

Research Highlights

Poisonous Evidence: North Carolina's Gold Hill District Remains a Repository of Mercury Waste from Long-abandoned Gold Mines

Though it is a fact nearly forgotten by all but historians, North Carolina was the site of the nation's first gold discovery, in 1799 at what was to become the Reed Gold Mine in Cabarrus County. Twelve-year-old Conrad Reed found a 17 lb. gold nugget while fishing in Little Meadow Creek on the family farm. Its value at first unrecognized, the nugget was used as a door stop for several years before being sold to a local jeweler for a mere \$3.50. This initial find piqued interest, and exploration gradually expanded throughout the Southern Piedmont district, from Virginia to Alabama, gaining momentum to become the nation's first bona fide gold rush, which also began in North Carolina, in the 1820s. By the mid-1840s a significant find in southern Rowan and northern Cabarrus Counties was becoming a gold-rush focal point. The Gold Hill mining district, located in the headwaters of Little

Buffalo Creek (a tributary to Dutch Buffalo Creek), was mined intensively for many years. Industrial-level extraction, which came to include the mining of copper as well as gold, was interrupted only by the Civil War, and then continued with lesser intensity until roughly World War I.

In those decades, vast quantities of mercury were shipped into the Gold Hill district for use in the process of extracting gold particles from crushed vein ore. Though it seems inevitable that mercury would end up being washed into streams and deposited by floods onto valley bottoms, until recently no one knew how much of the heavy metal might have been left behind in the soils and floodplains of the Carolina Piedmont. Now, for the first time, researchers have begun to explore Gold Hill, not for its precious metals, but for the legacy of those mercury imports. Last summer, a team of investigators and graduate students, led by Dr. Scott Lecce, Associate Professor in ECU's Department of Geography, began extracting sediment core samples around the Gold Hill district in a project to measure the presence of mercury and copper remaining in the environment. Working with a \$24,000 Research Development Grant from ECU, and with support from the Ozarks Environmental and Water Resources Institute of Missouri State University, Lecce and his associates collected a total of more than 550 samples from "active" stream channels, floodplains, and (to establish normal background levels) areas presumably untouched by mercury waste. Their findings show that mercury concentrations indeed persist in streams and floodplains downstream from the mines more than a century after mining activities ceased.

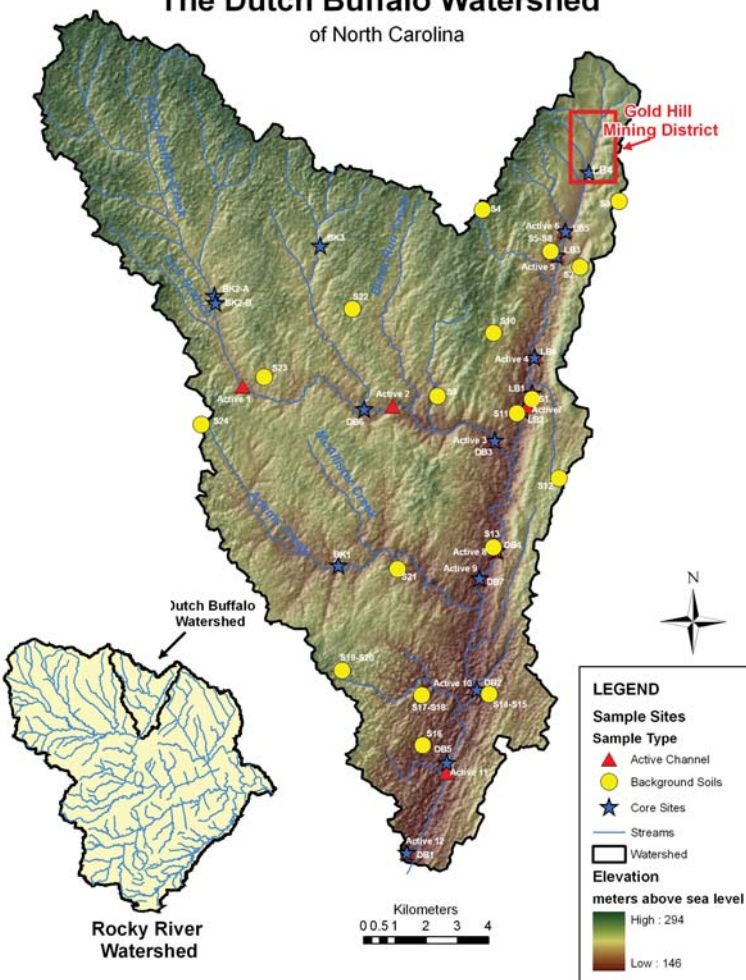
Lecce says that he was surprised to learn that such measurements had never been taken, and he gladly seized the opportunity to learn more about how metal contaminants are redistributed by rivers downstream from mining areas. Because historical accounts indicate that mercury was first used in the early 1840s, increases in mercury levels in cores recovered from floodplains can be used as a dating tool to calculate the rate that floodplain deposits have accumulated. This information is used to better understand how mining and agriculture activities have increased soil erosion. The mercury stored in floodplain deposits also has the potential to be transformed into a form that is more readily taken up by organisms. Lecce says, "Mercury can change over time, becoming the methylated form, which is what constitutes the biohazard that we already know has entered our food chain, in our fish and wildlife."

Mercury is a naturally occurring element, detectable in the atmosphere, bodies of water, the soil, and, in increasing concentrations, in fish and other wildlife. (The consumption of fish accounts for the majority of methylmercury exposure

among humans.) About forty percent of all environmental mercury contamination is believed to originate from the aerosol emissions of coal-fired power plants, with the rest attributed to the burning of hazardous waste, the process of manufacturing chlorine, breakage of mercury-containing instruments, and ground spills such as those which occurred in the Gold Hill District. Mercury exposure is a well-documented health hazard among humans. It can cause damage to the brain, lungs, kidneys, heart, and immune system in people of any age, though children are believed to be especially susceptible. So wherever a concentration of mercury is discovered to exist in the environment, it is a hazard well worth

(continued on page 4)

The Dutch Buffalo Watershed of North Carolina



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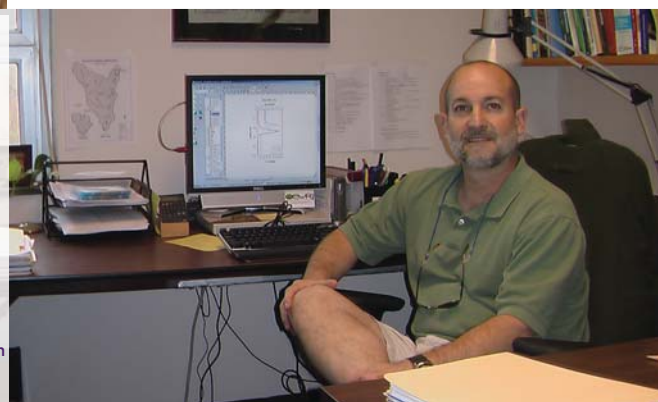
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Please contact us with your
comments and story ideas.



Dr. Scott Lecce, ECU's mercury detective

Research Highlights

Robotics (cont'd from page 1)

attitude toward the science and math curriculum being presented. Hall and her team will use pre- and post-experience questionnaires to assess the self-perception of students with respect to their own talents, and to gauge the impact of anxiety upon the students as they strive to master the material. Citing a "stereotype threat" that can be of particular concern among female and minority students, Hall says that too many high schoolers—including even those with strong analytical skills—give short shrift to their own prospects in the sciences. "Even some apparently strong performers may not have considered a career in math or high-tech," Hall says, "for example, because these fields are perceived as belonging predominantly to men. The problem is that even if you don't personally believe such a stereotype, research still shows that mere awareness of the stereotype can negatively affect your performance." Hall hopes the summer Academy will help reverse the "stereotype threat," and render useful data on how further measures might be developed to encourage more students to pursue careers in math, science, and IT.

But "the core issue from the program's perspective," says Kauffmann, "is that the university should make a difference in the K-12 world—in this case, specifically, in the 9-12 world. We really hope to nurture relationships with these students that will be synergistic and long-term, opening their eyes to science- and mathematics-related careers and college majors."

Clinical Trials group (cont'd from page 1)

program to enhance communication among scientists engaged in biotechnology-related research, and also to support collaboration of those scientists with our region's education, business, and economic-development communities. The inaugural program, Science at Starlight, filled the restaurant to capacity on November 20, 2006, and was very well received. CT-reg now becomes the second of these collaborative groups.

Carefully conducted clinical trials are the fastest and safest way to find effective treatments and other means of improving health. A "Clinical trial (also clinical research)," according to the National Institutes of Health, is a "research study in human volunteers to answer specific health questions." Clinical trials may be "interventional" or "observational" in design. Interventional trials determine whether experimental treatments or new ways of using known therapies are safe and effective under controlled environments. The most commonly performed interventions evaluate new drugs, medical devices, biologics, or psychological therapies. Observational trials address health issues in large groups of people or populations in natural settings.

The NIH web site clinicaltrials.gov offers information for investigators who may wish to participate in open or pending trials, and for the public to learn more about clinical trials and opportunities for enrolling in one. Findings from recently completed trials are also highlighted on the site.

To register for the May 17 event, please call 328-9981 or visit the following URL:

<http://guest.cvent.com/EVENTS/Info/Invitation.aspx?e=335e7611-c5b8-4c09-80b0-05f7758f3d4c>

Mercury testing (cont'd from page 2)

knowing about and avoiding.

Preliminary findings show that nineteenth-century gold mining has left behind a legacy of elevated levels of mercury that are detectable as far as 15 miles downstream from the mines. Nevertheless, Lecce says many questions remain. He asks, "Is erosion of stream banks releasing mercury stored in floodplain deposits? Is this mercury being transformed into methylmercury, a form that can be more easily accumulated in organisms? Can mercury be exploited as a dating tool to help scientists better understand the history of soil erosion and floodplain sedimentation throughout the Piedmont of the southeastern U.S.? Are mercury levels detectable in surrounding areas that were not mined as intensely as the Gold Hill mining district?"

It is that last question that Lecce and his team will explore this summer with the support of a new \$20,000 grant from the National Geographic Society. Scott Lecce has much detective work yet to do.

Core-sample analysis showing definitive "spikes" in mercury and copper concentrations—a mining legacy borne out in hard data.



Caleb Parker, graduate student in ECU's Dept. of Geography, prepares a core sample for shipment to analytical lab.

