USGS

Sound Waves

Coastal Science and Research News from Across the USGS

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Fieldwork

Coastal Landforms and Historical Shoreline Change on the West Coast of Hawai'i

By Cheryl Hapke and Bruce Richmond

Scientists from the U.S. Geological Survey (USGS)'s Coastal and Marine Geology Program have recently begun work with the National Park Service (NPS) to help create an inventory of geologic resources for two National Historical Parks (NHPs) and one National Historic Site (NHS) on the west coast of the Big Island of Hawai'i (see *Sound Waves*, February 2004). Part of this effort involves making coastal-landform maps to be incorporated into a geographic-information-system (GIS) data layer. A long-term historical-shoreline-change analysis is also part of the inventory.

In February 2004, a team of scientists from the USGS offices in Santa Cruz and Menlo Park, CA (**Cheryl Hapke**, **Bruce Richmond**, and **Tom Reiss**), conducted ground-based fieldwork at the three sites: Kaloko-Honokohau NHP, Pu'ukohola Heiau NHS, and Pu'uhonua O Honaunau NHP on Hawai'i's west coast. The purpose of the fieldwork was to collect ground-control points for photogrammetric pro-

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(From left to right) ***Rick Gmirkin****, NPS archeologist, explains to* ***Tom Reiss*** *and* ***Cheryl Hapke*** *how recent storm waves partly destroyed the Kaloko fishpond wall. In the background (inset) is one of the GPS receivers set up to record the position of a corner of the fishpond wall.*

Bruce Richmond *mapping an ephemeral flood-delta deposit at Pu'ukohola Heiau NHS. His equipment includes a GPS receiver and antenna in a backpack, used to accurately map the spatial distribution of coastal landforms in the field.*

Correction for April issue:

Research scientist **Alan Jones's** affiliation was incorrectly identified as Purdue University in the article "USGS Scientist Inspires Students at a High-School Career Day in California" in the mailed edition of the April 2004 *Sound Waves*. **Jones** is currently on the faculty at Binghamton University in New York State (he earned his Ph.D. at Purdue). We apologize for the error.
—**Editor**

Sound Waves

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Submission Guidelines

Deadline: The deadline for news items and publication lists for the July 2004 issue of *Sound Waves* is Wednesday, June 16.
Publications: When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.
Images: Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator© files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

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Fieldwork, continued

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cessing of aerial photographs that will be used in the shoreline-change analysis, as well as to begin mapping coastal landforms in the parks.

The first phase of the coastal-landform mapping focused on identifying shoreline features. Large segments of all three of the parks' shorelines consist of a low-lying basalt terrace or bench overlain by carbonate sand and gravel beaches. These perched, or storm, beaches are typically active only during large-wave events. As luck would have it, the team arrived for their fieldwork during just such an event; however, access to many of the beaches was closed because of hazardous conditions. Although large-wave events are positive processes in terms of delivering sediment to the beaches, these events are also responsible for damage to many of the unique Hawaiian historic sites that dot the coast. An improved understanding of the processes that shape the parks' coast will help park personnel better manage park resources.

For the aerial-photographic analysis, five to six ground-control points were collected in the vicinity of each of the three sites, using survey-grade Ashtech receivers and antennae. **Tom Reiss** set up a base station at the house we were renting (our neighbors were probably a bit perplexed), and team members occupied each ground-control point for approximately 45 minutes to collect global-positioning-system (GPS) data. All the ground-control points were identified on existing aerial photographs before the fieldwork; they included such locations as intersections of paths, corners of cement blocks, and corners on the walls of fishponds (prehistoric enclosures built by Hawaiians for raising fish).

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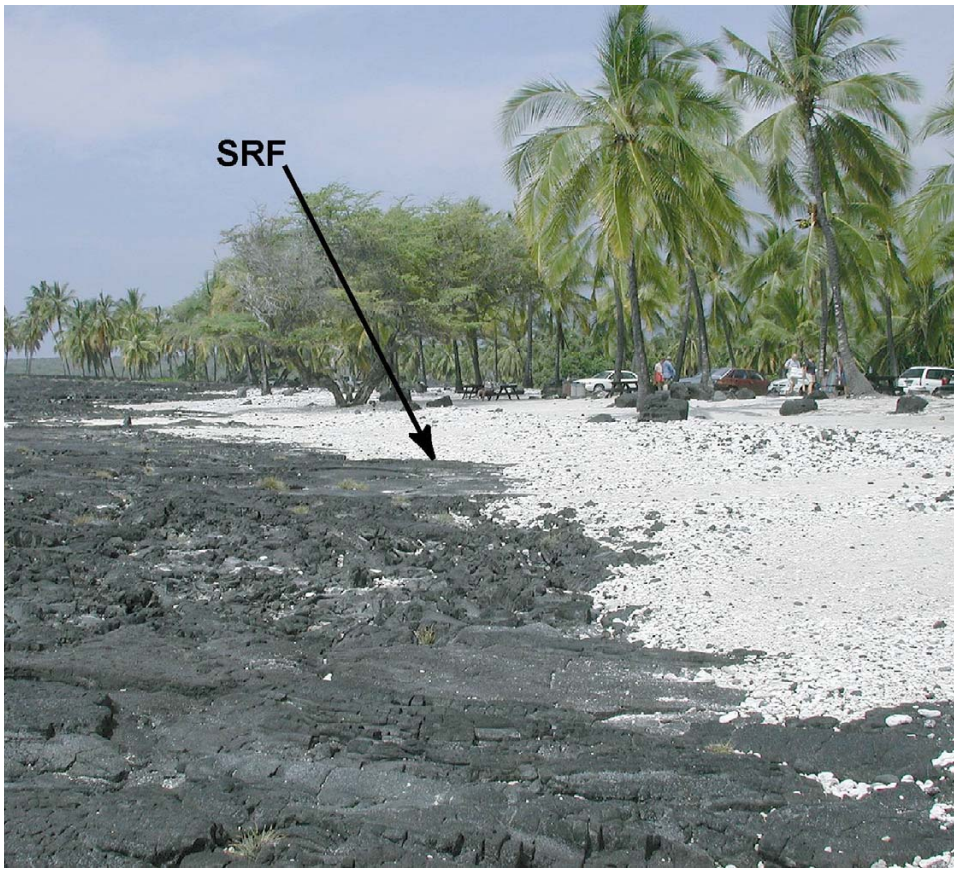

A classic example of a perched beach at Pu'uhonua O Honaunau NHP. The long-term-shoreline-change photographic analysis will examine the migration of the shoreline reference feature (SRF), which is the seaward edge of the sand.

Fieldwork, continued

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Future work will include additional offshore surveys to continue mapping of the coral reefs at Kaloko-Honokohau NHP and initiation of offshore mapping at both Pu'ukohola Heiau NHS and Pu'uhonua O Honaunau NHP. More detailed coastal-landform mapping will also be conducted at all three parks.

***Cheryl Hapke** explains the long-term-shoreline-change project to park superintendent **Daniel Kawaiaea** at Pu'ukohola Heiau NHS, while keeping an eye on a GPS base station.*

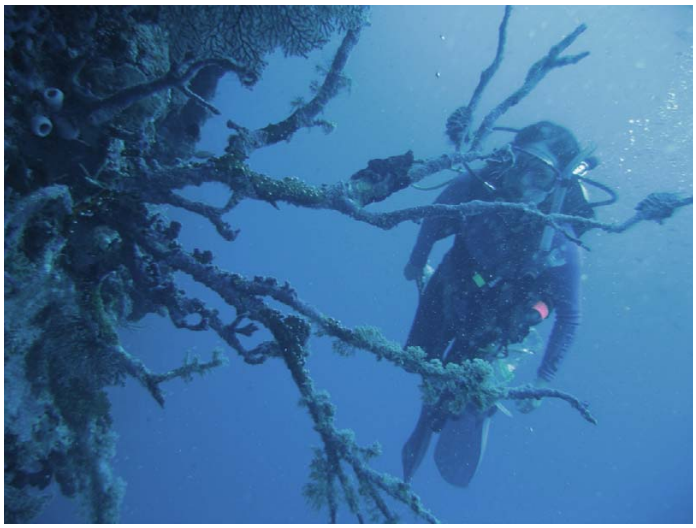
Research

Cooperative Study Notes Increased Occurrences of Infectious Disease in Our Oceans

By Gloria Maender

Outbreaks of infectious disease in natural communities have increased in frequency in several major groups of marine life during the past 30 years, suggests a new review of scientific literature by Cornell University and the U.S. Geological Survey (USGS) published in the April issue of the *Public Library of Science (PloS) Biology*. This study lends support for the need to understand disease dynamics in the oceans and marks the first quantitative use of normalized trends in the scientific literature to test an ecological hypothesis.

The study found an increased number of reports in the scientific literature of disease outbreaks among turtles, corals (noninfectious bleaching), mollusks, mammals, and urchins, said **Kevin Lafferty**, a USGS marine ecologist in Santa Barbara, CA, and coauthor with **Jessica Ward**, a graduate student at Cornell University. The scientists detected no significant trends for seagrasses, decapods, corals (infectious disease), and sharks/rays (close relatives grouped together for the study). Most surprisingly, the scientists found evidence of a decreased number of reports of disease outbreaks in fishes.



*Many gorgonian corals, like this sea fan that **Jessica Ward** swims toward, died in 1999 at this site in Palau. Photograph by **Drew Harvell**, Cornell University.*

Although stress may make individuals more susceptible to disease, disease outbreaks are also associated with population density, which aids in the transmission of disease between individuals of a species, noted **Lafferty**.

"Infectious disease should increase in thriving populations as much as or more than in stressed populations. Probably the most alarming result of our study is the suggestion of fewer diseases in fishes. As we fish stocks down, the remaining individuals may be too sparse to transmit infectious diseases," said **Lafferty**.

The USGS scientist noted that this research would not have been possible until a couple of years ago because the databases on scientific research only recently became extensive enough to allow scientists to use the data from previous research efforts to test scientific hypotheses, includ-

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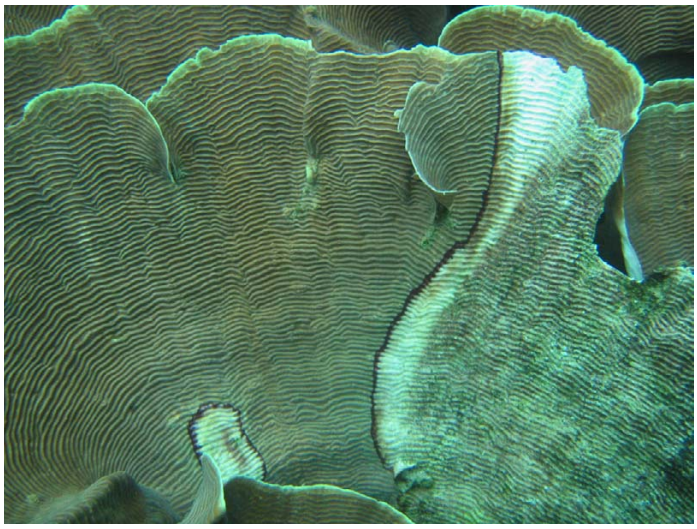
ing trends in population status possibly attributable to specific factors.

"Ideally, we would have complete records of disease outbreaks for all marine organisms," commented **Ward**. "However, that is an unrealistic expectation, even today, given that extensive surveys are difficult in terms of both time and money. So, we developed and tested a method to circumvent this problem."

In the absence of baseline data on changes in disease occurrence over time, this new study used publication effort by marine scientists as an indirect way to detect important trends in disease occurrence. **Ward** and **Lafferty** searched the Science Citation Index Expanded online database, which references almost 6,000 journals, for titles from 1970 to 2001 that reported on disease in organisms from naturally occurring populations of nine marine groups: turtles, corals, mammals, urchins, mollusks, seagrasses, decapods, sharks/rays and fishes.

The idea is that scientists, through their publication efforts, can collectively document changes in natural phenomena over time, assuming that scientists actually pursue problems in proportion to their frequency in nature. Simply counting reports, however, is misleading because of the general increase in the number of scientific publications and other potential biases. **Ward** and **Lafferty** quantified the reports of disease, and normalized the data by taking an annual proportion of disease reports and eliminating various biases, such as multiple reporting of the same disease outbreak. Their approach worked well for a test case, raccoon rabies. Publication effort followed the actual spread of this disease over time. The disparity in the results among different types of marine life suggests that the trends in disease reports were not simply a result of disease becoming a fashionable topic for study in recent years.



*Diseased Pachyseris coral in Palau. The dark band is a cyanobacterium currently being studied to determine whether it poses a threat to other corals. Photograph by **Drew Harvell**, Cornell University.*

With rising human stresses on the environment, understanding disease dynamics is vital to conserving marine ecosystems, warn the authors. Environmental factors such as global climate change could have complex effects on disease, and they recommend that future research look more closely at disease impacts within each marine group and consider the wide range of environmental factors that can affect disease, including warming, pollution, exotic species, and fishing. Although marine organisms are hosts for a diversity of infectious diseases, mortalities in hosts—for example, a loss of seagrass beds—can cascade throughout ecosystems.

"Although we are concerned that human impacts to the ocean may favor diseases, our study does not simply give the impression that global warming and pollution are making everything sick," **Lafferty** said. "Disease responds in complex ways to the environment, and it will be a challenge to better understand and manage disease in the ocean."

USGS Participates in Multidisciplinary Cape Cod Natural History Conference

By S. Jeffress Williams

Have you ever attended a science conference in which the talk and poster topics ranged from "Noise in the Oceans and Effects on Whales" to "GIS Study of Effects of Roads on Wildlife and Habitats" to "Extremophile Organisms are Everywhere" to "Coastal Geology and Effects of Sea Level Rise—Past, Present, and Future" to "Mating Behavior of Spiders"? Certainly, American Geophysical Union (AGU) meetings address diverse topics,

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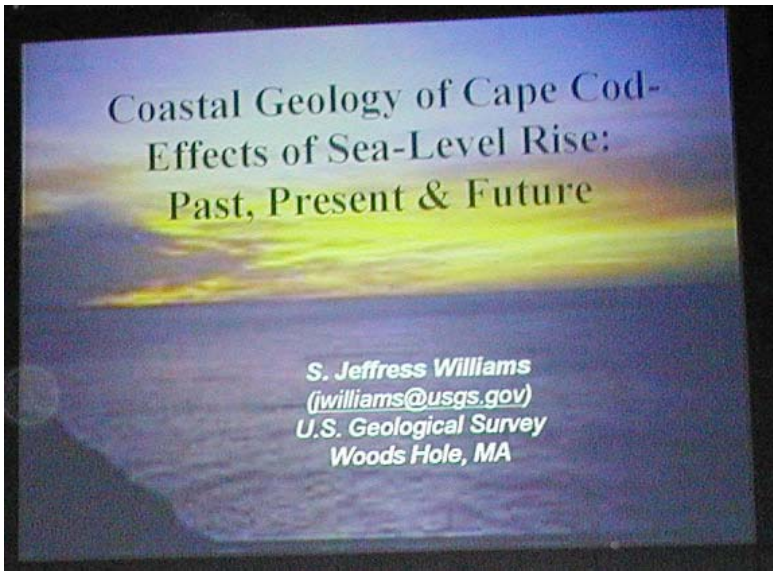
*Conference participant examines **Jeff Williams'** poster "Coastal Vulnerability Assessment of Cape Cod National Seashore to Sea-Level Rise."*

(Cape Cod continued from page 4)

but AGU talks are typically organized into narrowly focused sessions.

Recently, the U.S. Geological Survey (USGS) participated in the Cape Cod Natural History Conference, which included a total of 16 talks and 10 posters with clear linkages among broad-ranging topics, but no overlap in subject matter. The only thing that the talks had in common was that they focused on the Cape Cod-Nantucket-Martha's Vineyard region and truly fit the definition of "multidisciplinary."

Sponsored and organized by the Massachusetts Audubon Society (Mass Audubon)'s Wellfleet Bay Wildlife Sanctuary, the conference was held on March 20, 2004, at Cape Cod Community College. Participating from the USGS were **S. Jeffress Williams** (USGS Woods Hole Science Center), who gave an invited talk titled "Coastal Geology of Cape Cod—Effects of Sea-Level Rise: Past, Present, and Future" and presented a poster titled "Coastal Vulnerability Assessment of Cape Cod National Seashore to Sea-Level Rise." The poster was based on an ongoing national study with colleagues **Elizabeth Pendleton** and **Rob Thieler** (both of the USGS Woods Hole Science Center) in collaboration with the National Park Service (a USGS Open-File Report on the topic is available at URL **http://pubs.usgs.gov/of/2002/of02-233/**). In addition, **Chris Polloni** and **Nancy Soderberg** (also from the USGS Woods Hole Science Center) arranged materials for a table of USGS products that proved to be especially popular with the 300 attendees.❁



*Opening slide of **Jeff Williams'** invited talk at the Cape Cod Natural History Conference.*

Tampa Bay Study's Third Annual Science Conference

By Jennifer Rosser

The third annual science conference for the Gulf of Mexico Integrated Science Tampa Bay Study was held January 30 in Ruskin, FL. The conference gave U.S. Geological Survey (USGS) scientists and partners the opportunity to review relevant research and discuss the future direction of the Tampa Bay Study. The conference was beneficial because the format was interactive and fast paced. The focus topics of the conference included integrated modeling, mapping, history and prehistory, wetlands, benthic habitats, water and sediment quality, and data and information management. Teams of scientists presented accomplishments and current research in their particular tasks of the Tampa Bay Study. Each presentation included a poster to be reviewed and discussed. Approximately 100 people from

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*Breakout group includes (left to right) **David Hollander**, USF; **David Hastings**, Eckerd College; **Dawn Lavoie**, USGS; and **Deb Willard**, USGS.*

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19 different agencies participated in the conference.

Participating agencies and partners included ETI Professionals, Inc., Johnson Controls World Services, Inc., the USGS National Wetlands Research Center, the Tampa Bay Estuary Program, the Florida Marine Research Institute, the National Oceanic and Atmospheric Administration, Pinellas County Environmental Management, Eckerd College, the University of Florida, the University of South Florida (USF), the University of Louisiana, Delta Seven Inc., the University of Pennsylvania, Lewis Environmental Services, Inc., the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers' New Orleans District, the Geological Survey of Alabama, the Southwest Florida Water Management District, the Florida Department of Environmental Protection, and the Environmental Protection Commission of Hillsborough County.

To access the USGS Gulf of Mexico Integrated Science Tampa Bay Study's home page, visit URL **http://gulfsci.usgs.gov/**.

Steve Travis *(USGS, Biological Resources Discipline, Lafayette, LA) presented a poster entitled "Rambling Tampa Reds: What Population Genetic Structure of* Rhizophora mangle *Reveals About Patterns of Gene Flow in Tampa Bay, Florida."*

Justin Krebs *(ETI Professionals, Inc./USGS, St. Petersburg, FL) discussed his poster entitled "Community Structure and Habitat Use by Fish Assemblages in Altered Wetlands: An Ecological Comparison of Mosquito Ditches and Natural Tidal Creeks."*

Colonial Period Comes to Life (and Print!) with the Help of USGS Scientist Terry Bruns

By Helen Gibbons

It's a scene frozen in time, a snapshot of life in a colonial town about 230 years ago—sort of. Costumed fifth-graders stand like statues—well, almost like statues; there's some shifting and the clatter of a dropped spoon—as a group of first-graders files in to see the display. Once the younger children are seated in the middle of the reconstructed village, they're greeted by fifth-grade "colonists" who say, "Welcome to Landelsburg! 'Tis the year seventeen and seventy-five." That's the cue for the scene to come to life: cobblers begin tapping on shoes in the Boot and Shoemaker Shop, workers at the Bakery urge passersby to sample their baked goods, well-to-do young ladies do needlework in the parlor of the Governor's mansion, and a group of young assistants in the Printing Office resume printing copies of the *Landelsburg Gazette*.

Presiding over the Printing Office—authentically attired in waistcoat, breeches, tricorner hat, and buckled shoes—is **Terry Bruns**, Associate Chief Scientist of the U.S. Geological Survey (USGS)'s Western Coastal and Marine Geology Team in Menlo Park, CA. A hobby letterpress printer, **Terry** has been assisting in the Landelsburg reenactment since it was first held at Landels Elementary School in Mountain View, CA, in 1993. The printing press he brings to the school each year is a Kelsey Platen press; it's not quite right for Colonial times, but it has the advantage of being portable. "It's actually a type of press that would have been in use during the Gold Rush era," says **Terry**. "A printing press like those used in the colonies in 1775 would be far too heavy to move around to different schools."

The day before each year's Landelsburg reenactment, **Terry** meets with his crew, a group of three or four students assigned to their roles by their teachers, to show them how the press works and how to set type for the *Landelsburg Gazette*. A single-page leaflet, the *Landelsburg Gazette* contains news and announcements typical of the year before the American Revolution. The kids reset some of the type each year, matching the date to that of the reenactment day and tailoring several items to feature their teachers and principal. The student assistants enjoy deciding which teacher's horse will be stolen that year (invariably, it's the principal who's tried for the crime), which teacher's flour mill

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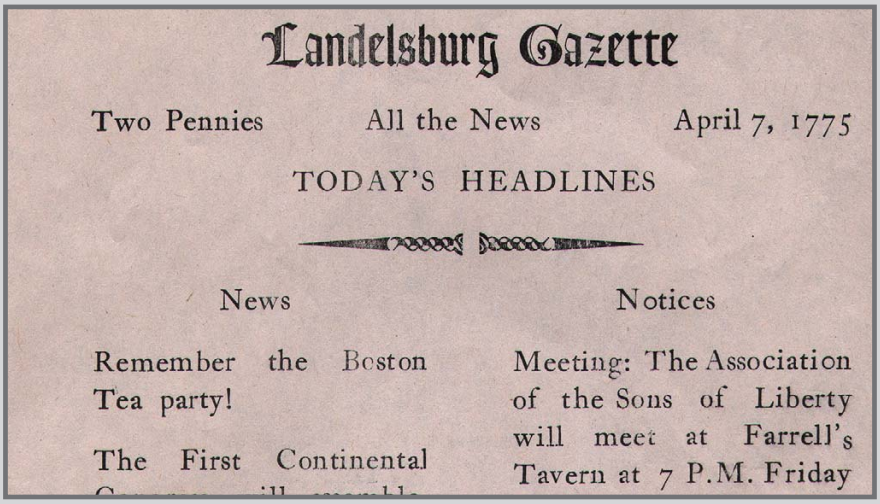
will be advertised, and which teacher's tavern will host the meeting of the Association of the Sons of Liberty. They also enjoy working the press, and during a typical Landelsburg day, they will print and hand out 800 to 900 copies of the *Landelsburg Gazette*.

Each fifth-grader in the re-created colonial village, modeled after Williamsburg, VA, assumes the role of a citizen of the time and is fully knowledgeable about his or her character's position and responsibilities in the community. The activity is the culmination of several weeks of research. One former student, recalling the day, said, "That was the most fun I ever had in school!" It must be fun for **Terry**, too, who has attended every Landelsburg reenactment to date and also helps out with similar colonial reenactments at four other local schools every year.❁

Terry Bruns *(right) enjoys a tankard of apple juice while his student assistants print the* Landelsburg Gazette.



Landelsburg Gazette

Two Pennies — All the News — April 7, 1775

TODAY'S HEADLINES

News

Remember the Boston Tea party!

The First Continental

Notices

Meeting: The Association of the Sons of Liberty will meet at Farrell's Tavern at 7 P.M. Friday

Recently Published Articles

Bradbury, J.P., Colman, S.M., and Dean, W.E., 2004, Limnologic and climate environments at Upper Klamath Lake, Oregon, during the past 40,000 years: Journal of Paleolimnology, v. 31, no. 2 (special issue), p. 167-188.

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