state's rarest animals and plants are found in the park.

Schermerhorn Cave, located in the park, is the source of a spring-fed stream that is home to four species of amphibians—the dark-sided (or longtailed) salamander, cave salamander, graybelly (or many-ribbed) salamander, and grotto salamander. All are on the Kansas endangered or threatened species list. Rare fish in the stream and adjacent Spring River include the Ozark minnow, black redhouse, and greenside darter. Also found in the area are the spring peeper, pickerel frog, fox squirrel, flying squirrel, chuck-will's-widow, whip-poor-will, great horned owl, barred owl, and eastern screech-owl. Woodland birds include the red-shouldered hawk, pileated woodpecker, Carolina chickadee, scarlet tanager, and yellow-throated warbler. White and Shumard's oaks and bitternut and shagbark hickories, all typical of the Ozarks, dominate the hillside.



Figure 4-6. Shoal Creek at Schermerhorn Park (photo by R. S. Sawin).

Schermerhorn Cave

Schermerhorn Cave, the largest in the area, appears deceptively welcoming with its 58 x 80-foot entrance (fig. 4-7). Although the cave is nearly 1/2-mile long, within 80 feet of the entrance the passage becomes a crawlway, most of which is a low streambed rarely exceeding 2 feet in height. The stream adds a risk of hypothermia for spelunkers. In addition, the cave is prone to flooding, as evidenced by flood debris in the ceiling cracks. Due to these potential dangers, the cave is locked and not accessible to the public. Management is overseen by the Kansas Department of Wildlife and Parks, and the U.S. Fish and Wildlife Service has provided support in a number of maintenance activities associated with the cave.

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Figure 4-7. Schermerhorn Cave (photo by R. S. Sawin).

Grand Lake O' the Cherokees

Grand Lake O' the Cherokees (Grand Lake) is the third largest reservoir in Oklahoma, with 46,500 acres of water and a 1,300-mile shoreline. Its watershed spans four states and two U.S. Environmental Protection Agency (EPA) regions. The drainage area for Grand Lake covers 10,298 square miles in Arkansas, Kansas, Missouri, and Oklahoma, and includes the Neosho, Spring, and Elk rivers.

Pensacola Dam, which holds back Grand Lake, was constructed by the Grand River Dam Authority (GRDA) in 1940 as the state's first hydroelectric facility and is the longest multiple-arch dam in the world. The GRDA, a state agency, was created in 1935 to control, store, and preserve the water of the Grand River and its tributaries and to develop and generate water power and electric energy. Grand Lake is one of two GRDA lakes on the Grand River. A third lake on the river is under the authority of the U.S. Army Corps of Engineers.

While Grand Lake is one of the fastest growing retirement destinations in the United States and one of the top recreational destinations in the region, accelerated water-quality decline presents a serious threat. Recognizing the implications of this trend, the Oklahoma Legislature passed Senate Bill 408 in 2003. The statute charged Oklahoma's Secretary of the Environment with coordinating an investigation into the problems plaguing the Grand Lake watershed.

Previous studies indicate that eutrophication—the reduction of oxygen due to increased mineral and organic nutrients—is occurring in Grand Lake at a much faster rate than is natural. Research suggests that the primary sources of impairment within the watershed stem from the explosive growth of industrial-scale poultry operations, heavy metals associated with the historical lead and zinc mining of the former Tri-State mining district, and discharges from municipal and industrial wastewater-treatment plants. The lack of centralized wastewater treatment for the expanding residential development along Grand Lake's shoreline also may be contributing contaminants, particularly bacterial, although further scientific research is needed to confirm that. Nutrient and sediment runoff from other watershed activities, including construction, urban development, golf courses, and agricultural operations, contribute additional pollutant loads.

Modeling of Grand Lake and its watershed has estimated that 72 percent of the phosphorus loading stems from nonpoint source runoff, while 28 percent comes from point sources. Although the vast majority of the Grand Lake watershed's land area lies in Kansas, the bulk of its population and the largest number of point-source dischargers are in Missouri. The Lower Spring River subwatershed, which includes Joplin, Missouri, has been identified as the area contributing the most phosphorus from both point and nonpoint sources (Dutnell et al., 1995).

The latest water-quality information shows that, in general, the lake continues to exhibit signs of accelerated eutrophication caused by elevated levels of nutrients entering the lake. An analysis of harmful algae blooms in the lake found no serious occurrences yet, although the Oklahoma Water Resources Board notes that continued increases in nutrient loading and eutrophication of the reservoir will increase the likelihood of harmful algae blooms in future years.

The Oklahoma Department of Environmental Quality (DEQ) coordinates with other agencies to focus on the heavy metals and other contaminants associated with historical lead and zinc mining in the Tar Creek sub-watershed. Several new monitoring initiatives are beginning under the leadership of the EPA Region 6 and Region 7 offices, all of which will serve to better quantify the impacts of releases from the former mines on Grand Lake sediments, biota, and water quality.

In addition to water-quality studies, the Oklahoma Legislature requested that the Oklahoma Water Resources Board conduct an intensive sedimentation survey and develop a bathymetric map of the lake in order to determine the degree to which sedimentation has decreased lake volume. This study will seek to predict changes in lake volume and storage capacity over time.

Today, Grand Lake and many of its tributaries are identified as impaired on the 303(d) lists of Oklahoma, Missouri, and Kansas for such causes as nutrients, sedimentation, low dissolved oxygen, lead, zinc, and cadmium. Additionally, the DEQ has issued a warning against consumption of whole fish caught in the Spring and Neosho rivers at the upper end of the lake due to its preliminary findings of high lead levels in fish

tissue. State monitoring activities continue to detect impaired water-quality conditions in Grand Lake and its tributaries.

To advance the restoration and protection effort, the Oklahoma Secretary of the Environment proposes to coordinate the development of a network of watershed stakeholders representing all four states. This collaboration would serve as the principal vehicle for enlisting participation, developing a sound restoration action strategy, implementing measures to improve the Grand Lake watershed, and educating watershed residents about the importance of protecting their natural resources.

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Grand River Dam Authority
www.grda.com

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SCHEDULE & ITINERARY

Friday June 16, 2006

7:00 am	Breakfast at the Holiday Inn Express, Vinita, OK
8:00 am	Bus Leaves Holiday Inn Express for Site 10
9:00 am	SITE 10 —Oil and Gas Well Plugging Demonstration, Labette County, KS <i>Morris Korphage and Bob Jenkins, Kansas Corporation Commission</i>
9:45 am	Bus to Site 11
10:00 am	SITE 11 —Neosho Energy Center, Parsons, KS <i>John Cigainero, Westar Energy</i> Electrical Generation Issues in the Tri-State Region <i>Jim Ludwig, Westar Energy</i> Economics and the Future of the Tri-State Region <i>Gordon Elliott, Pittsburg, KS</i> <i>Sen. Derek Schmidt, Independence, KS</i> <i>Chuck Surface, Jasper County, MO</i>
12:15 pm	Bus to Pittsburg
12:45 pm	Arrive Comfort Inn, Pittsburg

Oil and Gas Well Plugging in Kansas

The regulation of oil and gas wells by the Kansas Corporation Commission (KCC) began in 1935. Plugging and abandonment procedures were in place in 1935, and were revised and expanded in 1982. During fiscal year 2005, 1,618 wells of all types were plugged by the oil and gas industry.

Before plugging begins, the operator must give written notice to the Conservation Division of the intention to plug and abandon the well, and notify the appropriate district office of the proposed plan at least five days prior to plugging, unless an exception is granted. District offices are in Dodge City (Southwest Kansas), Wichita (South and North Central Kansas), Chanute (Eastern Kansas), and Hays (Northwestern Kansas).

The KCC requires operators to comply with the following plugging regulations:

- For productive or past-productive oil or gas formations, a cement plug not less than 50 feet in length or a bridge capped with cement shall be placed above each such formation.
- Cement plugs of 50 feet or more in length shall be placed both above and below any fresh or usable water horizons. The lower plug shall extend at

least 50 feet below the base of water zones, and the upper plug shall extend at least 50 feet above the top of the water zones.

- In each well plugged, a cement plug shall be placed near the surface of the ground in a manner that does not interfere with soil cultivation.

Additional regulations may apply in specific circumstances, such as when a wellbore has penetrated both a highly permeable formation and a major salt formation or when a well is located near the lease or unit boundary. On occasion, alternative plugging methods may be used if authorized by the KCC. All plugging operations are conducted in a manner that is protective of water resources and correlative rights of mineral owners.

Abandoned Oil and Gas Well/Site Remediation Program

The Abandoned Oil and Gas Well/Site Remediation Fund was established in 1996 to provide additional financial support to the Conservation Division so that the agency could address the problems of both abandoned oil and gas wells and sites contaminated by exploration and production activities (fig. 5-1). Under K.S.A. 55-179, monies could be used to plug



Figure 5-1. Abandoned well leaking saltwater, Verdigris River floodplain, Montgomery County, KS (photo by KCC).

abandoned wells and to remediate surface and ground-water contamination related to oil and gas activities in cases where there is no responsible party. The KCC plugs an average of 650 abandoned wells annually.

Funding for the Abandoned Oil and Gas Well/Site Remediation Fund is provided through four funding sources:

- Increased assessments on crude oil and natural gas production through the conservation fee fund
- General fund monies
- 50% of monies received by the state through the federal mineral leasing program
- State water plan monies

The total funding package was expected to be \$1,600,000 per year. Between July 1996 and the end of 2006, 5,929 wells were plugged or were scheduled to be plugged in Kansas through the program at a cost of \$15,778,495. More of those wells were located in the Neosho River basin than any other river basin in Kansas (fig. 5-2), with 2,567 wells plugged or scheduled for plugging at a cost of \$5,408,236. Senate Bill 321, passed during the 2001 legislative session, extends the original fund sunset date seven years to June 30, 2009.

Well Plugging Assurance Fund

Besides creating the fund, the legislation directed the Conservation Division to establish financial responsibility requirements for oil and gas operators within the state of Kansas. These requirements were in place by January 1998. The Well Plugging Assurance Fund was designated for those wells drilled after July 1, 1996, which may become abandoned and require plugging with state funds in cases where there is no responsible party. House Bill No. 2390, passed during the 2005 legislative session, increased financial assurance requirements for oil and gas operators effective July 1, 2005.

References

Abandoned Oil and Gas Well Plugging Demonstration presentation, Kansas Corporation Commission, Conservation Division, June 16, 2006.

Kansas Corporation Commission
www.kcc.state.ks.us/conservation/index.htm

RIVER BASIN NAME	NUMBER OF ABANDONED WELLS PLUGGED OR SCHEDULED FOR PLUGGING	TOTAL COST TO DATE
Cimarron	2	\$8,285
Kansas-Lower Republican	17	\$45,020
Lower Arkansas	109	\$944,475
Marais Des Cygnes	1478	\$3,111,299
Missouri	6	\$20,472
Neosho	2567	\$5,408,236
Smoky Hill-Saline	215	\$1,516,322
Solomon	58	\$316,068
Upper Arkansas	54	\$294,601
Upper Republican	16	\$55,802
Verdigris	1364	\$3,738,856
Walnut	43	\$319,059
TOTALS	5929	\$15,778,495

Figure 5-2. Oil and gas wells plugged or scheduled to be plugged through the Kansas Corporation Commission's Abandoned Well Plugging Program, July 1, 1996, to June 2006 (from KCC).

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Kansas Geological Survey Plugged Well Database
www.kgs.ku.edu/Magellan/Plug/

Neosho Energy Center

Neosho Energy Center dates back to 1923, when the original generating unit was placed in service. By 1927, a second unit was in service, bringing the total station capability to 50 megawatts. At that time, both units were located on the east side of the Neosho River. The two turbine generators were supplied steam from six stoker-fired boilers. The fuel source was local coal transported to the site by rail. Both units experienced heavy operation through 1960, when more efficient, natural gas-fueled units relegated them to “peaking” and emergency duty. The coal-fired units were retired in 1979 and completely demolished in 1990.

In 1954, construction was completed on the No. 3 generating unit and No. 7 boiler (70 megawatts) on the west side of the river. It can be fueled by natural gas and can also burn #6 heavy oil as a secondary fuel. This unit saw heavy operation until 1986. The No. 3 unit was “moth-balled” when LaCygne, Jeffrey, and Wolf Creek generating stations were brought on-line.

In 1998, the unit was brought back into service and updated with numerous control and flame management systems and emission controls. It operated successfully until 2003, when new gas turbines were constructed in the Wichita area, which again put this unit in the role of “peak” use and emergency back-up generation. The unit is currently in a semi-moth-balled status, operating occasionally during the summer months as required.

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Economics and the Future of the Tri-State Region

The economic history of southeastern Kansas, southwestern Missouri, and northeastern Oklahoma is one of dramatic change. Probably owing primarily to its topography, this area has never been as dominated by agriculture as other parts of Missouri, Kansas, and Oklahoma. On the other hand, the use of other natural resources—coal, oil and gas, and metallic minerals—is much more important to the economy here. Coal mining began in the 19th century, but it was the mining and smelting of lead and zinc in the late 1800's that produced a boom in the area's economy. Oil was discovered in this area in the 1890's, and exploration and production thrived in the early 20th century. In addition, natural gas was used to develop a variety of industries, including the production of cement, glass, brick, tile, and other materials.

The result was an expanding economy and a jump in area population. Cherokee County, Kansas, for example, increased in population from 27,000 in 1890 to 42,000 just 10 years later. The entire population of the 10 counties that make up southeastern Kansas (Allen, Bourbon, Chautauqua, Cherokee, Crawford, Montgomery, Wilson, Woodson, Labette, and Neosho) increased from 105,000 to 186,000 from 1890 to 1920. But nearly as quickly as this boom developed, some parts of it went away. Supplies of natural gas in some areas were quickly depleted, and higher energy costs, combined with the impact of prices, supply, and demand on the national scale, dealt severe blows to the cement, glass, and clay industries. While the oil fields of southeastern Kansas and northeastern Oklahoma were highly productive in the early 20th century, they produced less and less over time and the oil industry in both states turned its attention to larger, more productive fields farther west.

For a time in the early 20th century, the Tri-State region was the world's largest producer of lead and zinc ore. However, production of lead and zinc in Kansas peaked in 1926, and the history of lead/zinc mining in the area ended in 1970 with the closing of the Eagle-Picher Industries Swalley mine near Baxter Springs and the closing of the Eagle-Picher central mill at Cardin, Oklahoma. The history of coal mining in the area is slightly different. Its production peaked in 1918. Coal continued to be heavily mined through the 1960s, when concerns about the environment made low-sulfur coals from the western U.S. more attractive, and reclamation laws made the thin coal seams from

this area more expensive to mine. The result was a drop in demand for Kansas coal from the Tri-State region. Coal continues to be mined here, but at a much lower level than in the past.

The demise of lead and zinc mining, along with dramatic declines in production of oil, gas, and coal, resulted in economic dislocation and a change in the area's population. For example, in the year 2000, the population of Cherokee County was about 22,000, or about half of its level in 1900. Today the economy of this region is much more dominated by manufacturing and retail activity. While there has been a recent resurgence in the production of at least one natural resource, coalbed methane, a mix of manufacturing, wholesale and retail trade, and construction remain the primary drivers of economic activity in this area.

References

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