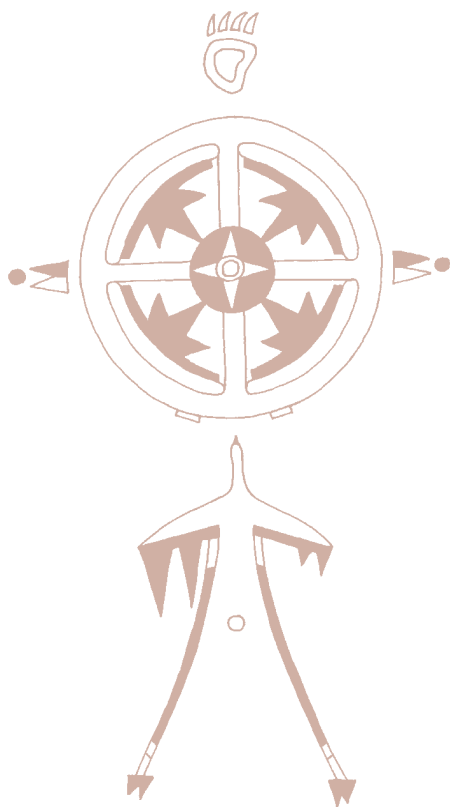


# EARTH MEDICINE

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## Microscale chemistry benefits the environment and lab practices

by Patterson T. Yazzie, Haskell Indian Nations University

The second program in the Haskell Environmental Seminar Series was filmed recently at Haskell Indian Nations University. The program, "Microscale Chemistry in Your Classroom," was a demonstration of microscale chemistry techniques by Dr. Mono Singh. Singh is a professor of chemistry and director of the National Microscale Chemistry Center at Merrimack College.

Singh defines microscale chemistry as an environmentally safe pollution prevention method of performing chemical laboratory experiments using a minimal amount of chemicals. According to Singh, microscale chemistry uses a drastically reduced amount of chemicals and the use of miniature labware results



*Mono Singh compares labware used in a macroscale and microscale titration lab.*

in increased safety. Some of the benefits of microscale chemistry that he described include that it is an environmentally safe method, reduces chemical waste, is cost-effective, and employs the integral part of the 3 R's: reduce, reuse, and recycle. He said that it also reduces the amount of chemical exposure and eliminates explosion and fire hazards. Singh stated that students who are trained using microscale chemistry techniques change their views on the environment. Students learn that environmentally friendly processes must be practiced.

Singh explained that microscale chemistry techniques should be implemented because they allow students to perform a variety of laboratory experiments in less time. Regular laboratory exercises take about 2 hours and 30 minutes compared to the short amount of time spent in microscale chemistry.

His first demonstration was on making a micro pycnometer, which measures the density of a liquid. He said that a regular pycnometer consists of three parts and costs about \$90. It holds about 30 milliliters (ml) of solution and every time you determine the density of a liquid, you generate 30 ml of chemical waste. In microscale chemistry, you only use a few microliters of a solution when you construct your micro pycnometer with a pasteur pipette. Students can also construct a stir ball for mixing solutions from a piece of a metal paper clip and a melting point capillary. Using a newly constructed stir ball, Singh demonstrated another experiment which determined the boiling point of a liquid using the micro stir ball, a pasteur pipette to construct a test tube, and capillary

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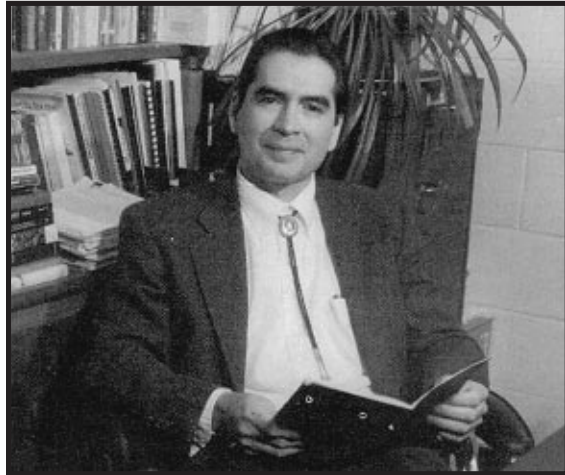
8.....Wetlands Workshop

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# TC<sup>3</sup> = technology, community, culture, and communication

by Daniel Wildcat, Haskell Indian Nations University

Technology, community, culture, and communication are intimately related. At the 1998 Conference on Hazardous Waste Research: Bridging Gaps in Technology and Culture, I translated this relationship for scientists and engineers as the TC<sup>3</sup> formula. Imagine any one of the four



*Dan Wildcat, co-director of HERS, is also an instructor of American Indian Studies at Haskell.*

existing among human beings without the other three—you cannot. Ironically, though, we live as if this relationship was unknown. Two HERS Center projects, a United States Geological Survey-funded Earth Science curriculum project and an Environmental Protection Agency-funded

pesticide technology curriculum program, have reminded me of the importance of the TC<sup>3</sup> formula or relationship. The fact that we recognize gaps between technology and culture is crucial, but even more important is the recognition that the gaps are not academic issues but issues that strike at the core of what environmental research and studies ought to be about today: the way we live.

Many scholars, scientists, and engineers are engaged in problem solving and research, as if TC<sup>3</sup> were unimportant. Disciplinary boundaries and professional specialization force many to work in conceptual boxes and we increasingly live literally in isolated/insulated physical boxes. The result is a natural and social forgetfulness about the way in which technology, community, culture, and communication are related. Collectively our human ancestors may very well have possessed a wisdom modern human societies desperately need—a **wisdom** not produced by superior “intelligence” or rationality, but **borne of direct experience and subsequent reflection**. The wisdom is that the modern dichotomy between human/social issues versus technology or technical issues is a false one—an invidious distinction. Technology and

humanity are as inseparable as human beings are from their natural environments.

Reading human history, one is impressed by the extent to which it is full of humankind’s self-declared superiority. However, most recent entries appear to revolve around our technological achievements. For good reason: human evolution has resulted in an attribute that is anything but physical or adaptive as it is ordinarily conveyed in beginning biology courses. Our uniqueness as a species is found in the ability to use technology to reside in environments which would otherwise be largely uninhabitable by humans and the societies on which we depend.

Our capacity to manipulate environmental elements to compensate for, what I call, our physiological awkwardness, is what Nature has given we two-legged persons to work with in securing our lives. Natural selection has not selected us for a particular niche or place on the planet, but selected traits that allowed human beings, with the use of technology, to adapt to different places and environments on our Mother Earth.

Central among those traits is our sociability or social nature. Unlike the social dimension found in many animals, e.g., big cats, wolves, bears, dolphins, and, of course, higher primates, etc., our physiological awkwardness dictates a necessity for tool making and manipulation absent among other animal species. This is less a sign of human superiority, than a sign of biological difference. In my mind, this explains why, in our traditional indigenous ways of speaking and praying, we so often describe ourselves as pitiful beings. Humans depend on many good relations and relatives to live and survive in this world—hardly superstition, just ecological fact. Nature, nurture, and technology are intimately connected.

Our ancestors understood this profoundly important point: our evolutionary past has not made human beings superior but merely different. We identify our culture or social spheres as what distinguishes us from other biological life, but with respect to other animals, this is less a case of absolute uniqueness than an issue of degree. Elizabeth Marshall Thomas has demonstrated this in her wonderful book, *Tribe of Tiger*. Yet, **it is the degree to which our social behavior revolves around the development of technology that**

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# Technology in the big picture

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**distinguishes us from other animals and explains why we should consider technology as central to human nature and history.**

From primitive tool making to the advent of modern machinery, our primary goal was to fashion material culture, e.g., clothing, shelter, utensils, etc. that provided a social and cultural adaptation to environments and places. **Throughout most of human history, places and environments shaped and limited the kinds of cultures humans created. Places, technologies, and cultures were inextricably connected.**

Our biologically and geographically diverse natural environments shaped how we lived, e.g., our livelihood activities, shelters, clothing, and much of our symbolic non-material culture. Keith Basso's book, *Wisdom Sits in Places*, brilliantly documents the extent to which Western Apache history is less about time than places or what might be called a **sense of place**.

New technologies have given humans the ability to reshape environments and geographies to accommodate human comfort and convenience. And we are increasingly preoccupied with the physical rearrangement, manipulation, or engineering of natural environments. John Locke set out the rationale for this mode of living 250 years ago. In Locke's philosophy, the rest of nature existed ultimately for humankind's benefit and convenience. It was a short step to reason that if natural environments do not meet our human standards of comfort, convenience, and aesthetic beauty, we ought to change them to do so.

Modern technology allows us to do precisely this, but at what cost? I believe the cost is a growing absence of a sense of place for human communities and correspondingly modern cultures which are literally "groundless." 30 years ago Vine Deloria, Jr. described modern societies as rushing to create an "Artificial Universe." Mr. Deloria may be one of the few non-technical scholars unsurprised by discussions about artificial intelligence, globalization, and virtual "realities," "communities," "persons," etc.

Human beings fail to experience the world the way our ancestors did, as many of my living indigenous elders do, because our technologies increasingly insulate us from direct experience and the acquisition of experiential knowledge from natural environments.

Automobiles, television, air conditioning, and computers, to pick four obvious examples, result in human convenience, entertainment, comfort, and

escape from incredible drudgery. But I interact less directly and physically in time and space with other human beings and the natural environment because of the ease, comfort, and privacy with which I can use these technologies. Technology, in general, has reshaped most people's everyday lives, often in measurably positive ways. But here is the irony: as we disengage technology from communities (which include plants, animals, and geographic/logic features) with a sense of place and, thereby, create cultures and forms of communication that are relatively abstract, **we unconsciously destroy conditions for our human survival and threaten the lives of many other plants and animals with whom we share this biosphere.**

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*Throughout most of human history, places and environments shaped and limited the kinds of cultures humans created. Places, technologies, and cultures were inextricably connected.*

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I am not anti-technology: my human nature dictates otherwise. But my nature also requires community (nature), and currently we pose the quest for community and new technologies as if they were mutually exclusive endeavors—they are not. This knowledge ought to give us reason to pause, not because of fear for what technologies literally do, but of concern for their residual effects—the unintended by-products of our human use of the technology.

If we, human beings, begin our understanding of the natural world with the Big Picture, we must acknowledge our relatively recent arrival to our Mother Earth's biosphere. The result ought to be a kind of biological modesty—for many of our biosphere community members have been here much longer than ourselves and in the minds of many scientists, such as Richard Leaky, some of our biosphere neighbors may outlive us. **We can bridge the technology and culture gap if we are not only willing to acknowledge the TC<sup>3</sup> relationship but change the way we live—our survival may depend on it. ■**

## HERS profile: Jayne Yatchak—lab coordinator

by Brenda Brandon, Haskell Indian Nations University

Jayne Yatchak of Pablo, Montana, presented curricula and described elements of technological research being conducted through the Salish Kootenai College (SKC) Environmental Science Program at the Northwest Center for Sustainable Resources (NCSR) Tribal Forum held at the Kah-Nee-Ta Resort in Warm Springs, Oregon, July 7-10, 1998. Yatchak provided a unique contribution to the first annual NCSR Tribal Forum as the youngest and most enthusiastic participant.

Yatchak completed her second bachelor of science degree from Salish Kootenai College in June of this year. She holds a B.S. in environmental quality and a B.S. in fisheries and wildlife, both from the environmental science department. The department also offers a bachelor of science degree in tribal agriculture and associate of science degrees in environmental science or environmental science/forestry.

Salish Kootenai College is located on the Flathead Reservation in Pablo, Montana, which includes members of the Confederated Salish Kootenai Tribes. As a tribal college, SKC maintains a student body of 51 percent federally recognized enrolled tribal members.

As a student, Yatchak was employed by Salish Kootenai College as one of six departmental peer mentors that assisted in coordinating environmental science degree plans and internship opportunities for students. She also coordinated outreach services with tribes by making laboratory equipment and

water testing methodology available to the community. Yatchak worked on a number of tribal environmental research projects as an undergraduate. Part of one ongoing project was to assist in updating the water and wastewater systems for the city of Pablo.

Currently, Yatchak is employed as the assistant environmental lab coordinator in the environmental science department under the administration of Frank Finley, environmental lab coordinator. Her primary duties are to assist students in operating and maintaining lab equipment, running contracted soil and water analyses, and participat-

ing in ongoing research projects. Some of the parameters presently being tested include nitrates, phosphates, potassium, dissolved oxygen, conductivity, alkalinity, pH, total dissolved solids, and dissolved oxygen. The college is also equipped to study microinvertebrates, macroinvertebrates, and amphibians as they relate to aquatic habitats.

Future laboratory plans at Salish Kootenai College include obtaining Environmental Protection Agency certification and expanding facilities to accommodate more contract work in the environmental science department, including total and fecal coliform testing for water. The lab will be converted into a testing facility for tribes as well as continuing as a student research/teaching facility.

Yatchak assists in a number of interesting research projects at Salish Kootenai College. Some of the studies that she has been involved in are a Glacial Lake Missoula ecosystem and pollution study; acid mine drainage research in Dayton Creek, Spring Creek, and Jocko River flow studies; vegetation and amphibian studies at reservation sites; and the Post Creek Research Project.

The Post Creek Research Project is an ongoing study that Yatchak and Finley have been working on for a number of years. Post Creek runs through the Flathead reservation between the towns of Ronan and St. Ignatius. The headwaters are in the Mission Mountains and it converges with Mission Creek just prior to the National Bison Range in Moiese, Montana.

Yatchak joined the Post Creek Research Project in 1997. Hexavalent chromium is the primary pollutant of concern in the Post Creek. Since the discovery of hexavalent chromium in laboratory samples in 1995, Finley's research team has been sampling Post Creek and studying the concentrations level of the toxic metal.

This form of chromium is a known carcinogen, mutagen, and taratogen and is toxic to humans and animals. Acute doses of hexavalent chromium can lead to stomach and skin ulcers, convulsions, kidney and liver damage, or even death. The pollutant is generally a waste product of industrial processes, specifically leather tanning and textile industries that produce pigments and dyes, which are discharged into waterways. However, in winter 1997, natural chromium deposits were discovered in a band of igneous rock located in the Mission Mountains, which are part of the Post Creek drainage system.

Current research efforts are focusing on the fate

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**Jayne Yatchak is the assistant environmental lab coordinator at Salish Kootenai College.**

## TOSNAC program works to develop networks

by Brenda Brandon, Haskell Indian Nations University

**H**ERS has been busy coordinating efforts with Kansas State University in addressing environmental issues on tribal lands. Establishing a toll free number and presenting briefings on the Technical Outreach Services for Native American Communities (TOSNAC) program have brought about numerous new tribal relations and stronger ties with tribes that had previous involvement with HERS.

Technical outreach facilitation has been initiated with the Noatak Village of Alaska and the Lower Elwha Kllalam Tribe of Washington. Coordination is underway with tribal representatives, Environmental Protection Agency (EPA) community involvement personnel, and universities comprising the Hazardous Substance Research Centers, concerning environmental issues that impact these Native American and Alaska Native communities.

Communication channels between two Kansas tribes, the Prairie Band Potawatomi and the Kickapoo Nations, have been maintained through attendance at Natural Resource Committee meetings on the reservations. Both tribes are in the process of upgrading their GIS systems and emergency response capability.

### Badlands Bombing Range

TOSNAC coordinator Brenda Brandon attended the June 4 Badlands Bombing Range Restoration Advisory Board (BBR RAB) meeting at Oglala Lakota College and had the opportunity to meet Emma Featherman-Sam, BBR RAB director, and the newly hired field technicians at Pine Ridge Reservation. She was also honored with a tour of the BBR RAB office and the new GIS computer lab where bombing range technicians are stationed. Since the meeting, HSRC representatives at KSU have been

providing technical assistance through document reviews and research activities in preparation for the upcoming RAB meeting at Pine Ridge on August 27.

### Tribal Conference

The Fourth National Tribal Conference on Environmental Management was hosted by the Prairie Island Dakota Community, located in Welch, Minnesota, on May 19-21, 1998. Co-sponsored by the U.S. EPA, the tribal staff at Treasure Island Resort and Casino developed an exciting conference agenda, focusing on the theme, "Promoting Strength, Unity, and Self-determination to Protect Indian Country." Through the National Tribal Conferences on Environmental Management, the EPA has maintained opportunities to secure additional funding for tribes, heightened the level of tribal program involvement, and built EPA capacity and understanding of tribal needs.

Panel discussions were led by representatives from various EPA divisions and by a diverse representation of tribal program managers from across the nation. Over 150 tribes and 26 conference vendors participated in the event. Session topics included environmental justice, environmental law and enforcement, Superfund program access, hazardous waste program development, emergency response development, interagency/public partnership cleanup topics, air quality, casino waste and solid waste management, risk assessment, lead issues, drinking water technical training, and water resource management.

Brenda Brandon, TOSNAC coordinator, participated in two panel discussions moderated by Dave Evans, director of the State, Tribal, and Site Identification Center. The sessions focused on providing an

■ continued on page 6

## SKC lab involved in many research projects

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and transport of the metal through the Mission Mountain/Post Creek drainage basin and waterways. From her record, Yatchak is a dedicated environmental scientist and regards her work as being personally significant. Yatchak writes, "I am interested in the Post Creek study because not only is it interesting, but my parents and sister live right near the creek and I will be moving down to my parents' place soon."

Although her Native American roots are founded in the Shoshone and Seminole Tribes, Yatchak

considers the Flathead Indian Reservation to be home for herself and her two children, Roswitha, 6, and Jan, 5. "In working at SKC, I am helping to repay the community who gave so much to me, and can stay near my parents. This enables me to raise my children near their family, and to the best of my ability ensure that they are happy, well-adjusted children," she continued. As a scientist and a Native American representative, Yatchak represents herself and her college in a good way. ■

## Tribal forums provide opportunity for information exchange

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overview of the Superfund program, introduction to tribal opportunities, and methods of accessing funding for activities. Brandon presented an overview of the TOSNAC program. Other participants included Lisa Boynton, EPA; Ted Garcia, Pueblo Office of Environmental Protection; Darren Vogt, 1854 Authority; and Bill Sullivan, Puyallup Nation. The second Superfund session was formatted as a round-table discussion that allowed the audience to interact and discuss interagency/tribal community issues. The audience responded enthusiastically to HERS and the TOSNAC program and successful tribal networks have since been established.

### NCSR Tribal Forum

Chemeketa Community College in Salem, Oregon, and the Northwest Center for Sustainable Resources (NCSR), through support of the National Science Foundation and in collaboration with the Western regions of the Partnership for Environmental Technology Education (PETE) and the EPA, hosted the first annual NCSR Tribal Forum at Kah-Nee-Ta Resort near Warm Springs, Oregon, July 7-10, 1998. Susie Kelly, director of NCSR at Chemeketa Community College, facilitated the keystone event with the assistance of Donita Gray-Krueger, University of Northern Iowa, project manager for environmental programs, and Bob Tom, tribal consultant of Keizer, Oregon. Educators from 18 tribally controlled colleges, universities, and community colleges gathered to share model programs and curricula, identify critical issues, and

characterize Native American perspectives for natural resource/environmental science programs.

Susie Kelly and Donita Gray-Krueger led breakout sessions on the final day. Each group created a NCSR mission statement and developed elements of college coursework that addressed Native American perspectives in the development of natural resource and environmental college programs. Common themes included interrelatedness between humans and their environment; problems associated with separating natural resource from environmental issues; and connectedness that needs to be maintained between tribal members, community members, Native American students, and the faculty that teach at tribal colleges, in order to support traditional teachings in natural resource/environmental programs.

Brenda Brandon presented the TOSNAC program to the group of college and NSF representatives. Other college representatives presented overviews of their respective departmental programs, especially as they related to sustainability of natural resources. Participants had ample opportunity to share ideas related to transferring technological information to and facilitating with Native American communities, and to partner with other professionals in the academic fields of natural science. The NCSR forum culminated in a tour of the Warm Springs Tribal Salmon Hatcheries and Forestry Service Office, which included a demonstration of tribal GIS capability. ■

## Microscale chemistry in the classroom

■ continued from page 1

tube to construct the micro bell to hold the test liquid.

Singh talked about some of the problems with macro titration experiments. He said some of the problems with delivery burettes include spilling solution during cleaning and filling the burette. The procedure also requires about 250 ml of solution compared to only 10 ml of solution in micro titration. One of the major differences is that you fill the micro burette from the tip using the syringe, compared to filling from the top in macro titration. To construct a micro burette, you need a graduated pipette, a syringe, latex tubing, and a yellow plastic capillary tip to give precision on measurements up to 3 decimal places. The micro titration experiment

takes less than 5 minutes compared to about 20 minutes using macro titration.

To learn more about microscale chemistry or to get information on attending a workshop on microscale chemistry, contact the National Microscale Chemistry Center at 978-837-5137 or visit their Website at <[www.silvertech.com/microscale](http://www.silvertech.com/microscale)>.

“Microscale Chemistry in Your Classroom” will be distributed to participants in the Haskell Environmental Seminar Series. To participate in this series, please contact the Haskell Environmental Research Studies Center at the address listed on page 7 of this publication. ■

## Available videotapes

These tapes are available through interlibrary loan from Kansas State University's Hale Library, formerly Farrell Library. You may also request copies by contacting HERS by phone at 785-749-8498; by e-mail at [hers@hsrv.nass.haskell.edu](mailto:hers@hsrv.nass.haskell.edu); or by mail at HINU, 155 Indian Avenue, Box 5001, Lawrence, Kansas, 66046.

**Microscale Chemistry in Your Classroom (available fall 1998)**

**Environmental Justice in Indian Country**

**The Effects of the Nuclear Policy Act of 1997 on Native Americans**

**Native American Environmentalism at the Cusp of the Millennium**

All Things Are Connected: The Sacred Circle of Life Series

Air—Ensuring Quality for the Future

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Topics in Pollution Prevention—Vehicle Maintenance

PCBs in Our Environment—The Legacy Continues

Environmental Impacts of Gold Mining Operations Near the Fort Belknap Reservation

The NAOMI Program and HERS: New Opportunities in Environmental Research

**Bold print indicates current videos available at no cost to participants in the Haskell Environmental Seminar Series. All other tapes are available for \$5.00 each (includes shipping and handling).**



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# Wetlands workshop planned for September

The Prairie Band of Potawatomi Nation's Planning and Environmental Protection Department is organizing an inter-tribal wetlands workshop in collaboration with the Haskell Environmental Research Studies Center (HERS) and the Natural Resources Department at Haskell Indian Nations University and the Environmental Protection Agency (EPA)-Region 7. The workshop, scheduled for September 9-11, will be held at Haskell Indian Nations University in Lawrence, Kansas.

The workshop, *Jage Nagonan* (All Things Are Connected), will consist of hands-on and facilitated sessions from a primarily Native perspective. The workshop will begin with a social on Wednesday evening, September 9, which will present an opportunity to renew old acquaintances and friendships and to make new ones. The opening ceremony will take place at Haskell's Medicine Wheel on Thursday, September 10 with the blessing by Gary Mitchell, the placing of the colors by the We-Ta-Se American

Legion Post Honor Guard, and the Flag Song presented by Joe Hale, all members of the Prairie Band of Potawatomi Tribe. The workshop will include guided wetland field trips with identification of medicinal and edible plants; values of and threats to wetlands areas; EPA-Region 7 tribal programs on wetlands and water-related topics; and grant opportunities in these areas. Wes Martel, Wind River Associates, and Dan Wildcat, HERS, will make plenary addresses during the workshop.

A limited number of scholarships (up to \$100.00 each) are available to assist members of federally recognized tribes with travel expenses. For information on the workshop and registration procedures, please contact Greg Wold by mail at Prairie Band of Potawatomi Nation, Planning and Environmental Protection Department, 15434 K Road, Mayetta, Kansas 66509; by phone at 785-966-2946; or by e-mail at gwold@flinthills.com. ■

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