

2001—A REWARDING YEAR

Introduction

As a science agency within the Colorado Department of Natural Resources, the Colorado Geological Survey (CGS) collects and disseminates geologic information that is relevant to the citizens of the state. The books, maps, and papers that CGS scientists produce are used by Colorado citizens, but they are also read and reviewed by scientists across the country. This *RockTalk* will review some of the work CGS had done during the last year, and how that work has been received by our state customers and scientific peers.

Scientific Recognition

Our efforts as a science agency are recognized by our peers in the form of grants, achievement awards, and acceptance of papers for external publication. This year was noteworthy on several fronts. For one, our State Geologist, Vicki Cowart, received the distinguished honor of being elected as the President of the Association of American State Geologists.

Dave Noe recipient of the Burwell award from GSA



Awards

The Geological Society of America selected our publication, *A Guide to Swelling Soils for Colorado Homebuyers and Homeowners*, as winner of the coveted 2001 Edward B. Burwell, Jr. Award. This prestigious award is made to the authors of a published paper of distinction that advances the principles or practices of Engineering Geology. This is the second national award for Special Publication 43 which has sold more than 125,000 copies since it was published in 1997. The authors of this award-winning publication are David C. Noe, Candace L. Jochim and William P. Rogers.

Another CGS publication, *Colorado Earthquake Information, 1867–1996*, produced in a CD-ROM format won the Western States Seismic Policy Council's "2001 Award in Excellence in the Use of New Technology". The combined talents of CGS geologists Bob Kirkham and Pat Rogers and geotechnical personnel Randy Phillips, Matt



Vince Matthews receiving Western States Seismic Policy Council award from Jonathan Price, Chairman of the WSSPL Board

Morgan, and Cheryl Brchan made this unique publication a success.

Bob Kirkham received the 2001 Best Paper Award from the Rocky Mountain Association of Geologists as senior author for "Late Cenozoic Regional Collapse Due to Evaporite Flow and Dissolution in the Carbondale Collapse Center, West-central Colorado." This paper is an outgrowth of seven years of collaborative CGS and U.S. Geological Survey (USGS) mapping in central Colorado.

Grant Awards

The National Aeronautics and Space Administration (NASA) awarded a research grant to Matt Sares and collaborating consultants for a project which will use hyper-



field notes from the director

WHO IS THE COLORADO GEOLOGICAL SURVEY?

Colorado Statutes created the Colorado Geological Survey "to coordinate and encourage by use of appropriate means the full development of the state's natural resources, as the same are related to the geological processes that affect realistic development of human and mineral utilization and conservation practices and needs in the state of Colorado, all of which are designed to result in an ultimate benefit to the citizens of the state."

Our mission statement calls on us to "serve and inform the people of Colorado by providing sound geologic information and evaluation, and to educate the public about the important role of earth sciences in everyday life in Colorado."

What that really means is that we are a group of 37 state employees, plus a helpful group of contractors, consultants and interns, who work together to ensure that reliable and relevant geological information is available to the public. We do this by conducting field studies, performing applied research projects, and producing data compilations and analyses, all in the quest of good science for the benefit of Colorado.

We do our work within five scientifically focused sections, which are Engineering Geology, Environmental Geology, Mineral and Mineral Fuels, Geologic

field notes continued on p. 5

spectral remote sensing to map geology, hydrothermal alteration, and mine wastes in the upper Arkansas River watershed.

The USGS under its National Earthquake Hazard Reduction Program (NEHRP) awarded a research grant to Bob Kirkham to study the young faulting in the Williams Fork graben. A NEHRP grant was also awarded to Vince Matthews, Jim McCalpin, and Matt Morgan for collaborative study of young faulting and the 1882 earthquake in the northern Front Range.

A mentoring grant from the Association of American State Geologists allowed Andrew Lockman, a student at Western State College, to do field work with CGS geologist Beth

Widmann for the Keystone quadrangle mapping project last summer.

The USGS doubled the amount of their STATEMAP Project award to CGS this year. The grant partially funded mapping of seven quadrangles, digitization of seven previously mapped quadrangles, and entering Colorado maps into the National Geologic Map Database.

Chris Carroll, CGS geologist, received a USGS Coal Availability grant for the fifth straight year. The grant will fund a study that uses all available information to determine not only how much coal is present, but how much is actually available for mining. The study evaluates thickness, quality, economics, and cultural considerations related to the production of coal.

The Department of Energy awarded a grant to Laura Wray and collaborators in the Utah Geological Survey to characterize the carbonate reservoirs in the Ismay and Desert Creek Formations of the Paradox Basin in Utah and Colorado.

External Publications

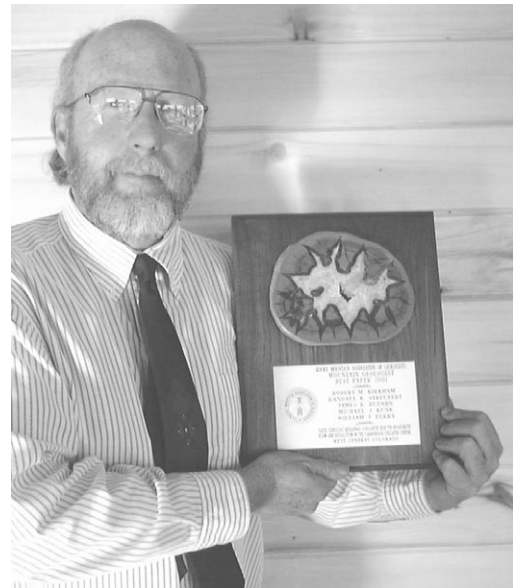
A technical paper, "The Cookbook Doesn't Work: Erosion and Sediment Control on Steep Slopes with Highly Erodible Soils," co-authored by Karen Berry was published in the September/October issue of *Land and Water*, a magazine that focuses on natural resource management and restoration.

Bob Kirkham was senior author on a paper published by the Mountain Geologist entitled "Late Cenozoic Regional Collapse Due to Evaporite Flow and Dissolution in the Carbonate Collapse Center, West-central Colorado."

CGS Publications

In 2001, the CGS continued its efforts to generate information of value to the public by producing 24 new publications, including four new geologic maps and seven reports evaluating the mineral and mineral fuel potential in our state.

Given the variety of Colorado's topography and the pressures attendant to accommodating a burgeoning population, CGS reports offer a



Bob Kirkham with the RMAG Best Paper Award

much-needed source of information about the state's geological resources, hazards and heritage. CGS continues to serve the public not only through its research, but also by making its reports accessible in a variety of formats.

In addition to offering published resources, CGS geologists, many of whom either were involved in the research or wrote the publications we offer, are in the office and available to answer questions. This dedication to public service and intimate knowledge of the information disseminated by the agency is one of the reasons CGS publications are so popular. CGS publications are modestly priced so as to be widely accepted. Even so, sales for fiscal year 2001 totaled \$170,568, an eight-percent increase over the previous year.

WHAT WE DID IN 2001

Land-Use Reviews

The Land Use Review (LUR) Program provides technical assistance to local-government planners and officials in evaluating the geologic suitability of proposed subdivisions, schools, and infrastructure projects.

CGS responded to 577 review requests from local governments during fiscal year 2000–2001—an all time high. The previous record was set in 1997–98 when CGS conducted 560 site appraisals.

Colorado Avalanche Information Center (CAIC)

In early November, offices of the Colorado Avalanche Information Center, staffed by 11 forecasters, prepared for their 19th season of operations. CAIC provides information on avalanche conditions for use by the Colorado Department of Transportation and everyone who ventures into Colorado's spectacular, but dangerous, winter backcountry.

Last winter's treacherous mountain snowpack made heightened avalanche danger inevitable. Although there were 2,867 avalanches reported and 113 people were caught in their paths, avalanches tended to be small, and most victims escaped unharmed. Remarkably, with only four deaths, the season was less lethal than

average. The total number of reported avalanches was 33 percent above normal by the end of the season, but Avalanche Warnings were issued on only 14 days.

Proof that the public values the services CAIC provides is easy to find: over 4,000 people attended 98 avalanche seminars presented by staff last season, 54,586 people called for information from the avalanche hotlines, and there were 189,887 hits recorded on the agency's web forecast page. In addition, 11 radio stations broadcast the agency's hotline messages each day and staff e-mailed 149,000 forecasts to members of The Friends of CAIC.

As its reputation as Colorado's premier source of information on all matters related to avalanches grows, CAIC's scientific staff have had to become as comfortable with microphones and audiences as they are with skis and snow probes. In October three staff members were selected to teach courses at Utah's National Avalanche School, one of the largest and most respected schools in the country. In addition, as an official state "spokes agency," CAIC staff worked frequently—166 times last season—with print and broadcast media on stories related to avalanches.

Water

CGS staff members have served as technical advisors to the Animas

how to order CGS publications

Mail:

Colorado Geological Survey,
1313 Sherman Street,
Room 715, Denver, CO 80203
Phone: (303) 866-2611
Fax: (303) 866-2461,
E-mail:
cgspubs@state.co.us

New CGS Website address:
<http://geosurvey.state.co.us>

VISA® and MasterCard®



accepted.

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Prepayment required.
.....

SHIPPING AND HANDLING

Please contact the CGS for shipping and handling costs.
.....

Discounts

Available on bulk orders.
.....

Call for a complete
publication list
.....

PUBLISHED IN 2001

- IS 55**
Colorado Coal Directory 2000 \$12.00
- IS 57**
Database of Geochemical Analyses of Carbonate Rocks in Colorado \$15.00
- IS 58**
Colorado Coal Quality Data \$15.00
- IS 59**
Colorado Mineral and Mineral Fuel Activity, 2000 \$6.00
- IS 61**
Snow and Avalanche: Colorado Avalanche Information Center Annual Report 2000–2001 \$5.00

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State of Colorado
Bill Owens, Governor

Department of Natural Resources
Greg Walcher, Director

Division of Minerals and Geology
Mike Long, Director

COLORADO GEOLOGICAL SURVEY

Vicki Cowart, Director
and State Geologist

James A. Cappa, Mineral Resources

Vince Matthews,
Senior Science Advisor

David C. Noe, Engineering Geology

Randal C. Phillips, GIS and
Technical Services

Patricia Young, Administration
and Outreach

Matt Sares, Environmental Geology

Knox Williams, Colorado Avalanche
Information Center

Administration and Outreach

Betty Fox, Brenda Hannu,
Melissa Ingrisano, Dori Vigil

Avalanche Information Center

Dale Atkins, Nick Logan, Scott Toepfer

Mapping, Outreach, and Earthquakes

John Keller, Bob Kirkham,
Matt Morgan, Beth Widmann

Engineering Geology and Land Use

Karen Berry, Jill Carlson, Sean Gaffney,
Celia Greenman, Jim Soule,
T.C. Wait, Jon White

Environmental Geology

David Bird, Ralf Topper, Bob Wood

GIS and Technical Services

Cheryl Brchan, Karen Morgan,
Larry Scott, Jason Wilson

Mineral Fuels

Chris Carroll, Laura Wray

Minerals

John Keller, Beth Widmann

River Stakeholders Group since 1995. The group's efforts culminated this year when the Water Quality Control Commission accepted their recommendations as standards for stream water-quality. The new standards recognize natural background sources of acidity and metals in the watershed, as well as mine-derived sources

The April edition of *RockTalk* which featured a historical and balanced view of recent events involving Summitville and the Alamosa River titled, "Geology, Mining, and the Environment: A History of the Upper Alamosa River

Basin." was very popular. Many individuals and organizations contacted CGS requesting that we send them several copies to distribute.

CGS Environmental Geology staff published four different reports on the history and environmental setting of several abandoned mines located on U.S. Forest Service lands. Three of the open-file reports address mines in Chaffee County and one addresses a uranium mine in Boulder.

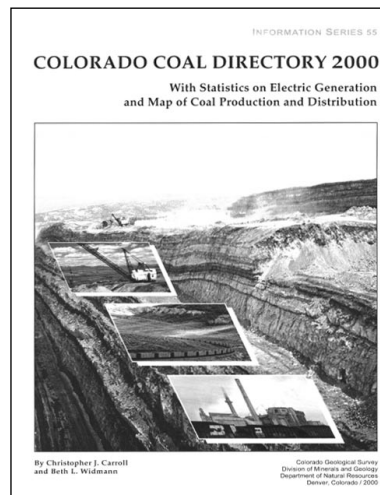
Mineral and Mineral Fuels State Land Board Mineral Inventory

The State of Colorado owns the mineral rights on about four million acres of lands that are administered by the Colorado State Land Board (SLB). Last year mineral rights produced \$15.1 million that goes to fund public education. In 1998 the CGS began evaluating the mineral and mineral fuel potential of each tract of the SLB's mineral rights. As of January 2002, the team

of CGS employees and contractors has completed 1.8 million acres with 1.3 million acres of inventory in progress. Fifteen counties were completed in 2001. The SLB evaluations are produced on CD-ROM. A map showing the completed tracts can be found on the CGS Website at http://geosurvey.state.co.us/pubs/slb/finished_tracts.gif

Coal Program

The CGS has an active coal resource program. Earlier this year the staff



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Please give us your name as it appears in your paper *RockTalk*. We will switch you from our snail mail subscription list to our e-mail subscription list.



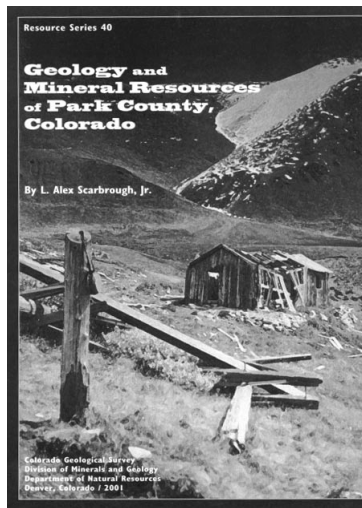
of the coal program completed the resource calculations on the *Available Coal Resource of the Yampa Coal Field, Moffat and Routt Counties* which will be published next spring.

Two new publications were completed this year, one is a coal geochemical and petrographic database on a CD-ROM, and the other is the *Colorado Coal Directory 2000 with Statistics on Electric Generation and Map of Coal Production*. The directory consists of production and mining operations information and an index map showing mine outlines of operating mines. A color map depicts coal transportation and distribution, as well as locations of coal and natural gas fired power plants, coal mines,

alternative energy units, and hydro-electric plants.

Oil and Gas Program

CGS completed a study of the coalbed methane potential of the Denver Basin of northeastern Colorado. The final report, in CD-ROM format, includes ArcView displays of coal thickness, sub-surface structure, gas content, a list of historical surface and subsurface coal mines with analyses, and selected cross sections of logs from



CGS coal drill holes. Laura Wray, in collaboration with the Petroleum Technology Transfer Council (PTTC), presented a well-attended seminar on coalbed methane potential of the Denver basin at the unveiling of this useful publication.

Minerals Program

The second of a series of county reports was completed and published this year on *The Geology and Mineral Resources of Park County*. This report explains the complex and diverse geological setting of Park County and the various mineral deposits of the county—from coal to rhodochrosite. A geologic map and a mining districts map with mines and prospects are included with the report. The Mineral Resource Database System information for Park County is included in a CD-ROM.

CGS built a database of carbonate rock geochemical analyses from published and unpublished literature. The database will supply useful data on the suitability of

field notes continued from p. 2

Mapping and Earthquakes, and the Avalanche Information Center. The studies we undertake reflect our dedication to the well being of the citizens of our state. But our work is only partially done when our studies are final—the real completion of a project comes with the public dissemination of our information. Whether it's in the form of a map, a book, a letter to a county planning group, a talk to a community organization—or this newsletter, *RockTalk*—our work isn't done until we have shared our results.

This begins our fifth year of publishing *RockTalk*, and we use this as an opportunity to look back over the last year, reminding ourselves of what we've done and hopefully informing you, in case you missed it, of some of the projects that may be meaningful to your interests. This year we are also introducing a change consistent with the times. With our next edition, *RockTalk* will be available to you through an email subscription. Simply contact us at cgspubs@state.co.us and we'll

switch you from a paper subscription to an email subscription.

This change is reflective of our focus on efficiency. Most of our publications are now produced in digital format as a CD-ROM. While we still publish many of our maps and more popular geology books as paper products, more and more we are turning to electronic publishing, which saves money in both production and storage of inventory. We want to put our limited resources into the important studies we do, rather than into the inventory management costs. In the next year, we hope to begin publishing large data sets and maps on the web as well.

No matter how we reach you, above all the people at CGS are interested in providing studies and data that are meaningful and useful to you, the Colorado public. Take a look at what we've done this last year, but remember, we are interested in your feedback, and invite you to share your interests and perceptions about what you think is important for *your* state geological survey to be doing.

RockTalk

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Room 715, Denver, CO 80203
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THIS ISSUE

Editor: Vince Matthews

Production: Cheryl Brchan



Geologic Hazards Field Trip, Durango GeoConference: Field trip leader, David Trautner of Lambert & Associates, describes a rockfall fence at the Mercy Housing Project in north Durango

carbonate rock formations for cement, chemical grade limestone, and construction and industrial material. The information is available as *Database of Geochemical Analyses of Carbonate Rocks in Colorado* in a Microsoft Access™ format.

Colorado Mineral Education Project

This year's CGS education project once again utilizes the CD-ROM format to present educational information about the multi-use potential and historical significance of coal and coalbed methane in Colorado. The interactive CD is designed for middle school students and meets the Colorado Model Content Standards for Earth Science (Standard No. 4). The process of coal and coalbed methane formation, the historic importance of coal mining in Colorado, a comparison between historic and modern coal mining methods, the technical innovations that turned deadly methane in the coal into an extractable resource, and the reclamation work required

for both coal mines and coalbed methane wells are all addressed in this digital publication (Special Publication 51). CGS offers free copies of this and other educational CDs to Colorado teachers.

Engineering and Land Use

Durango Geoconference—A Huge Success

The CGS hosted another of our popular GeoConferences in 2001. This year's conference, "Geologic Issues in Southwestern Colorado," was held in Durango on October 15–16. The conference highlighted a wide variety of geology-related issues including land use planning, geologic hazards recognition and mitigation, emergency management, post-wildfire hazards, avalanche monitoring, gravel pits, water quality and natural degradation, and coalbed methane.

Thirty speakers gave presentations and over 150 people attended the sessions. Participants included

planners, realtors, developers, homebuilders, engineers, geoscientists, emergency managers, building officials, landowners, attorneys, college students and educators, and local decision-makers. Most attendees were from Colorado, but Utah, New Mexico, Texas, Florida, and even Japan were also represented.

Two optional, full-day field trips visited excellent examples of geologic hazards, mining, water quality, avalanche, and other geology-related, land-use issues at sites near Durango and Silverton.

The Top Cut

As he has for the past several years, Jonathan White spent October at "the Top Cut," a long road cut near the summit of 12,095-foot Independence Pass near Aspen. White's job was to help the Colorado Department of Transportation and the Independence Pass Foundation with rockfall mitigation and slope restoration. Theoretically, October is the perfect month for this project: the tourists are gone and, at least on the flatlands, the weather is crisp and fair. Despite several days of battling the "crisp and fair" weather while bundled in his foul weather gear, Jon's primary objection to the experience is paying \$16 for a hamburger in Aspen.

Geologic Mapping and Earthquakes

Mapping

During 2001, CGS completed five 7.5-minute geologic quadrangle maps and carried out fieldwork for seven maps to be published in 2002. Three of the seven were in the Colorado Springs area, two were in the Keystone-Breckenridge area, one was southwest of Fort Garland, and one was north of Durango. These maps were funded by a combination of severance tax and a federal grant under the National Cooperative Geologic Mapping Program (NCGMP).

We also digitized and updated seven Open File quadrangles in the Glenwood Springs area to be released in our Geologic Map Series in 2002. Another project was entering the digital data for 370 non-USGS Colorado maps (the USGS maps are already entered) into the National Geologic Map Database. To see the results go to: http://ngmsvr.wr.usgs.gov/ngmdb/ngm_catalog.ora.html and search for geologic maps in Colorado by lat/long, county, type, scale, author, publisher, title, or date.

Earthquakes

In September, an earthquake swarm hit southern Colorado west of Trinidad. The largest of the earthquakes was 4.6 in magnitude and caused minor damage in Segundo and Valdez. CGS geologists Matt Morgan and Vince Matthews collaborated with the USGS to try and understand the origin of the Trinidad earthquake swarm. A 4.0 magnitude earthquake rattled Glenwood Springs in August.



Mapping Supervisor, Bob Kirkham, and Principal Investigator, Pete Rowley discuss the geology of the Cheyenne Mountain quadrangle from a 9,500 foot-high vantage point.

NEW EMPLOYEES

The Engineering Geology and Land-Use Section added three new permanent employees this year: Jill Carlson, Sean Gaffney, and T.C. Wait.

Jill comes to us from California, where she worked on large dam and other civil-works projects for many years.

Sean formerly worked for Douglas County as an engineering site inspector, and for several geotechni-

cal engineering companies in the Denver area.

T.C. has experience as an environmental engineer, and recently completed a master's degree in geological engineering at Colorado School of Mines, with an emphasis in landslide studies.

Matt Morgan transferred from the GIS and Technical Services Section group to the Mapping and Earthquake Section. Matt is finish-

publications continued from p. 3

OF 00-15

Evaluation of Mineral and Mineral Fuel Potential of Alamosa, Conejos, and Rio Grande Counties State Mineral Lands Administered by the Colorado State Land Board \$15.00

OF 01-06

Evaluation of Mineral and Mineral Fuel Potential of Grand and Summit Counties State Mineral Lands Administered by the Colorado State Land Board \$15.00

OF 01-07

Evaluation of Mineral and Mineral Fuel Potential of Cheyenne County State Mineral Lands Administered by the Colorado State Land Board \$15.00

OF 01-09

Evaluation of Mineral and Mineral Fuel Potential of Kiowa County State Mineral Lands Administered by the Colorado State Land Board \$15.00

OF 01-10

Evaluation of Mineral and Mineral Fuel Potential of Huerfano and Custer Counties State Mineral Lands Administered by the Colorado State Land Board \$15.00

OF 01-15

Evaluation of Mineral and Mineral Fuel Potential of Jackson County State Mineral Lands Administered by the Colorado State Land Board \$15.00

OF 01-17

The Coalbed Methane Potential in the Upper Cretaceous to Early Tertiary Laramie and Denver Formations, Denver Basin, Colorado \$15.00

OF 01-19

Evaluation of Mineral and Mineral Fuel Potential of Prowers County State Mineral Lands Administered by the Colorado State Land Board \$15.00

RS 40

Geology and Mineral Resources of Park County, Colorado \$30.00

SP 51

Coal and Coalbed Methane in Colorado \$10.00

ing his masters degree in Geology from the Colorado School of Mines.

Beth Widmann has joined the Mineral and Mineral Fuels group. She has worked on a temporary and contract basis with the CGS since 1996. Beth completed her Masters Degree at the Colorado School of Mines and will work primarily on industrial mineral studies.

David Bird joined the Environmental Geology Section in October. He is a hydrogeologist with a strong geochemistry background and worked with URS Corp. and Hydrologic Consultants Inc. before joining CGS.

Karen Morgan, new to the GIS and Technical Services Section, has a masters in geology and wide experience using GIS to study geology, perform environmental assessments and produce digital cartography.

Jason Wilson started with the Survey almost five years ago and was recently hired as a permanent employee in the GIS and Technical Services Section. He has a degree in Land Use with a GIS emphasis.

Betty Fox and Brenda Hannu are new to the Administration and

NEW EMPLOYEES from top left: Sean Gaffney, Brenda Hannu, Jill Carlson, T.C. Wait, Betty Fox; bottom left: Karen Morgan and Jason Wilson. Below, clockwise from top box: Beth Widmann, David Bird, and Matt Morgan



Outreach Section. Betty, who has extensive experience in administrative positions in both the private and public sector with a special fondness for writing and editing, assists with billing, outreach events, and publication sales. Brenda is the new Land-Use Review clerk and Assistant to the CGS Chiefs. Her background includes work in administration and computers.



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