



MUSEUM AND SCHOOLS PROGRAM

EDUCATOR GUIDE
Kindergarten-Grade 12

FORCE OF NATURE ***1906 Earthquake Centennial Exhibition*** April 22 – July 9, 2006



Panoramic view from 4th and Hinton Streets, Santa Rosa, after the 1906 earthquake

SONOMA COUNTY MUSEUM
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**FOR MORE INFORMATION ABOUT THE EXHIBITION OR
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Hours:

Open Wednesday through Sunday 11:00 a.m. to 5:00 p.m.

Admission:

\$5 General Admission

\$2 Students, Seniors, Disabled

Free for children 12 and under

Free for members

The Museum offers free tours to school groups. Please call for more information.

INTRODUCTION

The 1906 Earthquake Centennial commemorates one of the most destructive natural disasters to strike California. Santa Rosa sustained the most damage from the earthquake itself and San Francisco was destroyed by the ensuing fire. It also marks major advancements in the modern science of seismology as we know it today. The 1906 earthquake was the first to be documented to this extent directly due to the amount of damage caused. The advent of the Brownie camera from Kodak meant that for the first time visual documentation of the disaster came from both professional and amateur photographers. Additionally the 1906 Earthquake was the first to have such extensive research done on the physical effects of the quake left upon the land. Andrew C. Lawson a geology professor at Berkeley pushed to have physical research done on the 300 mile fault rupture (which he later named the San Andreas). Lawson's team of 8 geologists, engineers and astronomers made up the Earthquake Investigation Commission, taking 1 year to research (conducted in small groups on horseback) and 1 year to compile the data. That information was published in 1908 under the auspicious title The California Earthquake of April 18, 1906 Report of the State Earthquake Investigation Commission. Commonly referred to as the "Lawson Report", it was written nearly 100 years ago and is still used and referenced by geologists today.

MAIN GALLERY

Force of Nature

1906 Earthquake Centennial Exhibition

April 22–July 9, 2006

The Sonoma County Museum is pleased to present *Force of Nature*, a centennial earthquake exhibition in the Main Gallery commemorating the largest natural disaster to ever take place in Sonoma County. This exhibition features the human story of the 1906 earthquake, one of ruin and resurrection, along with the art and science that can visually reveal nature's fury. Explore the stories of Santa Rosa's complete devastation as well as the scientific context of the disaster, which can dramatically rupture our presumptions of stability.

The exhibition also features commissioned work by noted Bay Area artist John Roloff. Creating a visual link to the region's geology, Roloff's digitally compressed images of landscapes are designed to mimic stratigraphic columns. His outdoor flags are emblematic of geological symbols.

In conjunction with *Force of Nature*, in the Contemporary Project Space, located off the Main Gallery, the Museum also presents a contemporary sound installation entitled *Signature*, created by conceptual artist Paula Levine. And, in the History Gallery on the Mezzanine, the Museum features the exhibition *Cataclysmic—Change and Disaster in Sonoma County*, which includes documentation relating to other significantly devastating events that have changed this region.

The Museum would like to thank the following people for bringing their expertise to this exhibition: Thomas Anderson and Terry Wright, Department of Geology, Sonoma State University; Suzanne Hecker, U.S. Geological Survey; Michael Hargreaves and Wayne Goldberg, City of Santa Rosa; Paula Levine; John Roloff; ZFA Structural Engineers; Gaye LeBaron; installation consultant Dominic Egan; and Museum Staff, Patricia Watts, Chief Curator; and Eric Stanley, Exhibitions Manager.

Ariege Arseguel
Executive Director

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Force of Nature: The Story

Before...



Corner of 4th Street & Mendocino Ave before the earthquake

At the dawn of the twentieth century, Sonoma County had become a state leader in agriculture. By 1901, the sprawling cattle ranches of the Mexican era had disappeared. American settlers had divided the open grazing lands into smaller farms that collectively held over twenty million productive trees and vines, representing the region's economic foundation. At the heart of this rural farming center sat the bucolic town of Santa Rosa. About two-thirds of the city's population listed farmer as their occupation in 1890 and most of the rest served agricultural pursuits.

Although dominated by rural interests, Santa Rosa was growing and taking on the trappings of a larger city. By 1906 Santa Rosa's population was about 7,000 and residents and civic leaders were proud of their town. Served by three railroads, Santa Rosa had advanced from a frontier trading post to a commercial and agricultural shipping center since the town's 1854 founding. An ornate courthouse, symbol of the city's stature as the county seat, anchored the downtown. An assortment of handsome buildings, primarily constructed of brick surrounded the central courthouse and town plaza. The city boasted several large hotels—including the Grand, St. Rose and Occidental—and the Athenaeum theatre, a 2,000-seat venue that featured nationally known talent. As unknowing residents went to bed the night of April 17th, some of them, undoubtedly, contemplated the price of hops, or ways to occupy the town's restless youth, or simply getting an early start to the next day's business.

Quake!

April 18, 1906—5:12 am. 25 miles to the east the San Andreas fault shifts



View of Santa Rosa at 4th Street and Mendocino Ave, after the earthquake

Green Thompson, a city employed street sweeper was one of few people on the street in downtown Santa Rosa when the earthquake struck. He stood between the Grand Hotel and the courthouse, near the corner of Third and Main Streets. He heard the quake before he felt it, saying that it came with “a rumble like a wagon over cobblestones.” He watched as the waves struck and the dome of the courthouse swayed perilously, horizontal movement driving the building into an unnatural shimmy. Less than a minute later, with a sudden up and down motion, movement ceased and the courthouse came crashing down, along with much of the rest of Santa Rosa. Seven to eight full city blocks lay instantly in ruin. A large cloud of dust, slightly red from all the brick, hung in the air.

Fire!

“The sight that met our eyes was terrible. Fire was raging in a half a dozen different ...places...women were crowded everywhere crying and everyone near the fire had household goods packed to go as soon as the flames got nearer...The heat was overpowering and all that saved the town was the absence of wind.” – Jessica Lamont, 1906

After the shaking stopped, fire presented the greatest threat to Santa Rosa, claiming four or five city blocks and several lives. The fire moved through the downtown after being ignited, perhaps by toppled stoves or downed power lines. Explosions occurred when the fire reached several broken gas mains. In some cases, the force shattered the cast-iron mains.

The fire department struggled to get to the flames, which likely started near the corner of Third and B Streets. The fire station, located on Fifth Street, collapsed in the quake, killing the horses that pulled the pumping wagon. Firefighters hauled the apparatus by hand but had to take a circuitous route around debris blocking the way—Fifth Street to A Street and back up 2nd Street, to finally reach the burning section. With some water mains broken from the quake, extra water was pumped directly from Santa Rosa Creek.

Deaths that resulted from the flames tended to be particularly distressing. Rescuers worked frantically to free survivors of the initial shaking, but sometimes could not get them out in time. A former city official, Miles H. Peerman, for instance, was nearly freed from the wreckage of a building on Fourth Street when his would-be rescuers were driven away by the flames. Peerman burned to death.

Heroes

There were many heroes in the aftermath of the earthquake. Numerous descriptions record the unhesitating efforts of average citizens coming to the aid of the injured and imperiled—often at risk to their own lives. Amidst the masses of crumbling buildings and spreading fires, it was a race against the clock in the first hours after the disaster. As Herbert Slater would say recounting the quake two years later, to the rescuers it was nothing less than a “a battle for life”.

Many of the heroes were those with ax and shovel in hand, digging relentlessly to free survivors. People from all walks of life joined in the efforts, including Santa Rosa’s most famous resident, horticulturalist Luther Burbank who toiled at the ruins of the Grand Hotel. In describing the efforts of her own family members, Santa Rosa resident Jessica Lamont provides a poignant account: “...the men worked half the night in the ruins. Every once in a while a cheer announced that they heard someone alive and they worked like crazy men. Oh we have our heroes now. Chas. and Pa worked in the Occidental Annex and got out a big six-foot man and he only had his shoulder broke.”

Other heroic acts were officially recognized by the Santa Rosa City Council in the days after April 18th. Nurses, in general, were recognized for ministering to the sick and injured in makeshift hospitals without complaint or request for pay, as was Dr. Hooper, the leader of a contingent of the Red Cross from Santa Barbara. Finally, Bertrand Rockwell, a Civil War veteran and retired grain merchant from Kansas who happened to be visiting his daughter in Santa Rosa on April 18th, received a commendation from the City Council for organizing work crews to reach the dead and wounded.



Military Presence in Santa Rosa

Law and Order

“The local guard, Company E and Company C, of Petaluma...joined forces, and patrolling the streets, gave the desolate scene a warlike appearance.” – Tom Gregory, 1911

The courthouse—visible symbol of authority—lay in ruins. The need to maintain public order in the midst of chaos was crucial. Company E, the local detachment of the State Militia, and Company C of the Petaluma Fifth Infantry Regiment, National Guard of California, were dispatched to patrol the streets and Santa Rosa was placed under martial law.

Although Santa Rosans would later express pride in the fact that no citizen took advantage of the disaster, there were in fact several reported incidents. One noted that someone had attempted to break into the safe lying in the ruins of the Press Democrat building and another described attempts to rob the damaged winery at Fountaingrove. Several reports circulated of thieves stealing jewelry off of dead bodies. Nonetheless, it is true that violence and disorder were kept to a minimum. The City Council was quick to act in the aftermath of the disaster to maintain order. Among their directives was a freeze on price increases of over 5%. Merchants found in violation could have their goods confiscated. Mayor John P. Overton also ordered the indefinite closure of Santa Rosa’s saloons, and for several weeks the town went dry.

Lives Lost

“Following the earthquake there was a stillness—a stillness as of the tomb. A calm which to some people was almost as appalling as had been the mighty upheaval a few seconds previously.” – Herbert Slater, 1908

The greatest loss of life in Santa Rosa occurred in the downtown center, where multi-story, unreinforced brick buildings failed catastrophically when the earth moved. Particularly bad were the larger hotels like the Occidental and the Grand, each of which claimed multiple victims. Several second story boarding houses did not completely collapse, but left occupants trapped in a jumble of debris, and in some cases, they succumbed to spreading fires. Since many of the fatalities occurred in hotels or

boarding houses, many victims were visitors, including a novelty actress and several traveling salesmen. The search for victims went on for days and the newspapers kept a running list of the dead and injured.

In letters to her sisters, Jessica Lamont described the death toll:

“If the earthquake had occurred a little later a great many more would have been killed, but as it is the death list keeps growing. I saw dead men covered with sheets lying on sidewalks and lawns where they carried them at first. Now the Christian Church is turned into a morgue.” In describing preparations for the burial of a druggist named Mr. Newman she wrote, “The coffin came from Petaluma as they are all burned here.”

Recovery

Santa Rosa has suffered the greatest disaster in all its history, and is now a mass of ruins. But her spirit, thank God, still lives.

--Democrat-Republican, April 20, 1906

Within two days of the earthquake Santa Rosa was already looking to the future. On Friday, April 20th a slogan emerged from a special session of the City Council: “Build a bigger and greater Santa Rosa.” Through their newspapers, editors plead with Santa Rosans to stand “shoulder to shoulder” and to show faith in the future. Though the optimistic posturing was at odds with reality, it served a purpose—to bolster community spirit and to ward off any impression that the town was dead. Business had to carry on and a brave face was one way to help keep it going.

Before any thoughts of rebuilding, the barest sense of order had to be re-established. The City Council had already taken quick action in the aftermath of the quake, setting up a relief committee to handle private donations, creating an emergency center, organizing emergency shelter and providing for the removal of debris. Cleaning up was a massive task. A squad of sailors was dispatched from Mare Island to assist the local workers. One chronicler described the almost universal mindset of Santa Rosans willing to labor amidst the rubble: “It was more practical and more philosophical to shovel brickbats and ashes on to a platform car, than to stand around sadly contemplating the ruin of office and shop.”

A New City

“...the city has risen Phoenix-like from her ashes and is practically rebuilt.”

--Herbert Slater, 1908

A new Santa Rosa rose up out of the rubble. The earthquake, while devastating, created an opportunity to re-shape the city. By mid summer, 1906, businesses had been permanently relocated or were re-building. Forward-looking civic leaders like Frank Doyle of Exchange Bank called for the widening of roads and new street lines to accommodate the dawning age of the automobile. The quake hastened the construction of Santa Rosa’s new post office, which had been in the planning before the disaster. In spring of 1908 a cornerstone was placed at the new courthouse, a prominent symbol of recovery.

However, the opportunities for remaking Santa Rosa were not always met with careful thought for the future. So eager for reconstruction were some residents that they objected to new ordinances meant to create safer buildings. In May of 1906, the Sonoma County Herald printed a suggestion that “the ruins of the Courthouse be cleared away and Mendocino Street be continued through the courthouse square, thus making a continuous thoroughfare....”

The suggestion, not taken at the time, became reality in the 1965 when the 1910 courthouse was torn down and remains a subject of discussion to this day.

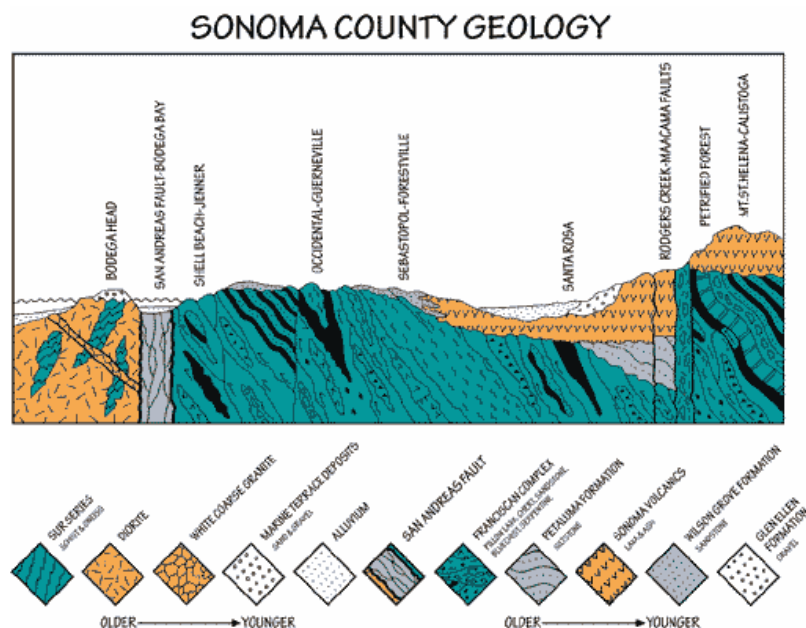
The 1969 Earthquake

A significant earthquake in 1969 led to other changes in the urban landscape that have been a matter of debate. Faced with developing a recovery policy in the aftermath of the quake, city officials were put under intense stress. In 1969 and 1970, the city's primary building official had a stroke and died, while the City Manager, Public Works Director, Fire Chief, and Finance Director all suffered heart attacks or strokes and were forced to retire. The city enacted a massive restructuring of seismic policies and building codes. Several areas of the city were completely re-shaped as a result of the quake. The most notable example is the area now occupied by the Santa Rosa Plaza mall. Numerous buildings, including several that had survived the 1906 quake, were targeted for demolition after 1969. Most of the buildings were destroyed to make way for the mall's construction in 1979. The only surviving building was the old post office, which was moved and renovated to become the Sonoma County Museum. Santa Rosa's unusual seismic history remains an important part of the city and its seismic future is something that Santa Rosa's residents are forced to keep in mind.

THE SCIENCE

Whose Fault was it?

Because the shaking was so intense, Santa Rosa must have *felt* like the epicenter of the earthquake on the morning of April 18, 1906. However, the earthquake actually occurred on the San Andreas fault, some twenty five miles west of Santa Rosa. For years after the earthquake, scientists assumed that the epicenter was in Olema near the Point Reyes seashore, where the ground on either side of the fault was offset as much as eighteen feet. That view didn't change until the late 1960s when UC Berkeley seismology Professor Bruce Bolt examined old seismographic readings and the time recorded by stopped clocks, and placed the 1906 epicenter off the San Francisco coast beyond the Golden Gate. Studies during the 1990s lent more support to the idea that the earthquake originated near San Francisco, within a mile of Daly City's coastline. During the earthquake, the fault ruptured both to the south and north of the epicenter over a distance of three hundred miles between San Juan Bautista and Shelter Cove.



Why did it shake so hard in Santa Rosa?

Prior to the 1906 earthquake, geologists had not yet identified the San Andreas fault in its entirety. In fact, not until almost sixty years later did geologists develop the theory of plate tectonics, which revolutionized the Earth Sciences. Knowledge and technology have continued to develop and scientists can now rely on such tools as modern seismic recording devices and digital maps made from surface and subsurface geologic data to provide decision makers with information needed for regional zoning, land use planning, and building codes, which affect development of schools, hospitals, homes, nuclear power plants, and other important facilities.

After many years of earthquake hazards research, scientists now understand that areas situated in sediment-filled valleys, such as the Santa Rosa Plain, generally sustain stronger shaking than nearby bedrock sites. This increase in seismic energy appears to be particularly strong in Santa Rosa and may be related to several factors, including: (1) the configuration of underlying bedrock basins and the thickness of basin-fill deposits, (2) the distribution of poorly consolidated manmade fills and buried stream channels, (3) the shallow depth to ground water, and (4) in 1906, an elevated pulse of seismic energy that may have been released from the San Andreas fault and directed towards Santa Rosa.

The Rodger's Creek Fault

The Rodgers Creek fault makes its way north from San Pablo Bay, crosses the flanks of the Sonoma Mountains, and lies directly beneath Santa Rosa. Although the fault runs close to downtown Santa Rosa, it did not rupture in the 1906 earthquake. In 1969, there were a pair of earthquakes that occurred in an area of complex faults just North of Santa Rosa, between the Rodgers Creek and the Healdsburg fault, a northern continuation of the Rodger's Creek fault. Geologists studying the Rodgers Creek fault have determined that it has produced large earthquakes on average, every two-to-three hundred years, and that the last earthquake occurred in the 18th century, sometime before Spanish missionaries began documenting damaging earthquakes. Geologists are concerned about the Rodger's Creek fault, as it has the highest probability (17%) of any fault in the San Francisco Bay region of generating a large earthquake before 2032.

THE ART



***Stratigraphic Column III*, San Andreas, 2006**

Bay Area artist John Roloff investigates geologic phenomena through his art. For the exhibition *Force of Nature* he was commissioned by the Sonoma County Museum to create work that artistically examines the geology of this region. Roloff's stratigraphic columns, located in the Museum's Main Gallery and reaching from floor to ceiling, are wrapped with ink-jet prints of black-and-white photographs. The images have been digitally compressed and stretched to represent the layers of rock formations on both the east and west sides of the San Andreas fault. These "core samples" contain distorted images of nature and of man-made structures, the human dislocations of geologic materials. They symbolize the geologic columns used by scientists to estimate the layers of rocks that have been laid down over millions of years to form the earth's crust. The imagery is a poetic mélange of tumbled materiality organized to represent larger geologic processes.



Protogaea Civica III, Santa Rosa, CA, 2006 (located on flagpole outside the Museum)

Protogaea Civica III is the third iteration of John Roloff's Geology Flags Project, a series of flags that provide symbolic demarcations of site-specific geologic structures and materials. The first two projects were designed for the San Francisco Art Institute and the San Francisco Civic Center, and they revealed the rock types that make up the San Franciscan Complex for the entire Bay Area.

Roloff's flags, created for the Sonoma County Museum, represent the geologic symbols for rock formations that lie under the Santa Rosa Plain, including the most recent deposits of alluvium—made up of sand, gravel, and clay— that are over two hundred thousand years

old. Deeply buried under the alluvium are Sonoma Volcanics dating back three to eight million years. And, at the deepest layer, is the much older Franciscan Formation, about one hundred million years old. The patterns used on the flags are derived from a geologic indexing and identification system used for maps that distinguishes these different rock types.

Although Roloff's geologic columns and flags derive from U.S. Geologic Survey studies, these works are not intended to be scientifically accurate. Roloff combines his skills as an artist with his understanding of geology to provide metaphors for the complexity and richness of the Bay Area geology. In the 1960s Roloff started out studying geology at University of California, Davis, during the formative years of the theory of plate tectonics. He subsequently studied art with well-known Bay Area artists Robert Arneson and William T. Wiley, who taught at Davis. Roloff is currently Chair of the Sculpture Department, and Co-coordinator of The Center for Art+Science at the San Francisco Art Institute.

EAST GALLERY

Contemporary Project Space

Devoted to the presentation of contemporary art by emerging and internationally recognized artists



Paula Levine

Signature

Simulation programming by Alex Killough

In conjunction with *Force of Nature*

April 22–July 9, 2006

Like history that refuses to remain in the past, Signature presents a confluence of present and absent, with each refusing to remain conveniently fixed in place.

Signature is an art and sound installation referencing handwritten and photographic documents from the Museum's permanent collection, as well as the "signature," or sounds translated from seismographic data recorded during the 1906 earthquake. This operatic and insightful installation creates a contemporary portrait of seismic history as it intersects with local lives

and landscapes. Artist Paula Levine, working with simulation programmer Alex Killough, have composed for this installation an audible and visceral immersion, interpreting an important historical event through a combination of both images and sounds that are triggered by Global Positioning Satellites passing overhead. Pulsing images of the streets of historic Santa Rosa intermittently reveal the fault that runs below the Santa Rosa Plain. Recordings derived from the handwritten words of Santa Rosa's survivors, describing their experiences after the epic event, are also triggered by the haunting reverberations.

The word *signature* most commonly refers to an individual's mark made by hand on paper. However, the term *seismic signature* is sometimes used to describe characteristic waveforms of a seismic event.

WEST GALLERY – UPSTAIRS

Christo and Jeanne-Claude

Selections from the Tom Golden Collection

The Sonoma County Museum is home to one of the largest collections in the nation of works by environmental artists Christo and Jeanne-Claude. In 2001, the collection was donated to the Museum by local art collector Tom Golden, who spent many years working closely with the artists to help realize several of their epic projects. Selections from this collection will now be on display in the West Mezzanine Gallery on an ongoing, rotating basis, as a suite of four exhibitions on the themes of the land, wrapped architecture, objects wrapped and unwrapped, and the artists' process. Acquiring the Tom Golden Collection has been one of the primary inspirations for the Museum's programmatic focus of Where Land Meets Art.

THE LAND

April 22–December 31, 2006



Running Fence, Sonoma and Marin Counties, 1976

Christo and Jeanne-Claude have wrapped buildings and bridges and have surrounded islands with fabric, as well as created other, more traditional sculptures. This suite of selected works from the Tom Golden Collection, entitled *The Land*, features their environmental projects created in rural environments. Envisioned to interact with the landscape and its inhabitants, these works create a magical connection between art, the viewer, and the environment.

Between 1972 and 1976, Sonoma and Marin County residents became very familiar with the European artists Christo and Jeanne-Claude, who labored for forty-two months to erect one of the world's most recognized artworks of the twentieth Century, *Running Fence*. Since then, the artists have completed other significant large-scale installations in the landscape, including *The Umbrellas* (Japan and

California), Surrounded Islands (Florida), and The Gates (Central Park, New York). These artworks, created on rural lands, have had a profound effect on the lives of those who encounter them. Years after the artworks have been removed, original visitors report that they are still deeply affected by the experience.

These epic environmental artworks are the product of years of inspiration and planning, and of working with public officials, landowners, and engineers; preparing environmental impact reports; attending community meetings; and obtaining special permits. The artworks, or the “hardware,” are temporary, and the preparatory works, or “software,” as well as the documentation, are what remains after the art installation is gone. Included in *The Land* are drawings, collages, prints, ephemera, and photographic records of these epic works.

MEZZANINE

The History Gallery

April 22–December 31, 2006



The history of Sonoma County is a collection of stories which, woven together, form a rich tapestry and sense of place. And what a tapestry it is-- from Native Americans, Russians and Mexicans jostling for territory; to the formation of the California Republic; to gold seekers turned settlers arriving fresh from the mines; from hop farmers to early Chinese laborers and Italian winemakers; to the modern telecom entrepreneurs, there are many stories to tell.

The Sonoma County Museum is dedicated to exploring this sense of place from multiple perspectives and to the idea that history is not simply a linear timeline, but an ongoing reexamination of the past. The History Gallery offers a place to investigate how the stories of *Birds-eye View Map of Santa Rosa, 1897*

Sonoma County connect to contemporary issues, to the natural landscape, to objects in the museum’s collection, and to the exhibitions in the Main Gallery. In this gallery, historical themes and content are exhibited on a rotating basis, inviting visitors and residents to explore the essential stories of this region.

Special thanks to:

Gaye LeBaron, Dan Markwyn, Simone Wilson, Jeremy Nichols, Sonne Pedersen, the Sonoma County Museum Auxiliary, Paul Hess and Sonoma County OES, Wendy Hurford, Amber Furtado, Eileen Jungwirth, Roberta Harlan, Sue Doherty

WINDOW ON COLLECTIONS

The Sonoma County Museum is home to the single most comprehensive collection of the county's cultural heritage. Today the Museum's collection is made up of about 20,000 items, ranging from fine art to agricultural tools.

Museum quality archaeological, public, and civic artifacts; jewelry, clothing and other personal accessories; ceramics and metalwork; tools and relics; textiles, needlework, souvenirs and ephemera; as well as paintings, photographs and sculpture are among the plethora of objects that remain to help connect the people of Sonoma County with their heritage.

The wonder of historical artifacts is their power to evoke the past and provide a tangible sense of history. However, any museum collection is a constant work in progress—new objects are acquired and ongoing research must be done to reveal their story. *Windows on Collections* provides a unique view into the Museum's array of cultural materials.

VOICES OF SONOMA COUNTY—THE ORAL HISTORY PROJECT

The Oral History Project began in 1994 when Song Bourbeau, the last resident of Santa Rosa's Chinatown, agreed, after a decade of my pleas, to talk about her life in Santa Rosa. For the funds to make that first video, I went to the Sonoma County Community Foundation where, with Jean Schulz's help, we established a fund for the purpose of preserving these real-life stories, with the Sonoma County Museum as the repository. Since that time the fund has been enhanced by donations from participants and a grant from The Press Democrat. Since my conversation with Song, some 30 Sonoma County residents have graciously consented to sit with me before the Community Media Center cameras and tell their stories; to talk about their country schools, the crops they've tended, the trains they've ridden, the wars they have fought, the changes they've seen. No one has ever refused. There are many ways to collect and preserve our history. Technology has made it possible for Song and all the others to keep on talking directly to us—and to future generations. What they have to say can only become more precious with the passage of time.

Gaye LeBaron

Disclaimer:

These oral histories are expressions of the memories and perspectives of the interviewee, and the perspective of the interviewer. They do not necessarily represent the views or policy of the Sonoma County Museum.

ANOTHER LIFETIME: THE SONG WONG BOURBEAU COLLECTION

Santa Rosa's Chinatown consisted of a block of boarded sidewalks and wooden buildings on Second Street between Santa Rosa Avenue and D Street. Chinese owned businesses, a Buddhist Temple, and boarding houses lined the streets. Lively, vibrant and bustling, life in Santa Rosa's Chinatown reflected the experiences of Chinese people throughout Sonoma County, which was also marked by cultural resilience in the face of oppression. Although no imprint of the neighborhood remains, having disappeared half a century ago, the stories of Chinatown's residents remain significant-- stories of immigration, of family, of making a life despite the obstacles. It is through Song Wong Bourbeau's stories and personal belongings that the experience of Chinese people in Sonoma County can be remembered.

Song Wong was born in a small home in the heart of Santa Rosa's Chinatown on Second Street, October 7, 1909. Song's father, Tom Wing Wong, was a prominent figure, regarded as the unofficial

mayor of Chinatown. His status derived from his work as the primary labor contractor, providing Chinese workers for the hop and grape growers, as well as being a storekeeper and overseer of the popular neighborhood lottery. Regardless of one's status being Chinese in Sonoma County carried daunting obstacles, particularly in the nineteenth century. The 1870s and 1880s were especially difficult as the presence of Chinese laborers competing for jobs during economic recession caused intense anti-Chinese sentiment. By 1886, anti-Chinese associations were pushing businesses to boycott Chinese labor. In Santa Rosa a giant banner was stretched across Mendocino Avenue at Fourth Street, which read, "THE CHINESE MUST GO. WE MEAN STRICTLY BUSINESS."

INTRODUCTION

Cataclysmic

He lived in a great icehouse in the sky
Four times he had destroyed the earth
The last destruction was by a great flood
Life on earth had been renewed when he came upon a lonely valley...

(From a Pomo legend, transcribed by the Santa Rosa Indian Center Heritage Project. Reproduced in "The Lonely Valley")

Humans have inhabited Sonoma County for more than ten thousand years. As long as they have inhabited the hills, valleys, and coast, natural disasters, from time to time, have disrupted their lives. As we explore the impact of the 1906 earthquake during this centennial year, we discover that disasters can reveal many things beyond simple destruction and tragedy. They can shed light on severe inequities and sometimes provide a stark demonstration of our failure to learn from the past. On the positive side, they can reveal human resilience and adaptability. This exhibition, *Cataclysmic*, investigates a selection of disasters that have had a significant impact on Sonoma County.

The 1969 Earthquake

Sonoma County has a long record of moderately strong earthquakes, the first reported in 1855. On October 1, 1969 the region endured two earthquakes, the most severe since 1906. These quakes registered 5.6 and 5.7 on the Richter scale and were felt as far away as the southern Bay Area. San Francisco skyscrapers shook noticeably. An additional 3.5 shock hit between the two main events, followed by two aftershocks the next day.

The 1969 earthquake epicenters were located in an area about two miles north of Santa Rosa. Damage patterns in the city were similar to 1906. Local property damage estimates ranged from five to seven million dollars, with the most severe damage occurring to non-reinforced brick buildings. Despite numerous injuries and even several heart attacks, the 1969 Santa Rosa earthquake caused not a single fatality. However, the quake had a dramatic impact on the city in terms of new policies and building codes, as well as leading to some significant urban redevelopment. After more than a decade of contentious wrangling and lawsuits following the quake, the way was cleared for the construction of the Santa Rosa Plaza mall.



Downtown Guerneville, Flood of 1940

Flooding

Flooding is a significant threat in Sonoma County. The Russian River area has one of the highest repetitive flood-loss rates in the state of California. The five worst floods in Sonoma County occurred in 1940, 1955, 1964, 1986, and 1995. The recent flooding in 2006 was the eighth highest documented flood level, the worst occurring in 1986, when the Russian River peaked at 49.05 feet.

The catastrophic 1986 flood pummeled Russian River communities as a result of roughly twenty inches of rain in just four

days. The Russian River rose so quickly that people had little time to secure structures or move valuables to high ground. In Guerneville, people retreated first to the Veterans building, then to St. Elizabeth's Church, and finally to a hilltop cemetery, where Chinook helicopters evacuated hundreds of stranded residents to Santa Rosa and Sebastopol shelters.

Flooding is exacerbated in years following summer fires. After the 1964 fire, that burned 50,000 acres in the eastern part of the county, a "one-in-a-thousand" storm struck Sonoma County on December 23rd. Floodwaters, carrying fire debris, caused fifteen million dollars in damage to bridges as well as residential and commercial structures. Despite the experience of the 1955 flood, rebuilding had occurred in the same areas leading to the severe losses.

During the 20th century, floods were the most significant natural disaster in the United States in terms of the number of lives lost as well as in property damage, and with the recent events of Hurricane Katrina, it continues to be one of the most significant threats. The Sonoma County Office of Emergency Services (OES) is the responsible agency for local planning and coordinating for response and recovery activities following any countywide disaster.



Phylloxera

In the 1850s, increasing numbers of Sonoma County settlers emanated from the grape growing regions of Europe. They soon recognized the suitability of Sonoma County for viticulture. Count Agoston Haraszthy, "Father" of California's wine industry, planted twenty-five acres of vines near the town of Sonoma

Wagons and Vineyard, circa 1900

in 1857. Commissioned by the 1861 California legislature to study viticulture abroad, he returned to Sonoma County the following year with over 100,000 prized varietal cuttings from France, Italy, Spain and Germany.

Disaster struck in 1873 with a worldwide outbreak of the parasite *phylloxera*. Sonoma County's vineyards were devastated with approximately 400,000 vines ripped out between 1873 and 1879, according to some estimates. Meanwhile many Europeans, already sensitive to competition with the expanding United States economy, blamed Americans for devastating the European wine industry with the imported "American root louse." The solution to the Sonoma County epidemic came from an unlikely place, the utopian community of Fountaingrove established in 1875 by Englishman Thomas Lake Harris. Harris hired vintner Dr. John Hyde to help establish the Fountaingrove vineyards and winery. Hyde was aware—or quickly became aware-- that native American vines were naturally resistant to *phylloxera*. He grafted varietal shoots onto native roots, thus avoiding the destruction that faced many other county grape growers. Hyde was among the first to have this insight and eventually his techniques were widely adopted and helped preserve the threatened industry.

The "Miramontes Epidemic" of the 1830s

Sonoma County is the traditional home of the Pomo, Wappo and Miwok Indians, who lived here undisturbed for thousands of years before the first white settlers arrived in the 1800s. In 1837-38, while Sonoma County was part of Mexico's northern frontier, a smallpox epidemic struck, killing thousands of Indians. The transmission of the virus from the Russian settlement at Fort Ross to the town of Sonoma, and subsequently through much of the surrounding area, is attributed to Lieutenant Ignacio Miramontes, an agent of General Mariano Guadalupe Vallejo. Vallejo reported that twenty thousand Indians died in a single year. Early Sonoma County settlers later recounted gruesome memories of coming upon bleached bone piles that they associated with the epidemic.

The Mexican rancheros were especially dependent on Native American workers, and the epidemic caused a severe labor crisis. Only white settlers and a few Indians received smallpox vaccines. Ethnocentric perceptions affected responses to the disease. Indian casualties were blamed on a "stubborn reliance on sweat lodges" for a cure, and white settlers promoted pseudo-scientific solutions such as cleanliness and temperance. In desperation, local officials even applied lime whitewash to Native homes in a vain attempt to halt the disease. The 1837-38 epidemic devastated the Native American population throughout much of Northern California. Historian Hubert Howe Bancroft compiled several mortality tolls, including Vallejo's, and in the 1880s estimated the total number of 1830s smallpox deaths to have been upward of 70,000. While some of the death estimates may be unreliable, the "Miramontes Epidemic" is part of one of history's most tragic disasters—the precipitous decline of the California Indian population after the arrival of Europeans.

SCIENCE

Grade Nine – Twelve Dynamic Earth Processes

3. Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface. As the basis for understanding this concept:
- Students know features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics.
 - Students know the principal structures that form at the three different kinds of plate boundaries.
 - Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes.
 - Students know why and how earthquakes occur and the scales used to measure their intensity and magnitude.
 - Students know there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slopes.
 - *Students know the explanation for the location and properties of volcanoes that are due to hot spots and the explanation for those that are due to subduction.

California Geology

9. The geology of California underlies the state's wealth of natural resources as well as its natural hazards. As a basis for understanding this concept:
- Students know the resources of major economic importance in California and their relation to California's geology.
 - Students know the principal natural hazards in different California regions and the geologic basis of those hazards.
 - Students know the importance of water to society, the origins of California's fresh water, and the relationship between supply and need.
 - * Students know how to analyze published geologic hazard maps of California and know how to use the map's information to identify evidence of geologic events of the past and predict geologic changes in the future.

SAMPLE ACTIVITY Grades 9-12

Tectonic Plate Movement

This activity gives students a visual understanding of tectonic plate movement and the resulting boundaries.

Introduce the terms:

Subduction Zone is the place where two lithospheric plates come together, one riding over the other. Most volcanoes on land occur parallel to and inland from the boundary between the two plates.

Transform Fault is a special variety of strike-slip fault that accommodates relative horizontal slip between other tectonic elements, such as oceanic crustal plates. Often extend from oceanic ridges.

Divergent boundaries-where new crust is generated as the plates pull away from each other.

Convergent boundaries-where crust is destroyed as one plate dives under another.

Materials:

Clay – at least 3 different colors (brown, white, red)

Paper

Pencil

- Roll out at least three different pieces of clay, different colors will represent different rock layers. Place the pieces on top of one another and press them together. Cut your clay layers in half.
- Move your layers slowly toward each other until they push together for at least 10 seconds. Make a sketch of your clay on your lab paper. Slowly press your clay together for 5 more seconds. What happened? What type of boundary could this be compared to?
- Slowly pull your clay halves apart. Sketch and describe the result of this pull. What type of boundary could this be compared to?
- Reflatten your clay, making the layers smooth. Slowly move the clay past one another, making certain that the edges touch with some pressure. Sketch and describe the result of this move. What type of boundary could this be compared to?
- Reflatten clay. This time make one thick layer of clay and one thin layer. Push the two pieces together slowly. Describe what happens. Could this be compared to a subduction zone? Why or why not?

Writing Activity: Students research different types of rock formations that occur in Sonoma County. Have students describe what areas are best for building and why using the terms: "divergent boundary," "convergent boundary," "transform fault," and "subduction zone."

Further Discussion: What does this activity teach us about our earth? How do these layers make up our earth? Why is it important to understand how the earth is constructed?

Adapted from content at <http://www.wvgs.wvnet.edu/www/geoeduc/edcs99u1.htm>

**This activity can be adjusted to be appropriate for different age levels **

SAMPLE ACTIVITY

Rupture Slip and Length of 1906 Earthquake



The 1906 earthquake ruptured the northernmost 296 miles (477 km) of the San Andreas Fault between San Juan Bautista and Cape Mendocino. By comparison, the 1989 Loma Prieta earthquake had a rupture length of only 25 miles. The San Andreas fault today has locked and creeping segments along its approximately 800 mile (1300 km) length in California. The 1906 earthquake ruptured all locked segments of the fault in northern California. The amount of horizontal slip, or relative movement along the fault, varied from 2 to 32 feet (0.5 m to 9.7 m). To better visualize this, picture standing face to face with a person on the opposite side of the fault and watching them slide horizontally 32 feet to your right! The following file depicts the 1906 rupture

length and the horizontal slip (in feet) along the rupture as a histogram. Scientists now believe that details in the geology along the earthquake fault plane, and differences in stress levels, may contribute to these changes in the amount of slip along the fault.

The above information courtesy of USGS and more info can be found at:

<http://earthquake.usgs.gov/regional/nca/virtualtour/earthquake.php>

SCIENCE

Grade Six

Focus on Earth Sciences

Plate Tectonics and Earth's Structure

1. Plate tectonics accounts for important features of Earth's surface and major geologic events. As a basis for understanding this concept:

- a. Students know evidence of plate tectonics is derived from the fit of the continents; the location of earthquakes, volcanoes, and midocean ridges; and the distribution of fossils, rock types, and ancient climatic zones.
- b. Students know Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core.
- c. Students know lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.
- d. Students know that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface.
- e. Students know major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions.
- f. Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics.
- g. Students know how to determine the epicenter of an earthquake and know that the effects of an earthquake on any region vary, depending on the size of the earthquake, the distance of the region from the epicenter, the local geology, and the type of construction in the region.

This activity is designed to give students a visual understanding of the magnitude of the 1906 earthquake through the distance of the rupture slip. This activity can be done outside or in the classroom – the impact is greater outside as the length of the rupture is most dramatic at 32 feet.

Materials:

Stop watch

Tape for markers

1. Make marker on the pavement/floor at the following intervals: 2 feet (shortest), 10 feet apart, 20 feet and 32 feet
2. Have students pair off
3. One student will remain in the same spot while the other student will travel to the first marker in 20-25 seconds
4. Have students switch roles and continue to switch with each new distance

Writing portion: Students write a response to the activity.

What did you learn? How was the 1906 earthquake made more real through this activity? Imagine what it was like to survive such an experience. What emotions would you experience? How would you react? How did your ideas change as the activity (experiment) progressed?

This activity can be adjusted to be appropriate for different age levels

SAMPLE ACTIVITY

Making a disaster preparation kit:

This activity is designed to introduce students to how to prepare for a disaster while creating a discussion as to why we should be prepared for a disaster.

1. Begin with a class discussion of what is needed for a disaster preparation kit. What do you need? Think of water (humans can live for up to 3 days w/out it), food (humans can live for up to 30-40 days w/out it) & shelter (exposure can be deadly- both to heat and cold) as the primary needs and expand from there; first aid items (band-aids, antiseptic, pain medication, disinfectant).
2. Have students discuss what is possible to have (a gallon of water), versus what is fanciful (a room full of water, a genie to make everything better, etc.). Why do you need those particular items? Have students explain their choices.
3. Have students calculate how much food and water would be needed per day for each person.
4. Collage with magazine clippings of their kit.
5. Students present their kits to the class explaining their reasoning for items in the kit.

Now hand out the following list to students. Have students compare/contrast their list with the Red Cross list. As a class discuss the importance of the items & why they were selected.

Red Cross emergency backpack contents:

- | | |
|---|---|
| -2 2,400 Calorie ER Food Bar, 5 year shelf life | -10 3/4" x 3" adhesive bandages |
| -1 Pocket First Aid Kit (3.25"x 4" x 1") | -1 AM/FM Radio w/ARC Logo |
| -2 2 gal. Water Storage Bags | -1 Whistle w/Lanyard |
| -1 16"x 24" Poly Bag | -1 Maxithin Sanitary Napkin |
| -1 Red Bio-Hazard Bag w/twist tie | -1 CYALUME 6" Green 12 hour Light Stick |
| -1 Instant Body Warmer | -1 Flashlight |
| -1 54"x 84" Emergency blanket | -1 D Cell Batteries 2 Pack |
| -1 Emergency Poncho w/Hood | -1 8 Pack Pocket Tissue |
| -2 hand warmers | |

Give the students the list and ask them to write about what they think the items are for or how they might use them.

Further Discussion: What happens when places like hospitals and grocery stores are destroyed (students to make a connection to Hurricane Katrina)? How do people get help/assistance? What happens when help is not immediate? How can you prepare for that?

**This activity can be adjusted to be appropriate for different age levels **

LANGUAGE ARTS

2.0 Writing Applications

Grade 1

2.1 Write brief narratives (e.g., fictional, autobiographical) describing an experience.

Grade 2

2.1 Write brief narratives based on their experiences:

- Move through a logical sequence of events.
- Describe the setting, characters, objects, and events in detail.

Grade 3

2.1 Write narratives:

- Provide a context within which an action takes place.
- Include well-chosen details to develop the plot.
- Provide insight into why the selected incident is memorable

Grade 4

2.1 Write narratives:

- Relate ideas, observations, or recollections of an event or experience.
- Provide a context to enable the reader to imagine the world of the event or experience.
- Use concrete sensory details.
- Provide insight into why the selected event or experience is memorable.

Grade 5

2.3 Write research reports about important ideas, issues, or events by using the following guidelines:

- Frame questions that direct the investigation.
- Establish a controlling idea or topic.
- Develop the topic with simple facts, details, examples and explanations.

SAMPLE ACTIVITY

Historic Artifacts

This activity is designed to raise awareness about the importance of preserving our history.

Some of the artifacts from the Museum's Permanent Collection are on view giving the public a behind the scenes view & some insight into the value of saving such objects that make up our shared past. Many of the items were common at the time but have become rare because so many were destroyed or deteriorated over time with use or neglect. Seeing how other people lived before us also gives modern society an opportunity to see our past and learn from it. How do everyday objects remind us of the past?

Writing Activity –

- Have students write the history of an object, where it was made and by whom, places it traveled and events it experienced/survived (like the 1906 Earthquake), who owned it, why they sold/donated it and where it is today. Why is it valuable? This could be an actual object or an imaginary one.
- Students read the newspaper looking for an event that happened (a storm, a disease outbreak, bike race). If you could preserve an artifact from this article/event what would it be? What kind of artifact would be good to preserve and why? Would a photograph be better? Why? How do you preserve newspaper articles?

SAMPLE ACTIVITY

Christo & Jeanne-Claude, *Surrounded Island* Land Art Project

This activity is designed to introduce students to the many facets of a land art project.

The major out come for many visitors/viewers of the works is a greater appreciation for the land. Christo & Jeanne-Claude open our eyes to locations we pass every day, taking for granted their sweeping beauty and importance. Once wrapped, surrounded, or highlighted the building or landscape tends to take on a whole new meaning and we the viewer see it with fresh eyes, (hopefully) appreciating it anew. Go to website <http://www.christojeanneclaude.net/rf.html> for additional information on specific projects.

- Select a large object to surround (an island, a mountain, a landscape, a pond/lake)
- Select the materials (fabric, support of fabric, colors, etc.)
- Draw sketches of your project
- Write an estimate of how much it will cost (including materials, labor, Environmental Impact Reports, permits, etc.) This can be a research assignment or the students can use their own imaginary figures/estimates
- Create a timeline for the project, it can be very general by month or can be very detailed by day or week
- Write a summary of the entire project including original idea, materials, sketches, estimate, and project timeline. This can be omitted for younger students.
- Students present their project to the class, students can make a poster of all the pieces.

Discussion:

How did your perception of Christo & Jeanne-Claude's work change during the activity? What were the most difficult aspects of this activity? Why? Have the discussion focus on the various aspects of creating works on such a scale that are not apparent when you see the piece (labor, time, planning commissions, private land owners, insurance again damage, etc.).

**This activity can be adjusted to be appropriate for different age levels **

SELECTED CALIFORNIA STATE CONTENT STANDARDS

SCIENCE

GRADES 2-12

Grade Two

Earth Sciences

3. Earth is made of materials that have distinct properties and provide resources for human activities. As a basis for understanding this concept:
- Students know how to compare the physical properties of different kinds of rocks and know that rock is composed of different combinations of minerals.
 - Students know smaller rocks come from the breakage and weathering of larger rocks.
 - Students know that soil is made partly from weathered rock and partly from organic materials and that soils differ in their color, texture, capacity to retain water, and ability to support the growth of many kinds of plants.
 - Students know that fossils provide evidence about the plants and animals that lived long ago and that scientists learn about the past history of Earth by studying fossils.
 - Students know rock, water, plants, and soil provide many resources, including food, fuel, and building materials, that humans use.

Grade Four

Earth Sciences

4. The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept:
- Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).
 - Students know how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals by using a table of diagnostic properties.
5. Waves, wind, water, and ice shape and reshape Earth's land surface. As a basis for understanding this concept:
- Students know some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
 - Students know natural processes, including freezing and thawing and the growth of roots, cause rocks to break down into smaller pieces.

- Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

Grade Six

Shaping Earth's Surface

2. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. As a basis for understanding this concept:
- Students know water running downhill is the dominant process in shaping the landscape, including California's landscape.
 - Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.
 - Students know earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

Grade Seven

Earth and Life History (Earth Sciences)

4. Evidence from rocks allows us to understand the evolution of life on Earth. As a basis for understanding this concept:
- Students know Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.
 - Students know that the rock cycle includes the formation of new sediment and rocks and that rocks are often found in layers, with the oldest generally on the bottom.
 - Students know that evidence from geologic layers and radioactive dating indicates Earth is approximately 4.6 billion years old and that life on this planet has existed for more than 3 billion years.
 - Students know fossils provide evidence of how life and environmental conditions have changed.
 - Students know how movements of Earth's continental and oceanic plates through time, with associated changes in climate and geographic connections, have affected the past and present distribution of organisms.

g. Students know how to explain significant developments and extinctions of plant and animal life on the geologic time scale.

Grade Eight

Forces

2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:

- a. Students know a force has both direction and magnitude.
- b. Students know when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.
- c. Students know when the forces on an object are balanced, the motion of the object does not change.
- d. Students know how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.
- e. Students know that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).
- f. Students know the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.
- g. Students know the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.

Grade Nine Through Twelve

Physics

Waves

4. Waves have characteristic properties that do not depend on the type of wave. As a basis for understanding this concept:

- a. Students know waves carry energy from one place to another.
- b. Students know how to identify transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves).
- c. Students know how to solve problems involving wavelength, frequency, and wave speed.

d. Students know sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.

f. Students know how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.

Biology/Life Sciences

Ecology

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:

- a. Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
 - b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
 - c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:
- a. Students know the role of the skin in providing nonspecific defenses against infection.
 - b. Students know the role of antibodies in the body's response to infection.
 - c. Students know how vaccination protects an individual from infectious diseases.
 - d. Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.
 - e. Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.

**CONTENT STANDARD LINKS
HISTORY, SOCIAL SCIENCE
GRADES K-12**

Chronological and Spatial Thinking

- 3. Students explain how the present is connected to the past, identifying both similarities and differences between the two, and how some things change over time and some stay the same.

Research, Evidence, and Point of View

- 1. Students differentiate between primary and secondary sources.
- 2. Students pose relevant questions about events they encounter in historical documents, eyewitness accounts, oral histories, letters, diaries, artifacts, photographs, maps, artworks, and architecture.

Historical Interpretation

- 1. Students summarize the key events of the era they are studying and explain the historical contexts of those events.
- 2. Students identify the human and physical characteristics of the places they are studying and explain how those features for the unique character of those places.
- 3. Students identify and interpret the multiple causes and effects of historical events.

K.6 Students understand that history relates to events, people, and places of other times.

I.5 Students describe the human characteristics of familiar places and the varied backgrounds of American citizens and residents in those places.

I.4 Students compare and contrast everyday life in different times and places around the world and recognize that some aspects of people, places, and things change over time while others stay the same.

2.4 Students understand basic economic concepts and their individual roles in the economy and demonstrate

basic economic reasoning skills.

1. Describe food production and consumption long ago and today, including the roles of farmers,

3.5 Students demonstrate basic economic reasoning skills and an understanding of the economy of the local region.

1. Describe the ways in which local producers have used and are using natural resources, human resources, and capital resources to produce goods and services in the past and present.
2. Understand that some goods are made locally, some elsewhere in the United States, and some abroad.

4.4 Students explain how California became an agricultural and industrial power tracing the transformation of the California economy and its political and cultural development since the 1850s.

- 3. Discuss immigration and migration to California between 1850 and 1900, including the diverse composition of those who came; the countries of origin and their relative locations; and conflicts and accords among the diverse groups (e.g., the 1882 Chinese Exclusion Act).
- 4. Describe rapid American immigration, internal migration, settlement, and the growth of towns and cities (e.g., Los Angeles).
- 6. Describe the development and locations of new industries since the turn of the century, such as the aerospace industry, electronics industry, large-scale commercial agriculture and irrigation projects, the oil and automobile industries, communications and defense industries, and important trade links with the Pacific Basin.

VOCABULARY

Alluvium – is soil deposited by a river or other running water and tends to be unstable during an earthquake

Artifact – a man made object usually designed for a practical purpose, especially an object from a particular time period

Geology – the scientific study of the history of the earth and its life especially as recorded in rocks

Geophone – an instrument for detecting vibrations passing through rocks, soil, or ice

Oscillate – a: to swing backward and forward like a pendulum b: to move or travel back and forth between two points

Oscilloscope – an instrument in which the variations in a fluctuating electrical quantity appear temporarily as a visible wave form on the fluorescent screen of a cathode-ray tube

Seismograph – an apparatus to measure and record vibrations within the earth and of the ground

Seismology – is the scientific study of earthquakes, their causes and effects & artificially produced vibrations of the earth

Subduction – the action or process of the edge of one crustal plate descending below the edge of another

Print Resources

Achenbach, Joel. *The Next Big One*. National Geographic, p. 120-147, April 2006.

Dalessandro, James. *1906: A Novel*. Chronicle Books, San Francisco, 2004.

Fradkin, Philip L. *The Great Earthquake and Firestorms of 1906: How San Francisco Nearly Destroyed Itself*. University of California Press: Berkeley, CA. 2005.

Hansen, Gladys and Condon, Emmet. *Denial of Disaster: The Untold Story and Photographs of the San Francisco Earthquake and Fire of 1906*. Cameron and Co., San Francisco, 1989.

Lee, Milly. *Earthquake*. Farra, Straus and Giroux, 2001.

McPhee, John. *Assembling California*. Farra, Straus and Giroux, New York, 1993.

Smith, Dennis. *San Francisco is Burning The Untold Story of the 1906 Earthquake and Fires*. Viking, London, England, 2005.

Winchester, Simon. *A Crack in the Edge of the World: America and the Great California Earthquake of 1906*. Harper Collins: New York, 2005.

Facing Disaster: A Centennial Postcard Album of the San Francisco Earthquake and Fire April 1906. San Francisco Bay Area Postcard Club, 2006.

Web Resources

California Geological Survey, teacher resources
<http://www.consrv.ca.gov/cgs/information/EdResCenter.htm>

USGS Educational Resources
<http://education.usgs.gov/>

USGS 1906 Quake INFO
<http://quake.wr.usgs.gov/info/1906/>

USGS Virtual Tour of Earthquakes
<http://earthquake.usgs.gov/regional/nca/virtualtour/>

Sonoma County Geology – Terry Wright
<http://www.sonoma.edu/geology/wright/overview.html>
www.terrywrightgeology.com

Teacher Links
<http://www.sonoma.edu/geology/wright/teachlinks.html>

Seismology definition
<http://en.wikipedia.org/wiki/Seismology>

1906 Earthquake snapshots (all areas that were affected)
http://mnw.eas.slu.edu/Earthquake_Center/1906EQ/1906thumb.html

PBS 1906 Earthquake
http://www.pbs.org/newshour/indepth_coverage/science/1906quake/ss_intro.html

CHRISTO & JEANNE-CLAUDE
<http://www.christojeanneclaude.net/rf.html>

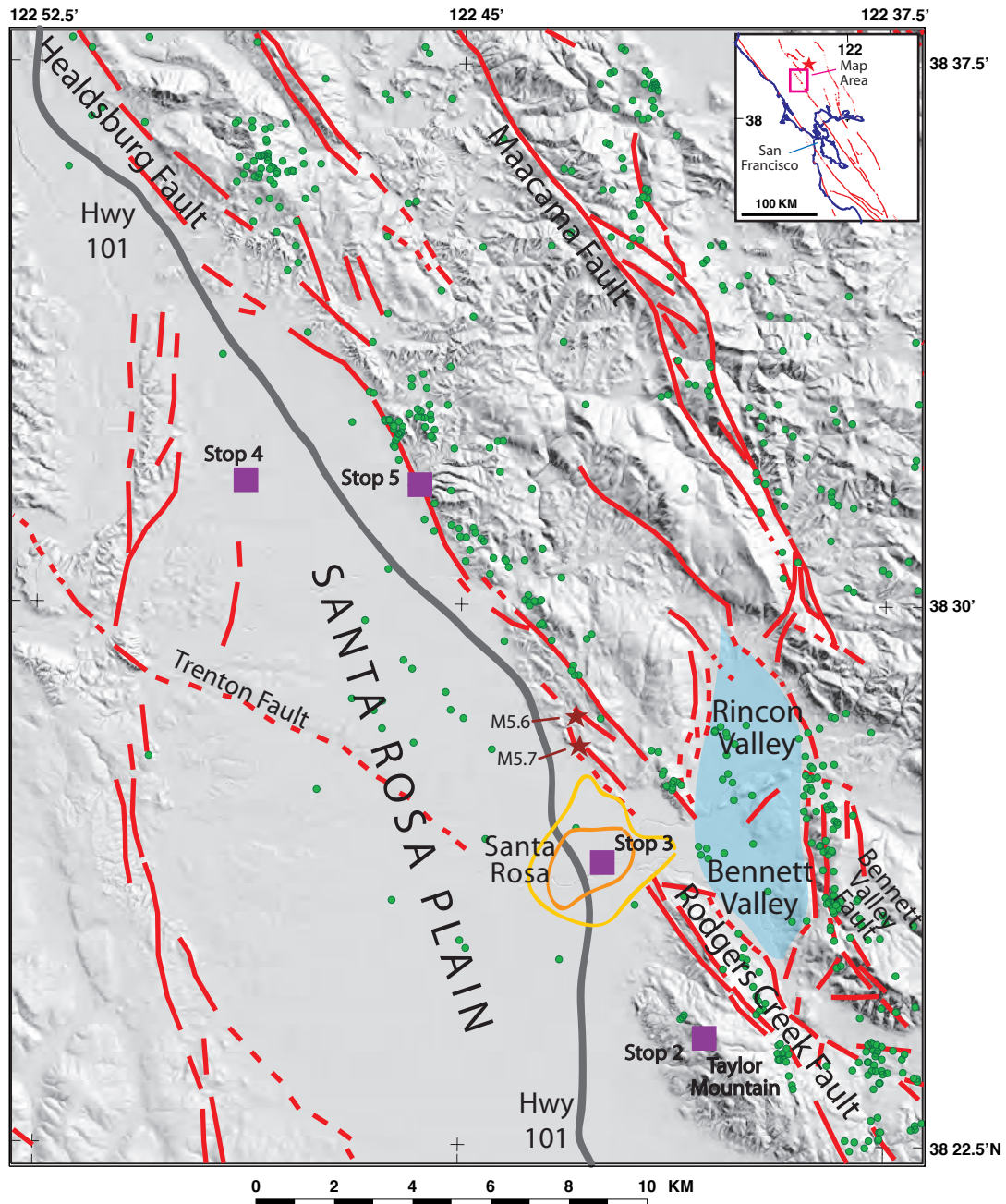


Figure 6. Site map of Taylor Mountain field trip stop. Purple squares denote field trip stops. Faults in red, earthquake epicenters in green; brown stars, epicenters of the 1969 earthquakes (Wong and Bott, 1995). 1906 and 1969 earthquake damage in yellow and gold, respectively. Blue area highlights Santa Rosa pull-apart basin formed in the right step between the Rodgers Creek and Maacama faults. Earthquake locations indicate that active slip deformation partitions between the Rodgers Creek Fault and the Maacama Fault and fault-plane solutions indicate right-lateral slip with a prominent component of extension (normal faulting). Star on index map shows location of Mount St. Helena.