

# The EarthConnections San Bernardino Alliance: Addressing Diversity in the Geosciences Using a Collective Impact Model

**SALLY MCGILL, CALIFORNIA STATE UNIVERSITY, SAN BERNARDINO**

MARK BENTHIEN, SOUTHERN CALIF  
EARTHQUAKE CENTER

BRYAN CASTILLO, CSU SAN BERNARDINO

JEFFREY FITZSIMMONS, LAHONTAN  
REGIONAL WATER QUALITY CONTROL BOARD

ANNA FOUTZ, CHAFFEY COMMUNITY  
COLLEGE

DANIEL KECK, ETIWANDA HIGH SCHOOL

CATHRYN ALLEN MANDUCA, CARLETON  
COLLEGE

GABRIELA NORIEGA, SOUTHERN  
CALIFORNIA EARTHQUAKE CENTER

RAJ PANDYA, AMERICAN GEOPHYSICAL  
UNION

JOHN TABER, INCORPORATE RESEARCH  
INSTITUTES FOR SEISMOLOGY

BERNADETTE VARGAS, ETIWANDA H.S.

# Earth Connections Collective Impact Alliance

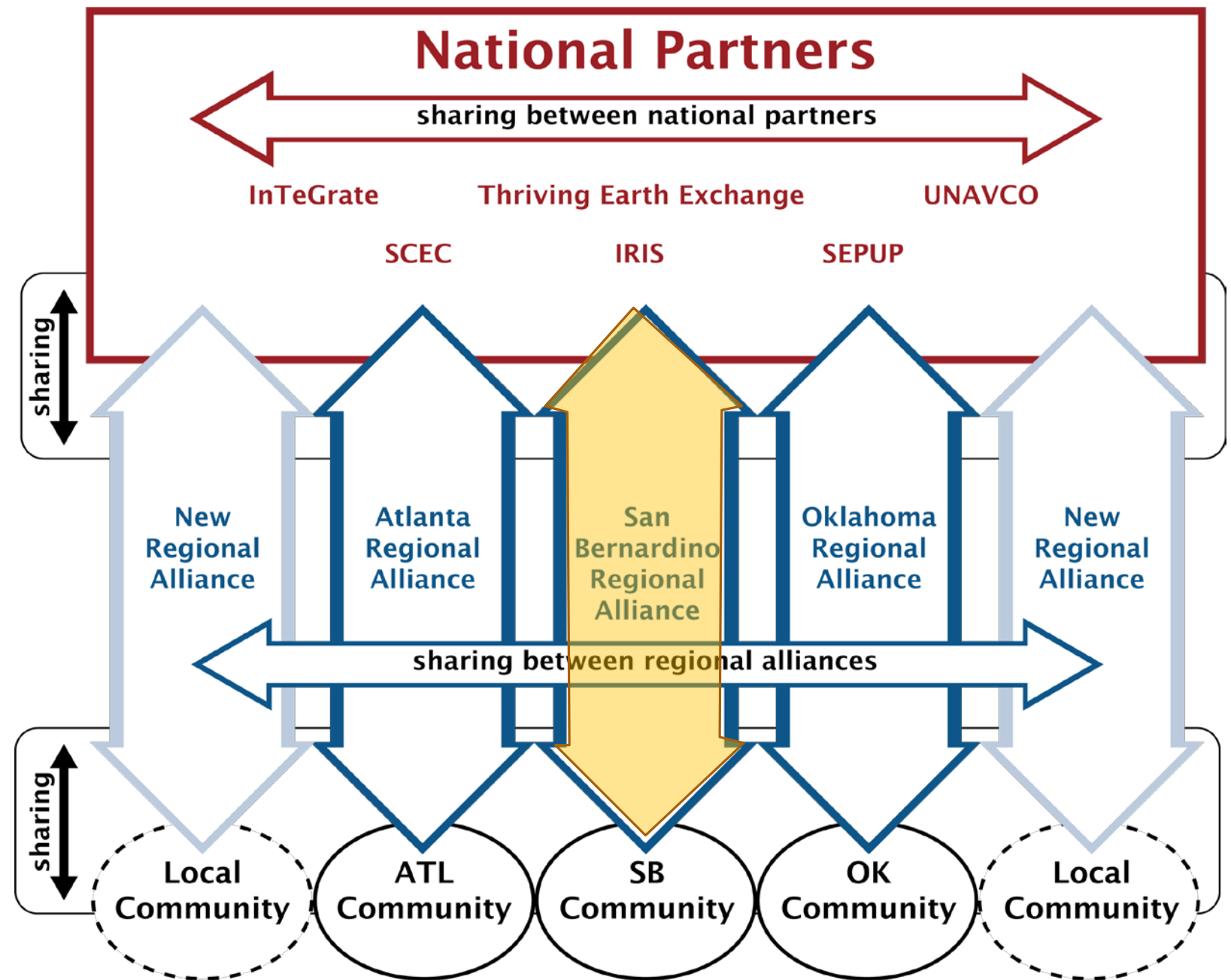


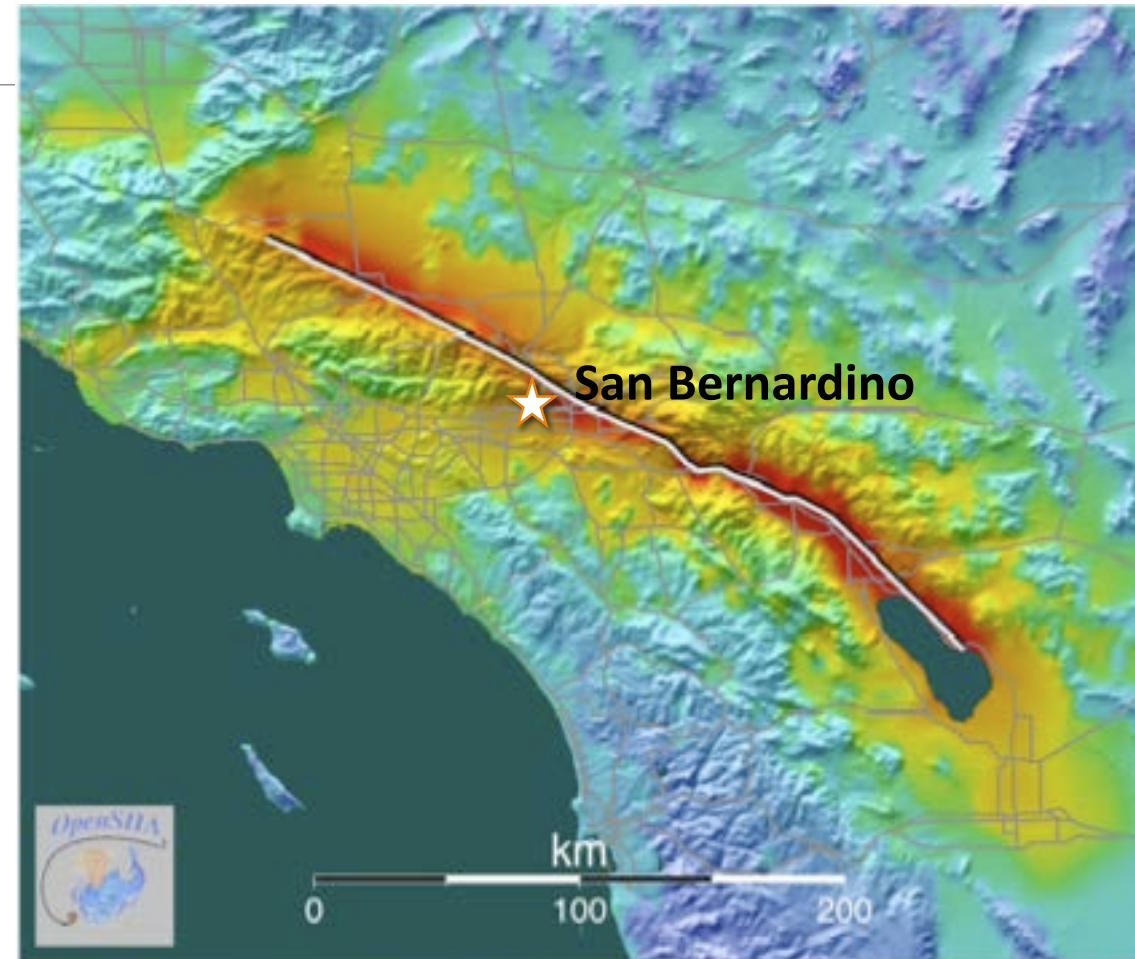
Figure by Mitchell Awalt

# San Bernardino Alliance

## Need for

- greater Earth literacy in the region
- more professional scientists who come from and can work with the communities that are impacted by these hazards.

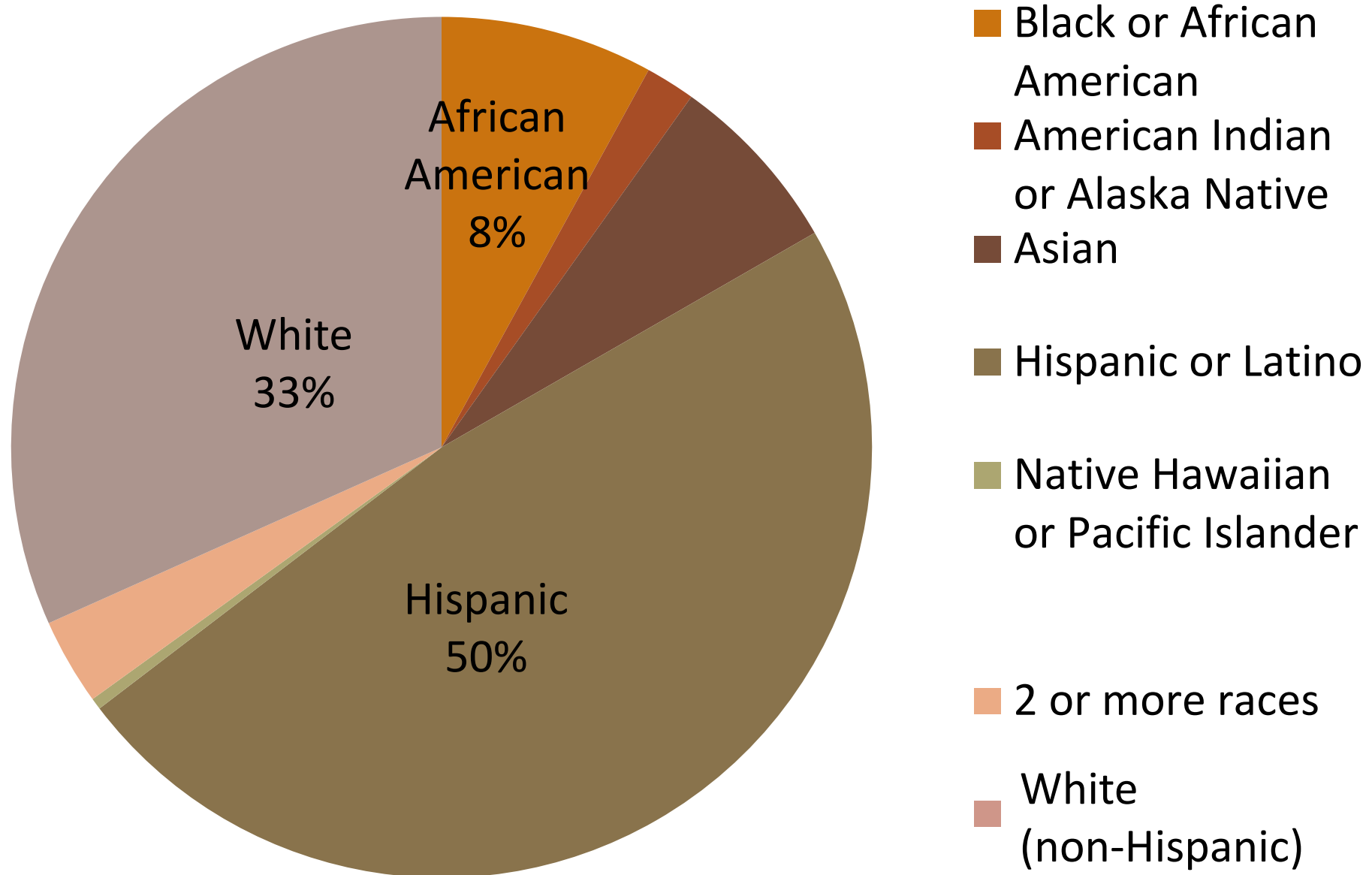
Expected shaking for a M7.8 earthquake on the San Andreas fault



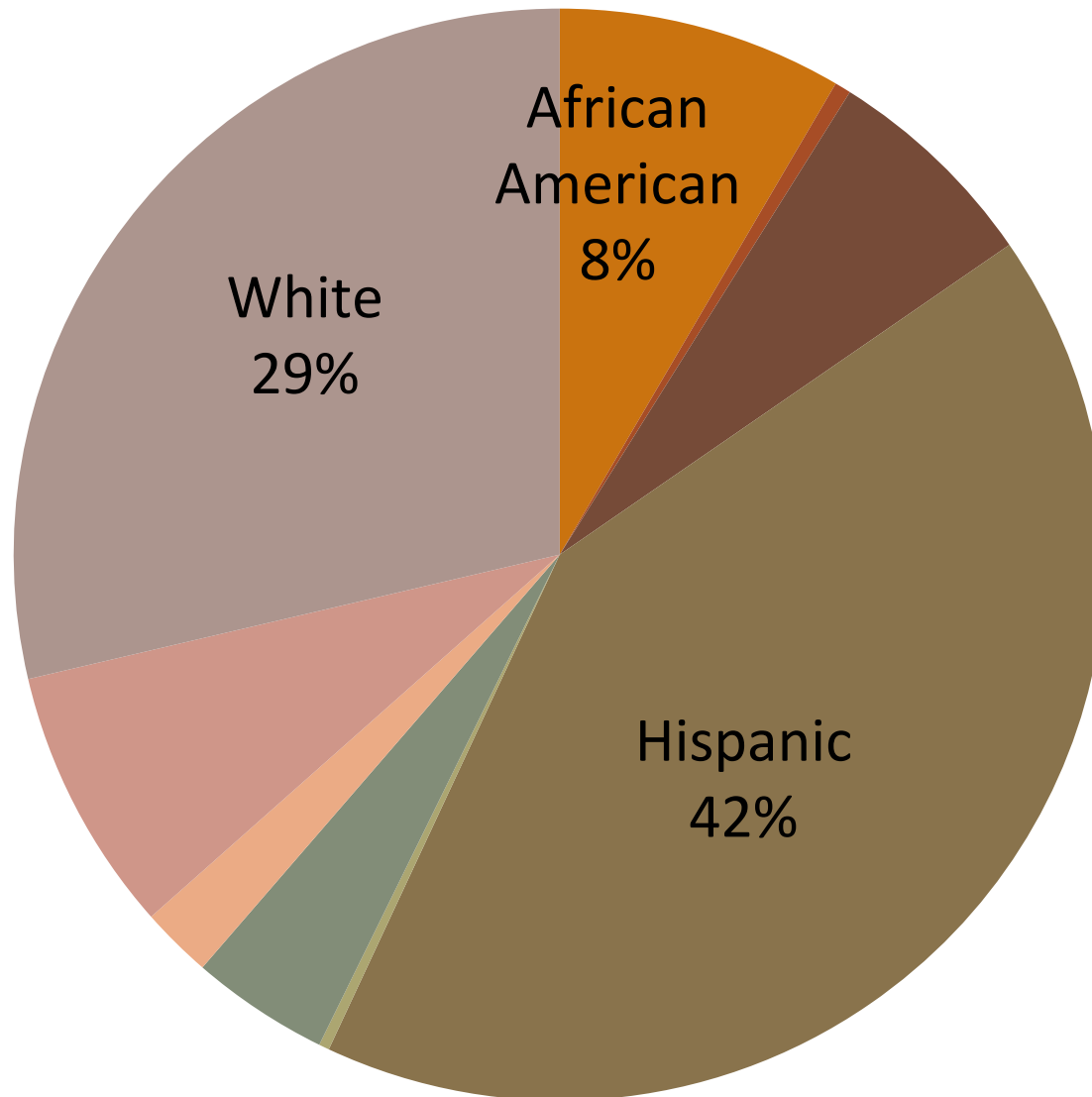
3 10 30 100

Peak Ground Velocity (cm/sec)

# San Bernardino and Riverside Counties, 2015

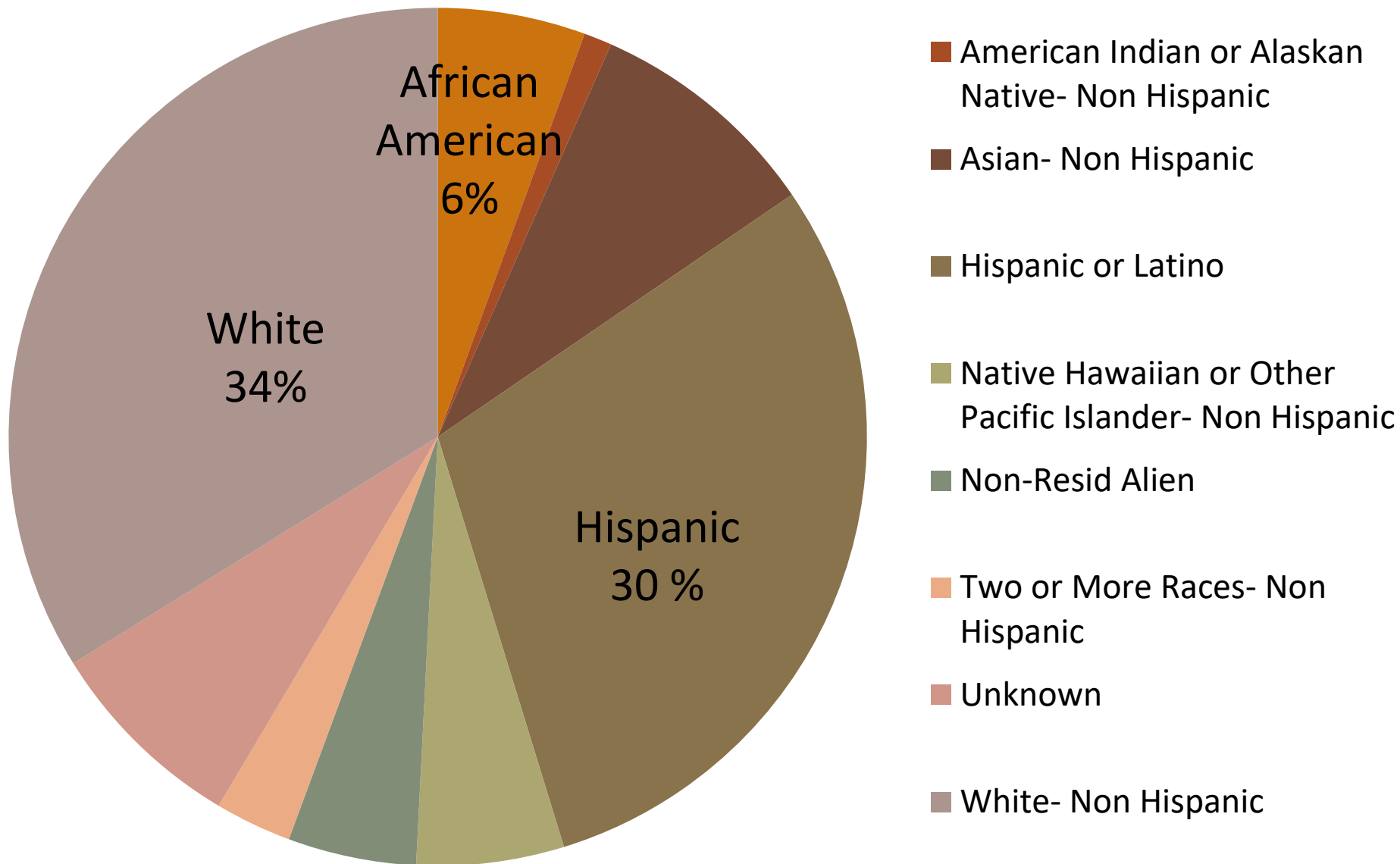


## CSUSB graduates (2007-2013)



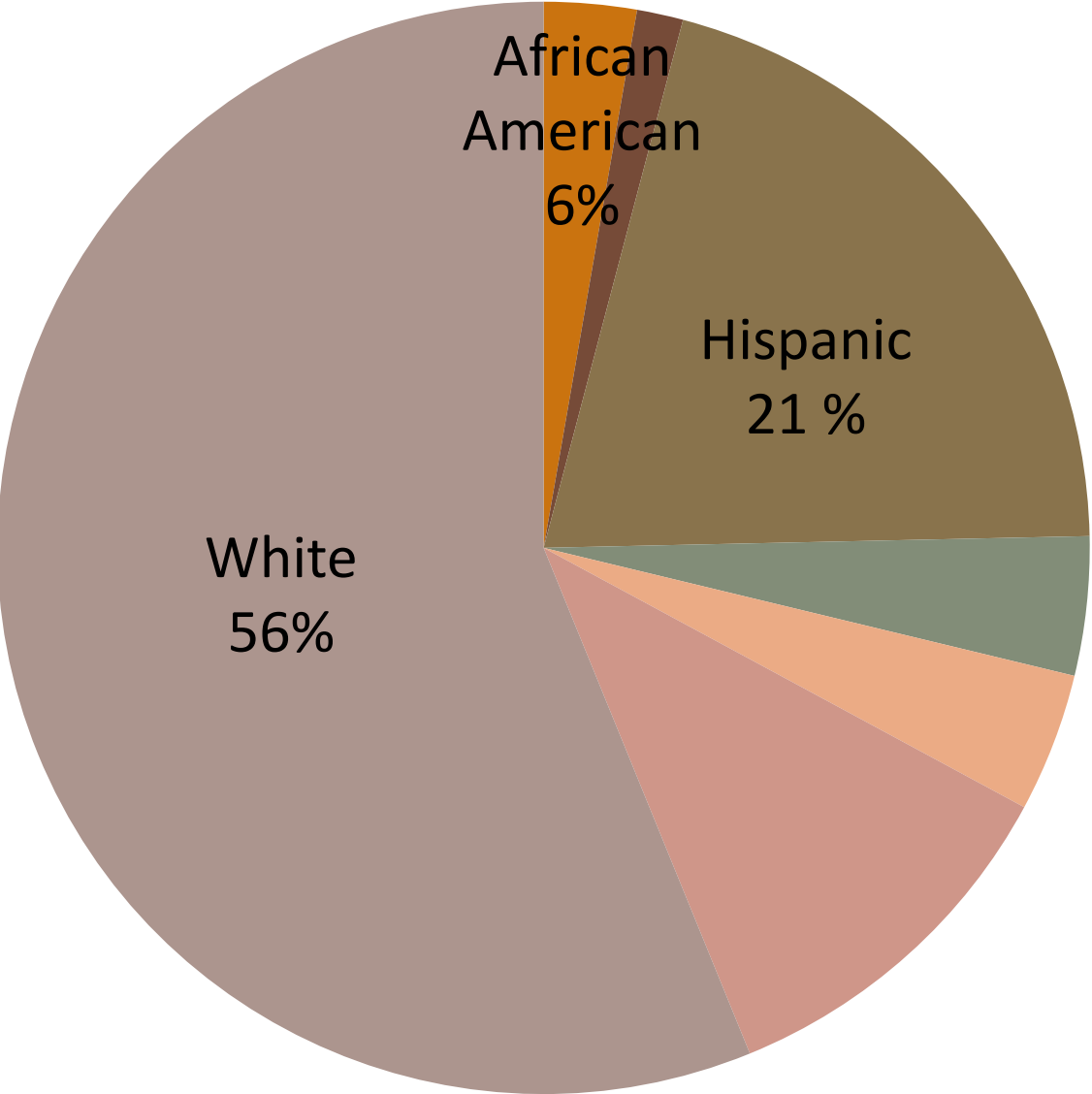
- African American
- American Indian or Alaskan Native- Non Hispanic
- Asian- Non Hispanic
- Hispanic or Latino
- Native Hawaiian or Other Pacific Islander- Non Hispanic
- Non-Resid Alien
- Two or More Races- Non Hispanic
- Unknown
- White- Non Hispanic

## CSUSB STEM graduates, 2005-2013



STEM = Science, Technology, Engineering and Mathematics

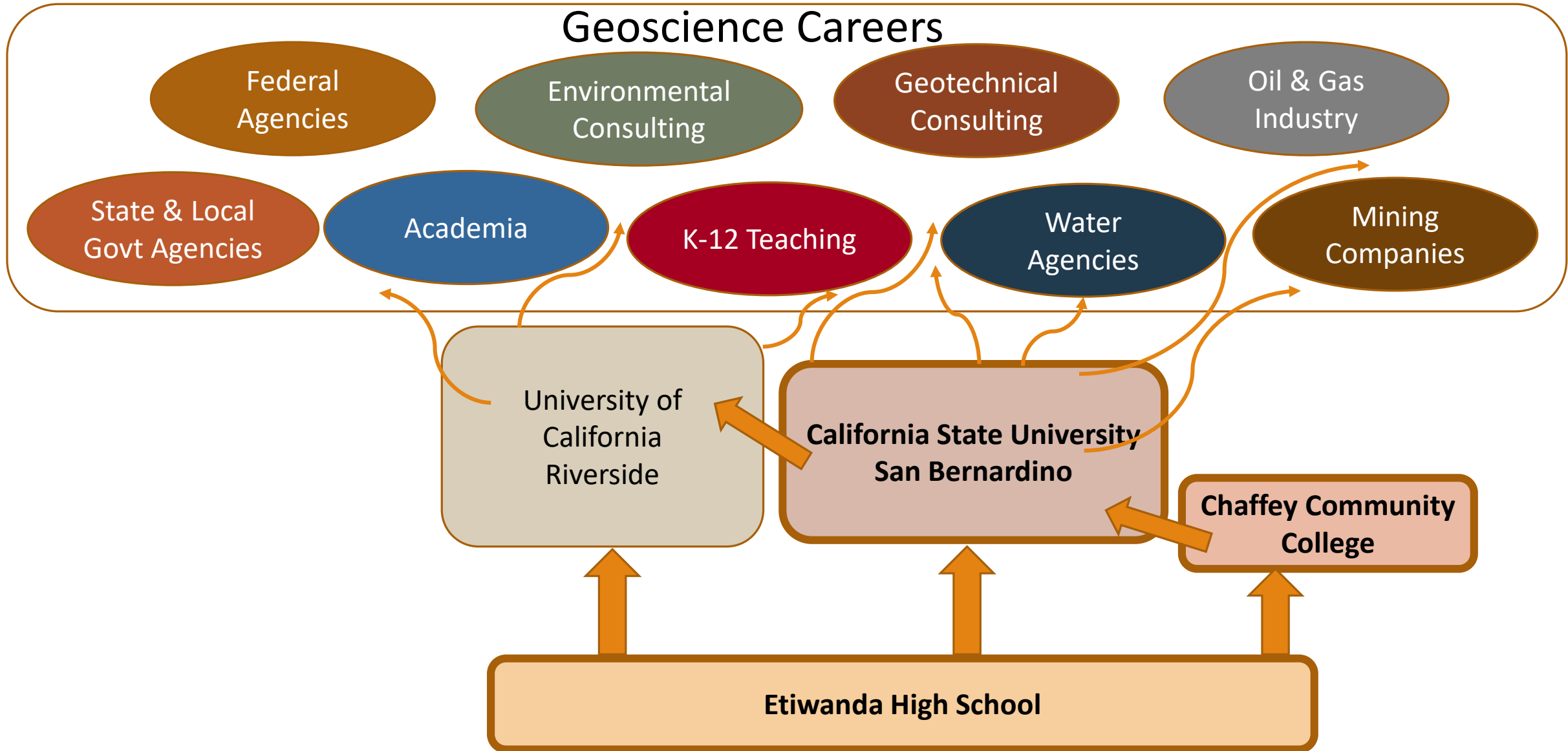
# CSUSB geology graduates, 2005-2013



- African American
- American Indian or Alaskan Native- Non Hispanic
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# San Bernardino Alliance Pathway Model

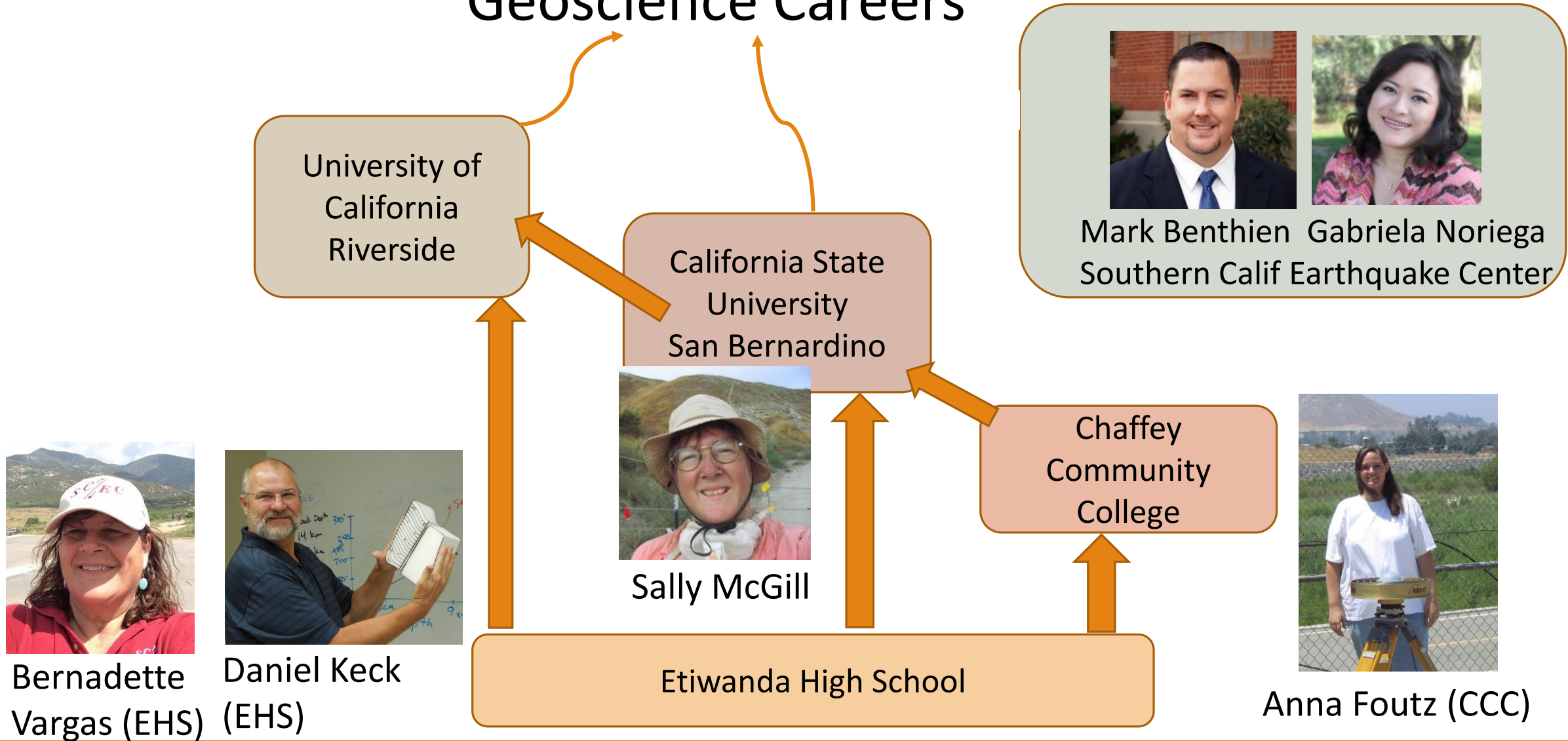
## Geoscience Careers





# Partnering with Local Champions for Earth Science Education

## Geoscience Careers



# Round Table Event

- December 15, 2016, at CSUSB
- Goals
  - Introduce the EarthConnections vision and San Bernardino Alliance to
    - administrators, geoscience faculty, students, and alumni of the three participating educational institutions
    - leaders of local professional organizations
  - Brainstorm ideas for how we can work together to implement our Shared Vision
  - Develop preliminary action plan



# Interventions

## Geoscience Careers

University of  
California  
Riverside

Local Professional Organizations

- Inland Geological Society
- Association of Environmental and Engineering Geologists

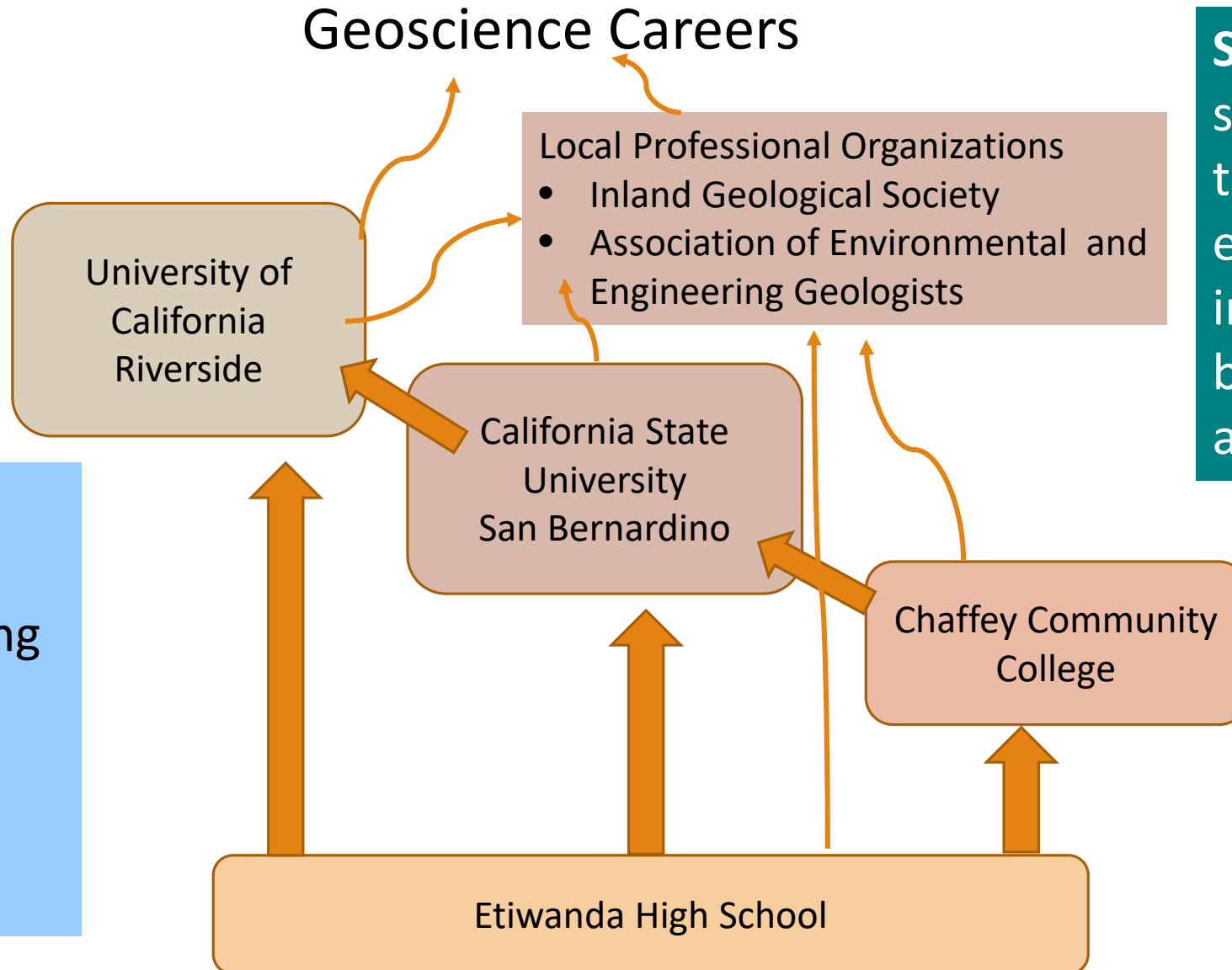
California State  
University  
San Bernardino

Chaffey Community  
College

Etiwanda High School

**Strategy 1:**  
Support and  
improve teaching  
in Introductory  
Geoscience  
courses across  
institutions

**Strategy 2:** Support  
students across the  
transitions between  
educational  
institutions and  
between education  
and career







# Interventions

## Geoscience Careers



University of  
California  
Riverside

California State  
University  
San Bernardino

Chaffey Community  
College

14 Geoscience faculty from all  
four institutions participated

Etiwanda High School

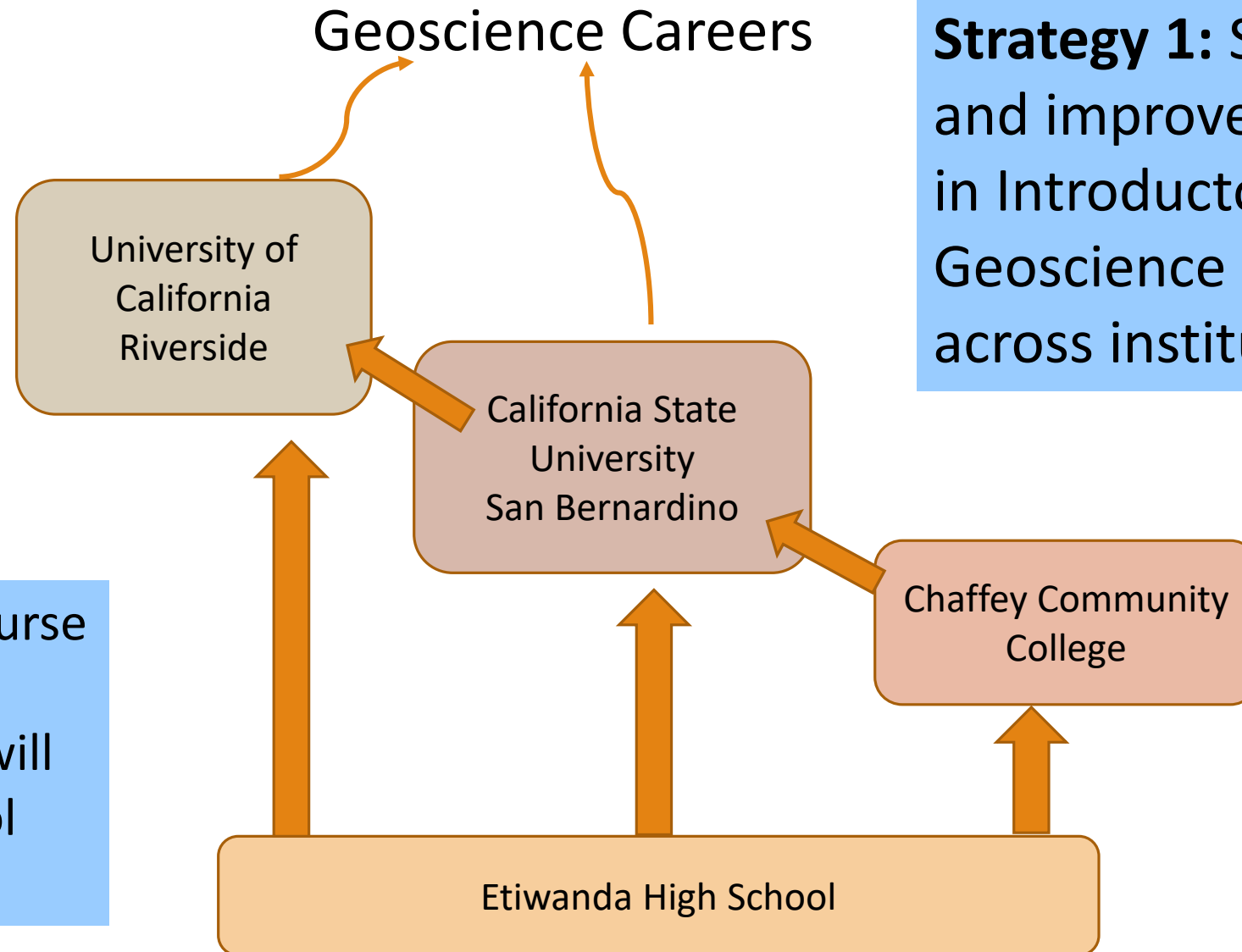
Hosted an  
NAGT/InTeGrate  
teaching workshop  
(Sept. 7-8, 2017)

# Interventions



Bernadette  
Vargas (EHS)

Honors geology course  
at Etiwanda High  
School. Students will  
earn credit for Geol  
101 at CSUSB

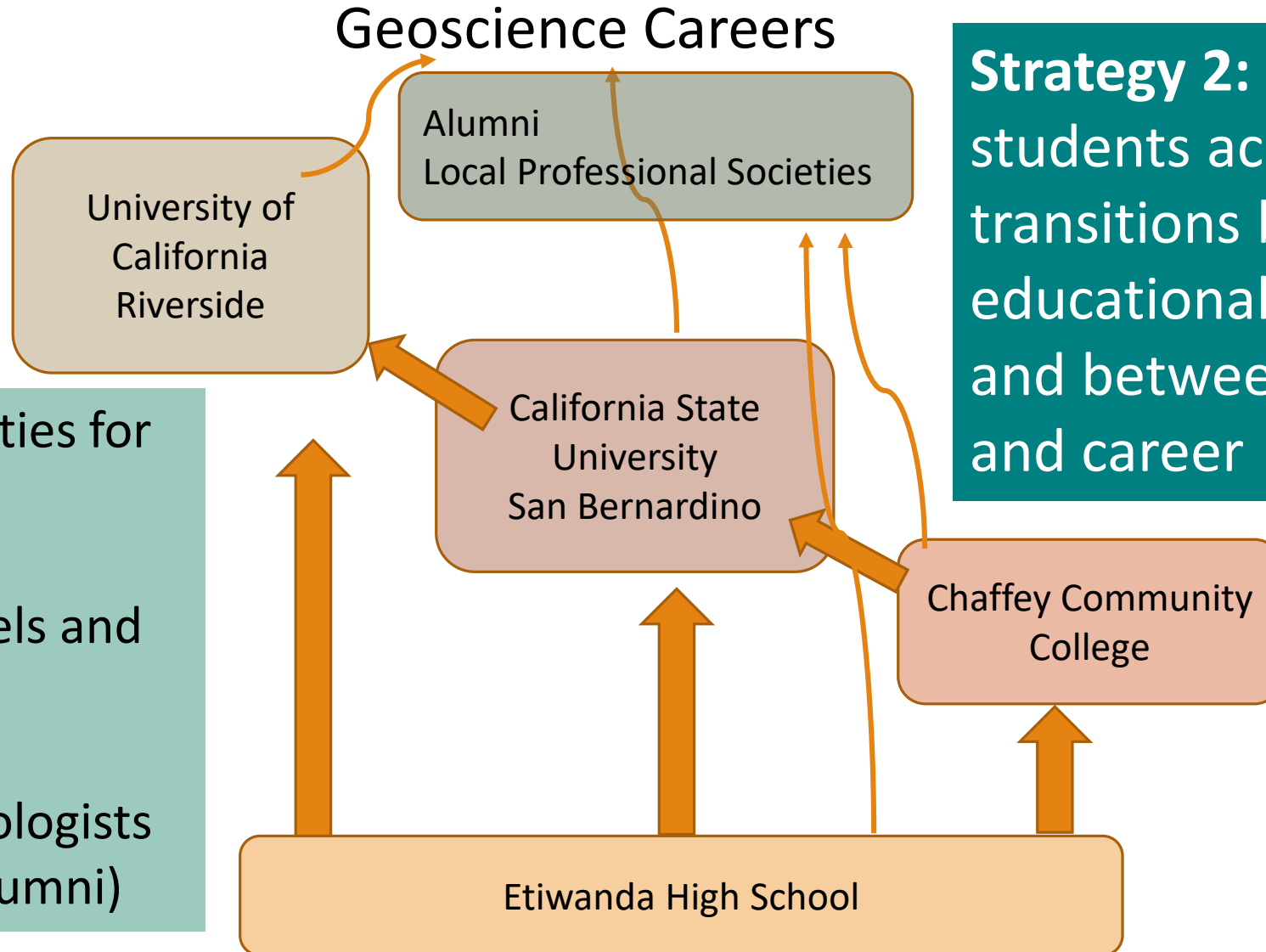


**Strategy 1:** Support and improve teaching in Introductory Geoscience courses across institutions.

# Interventions

**Action:** Joint activities for geology students

- across multiple educational levels and institutions,
- that include professional geologists (often CSUSB alumni)



**Strategy 2:** Support students across the transitions between educational institutions and between education and career

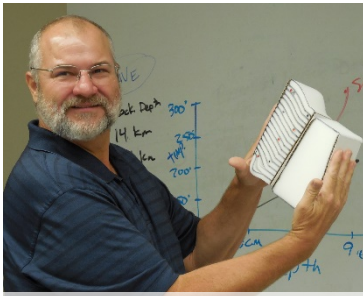
# Interventions

## Geoscience Careers

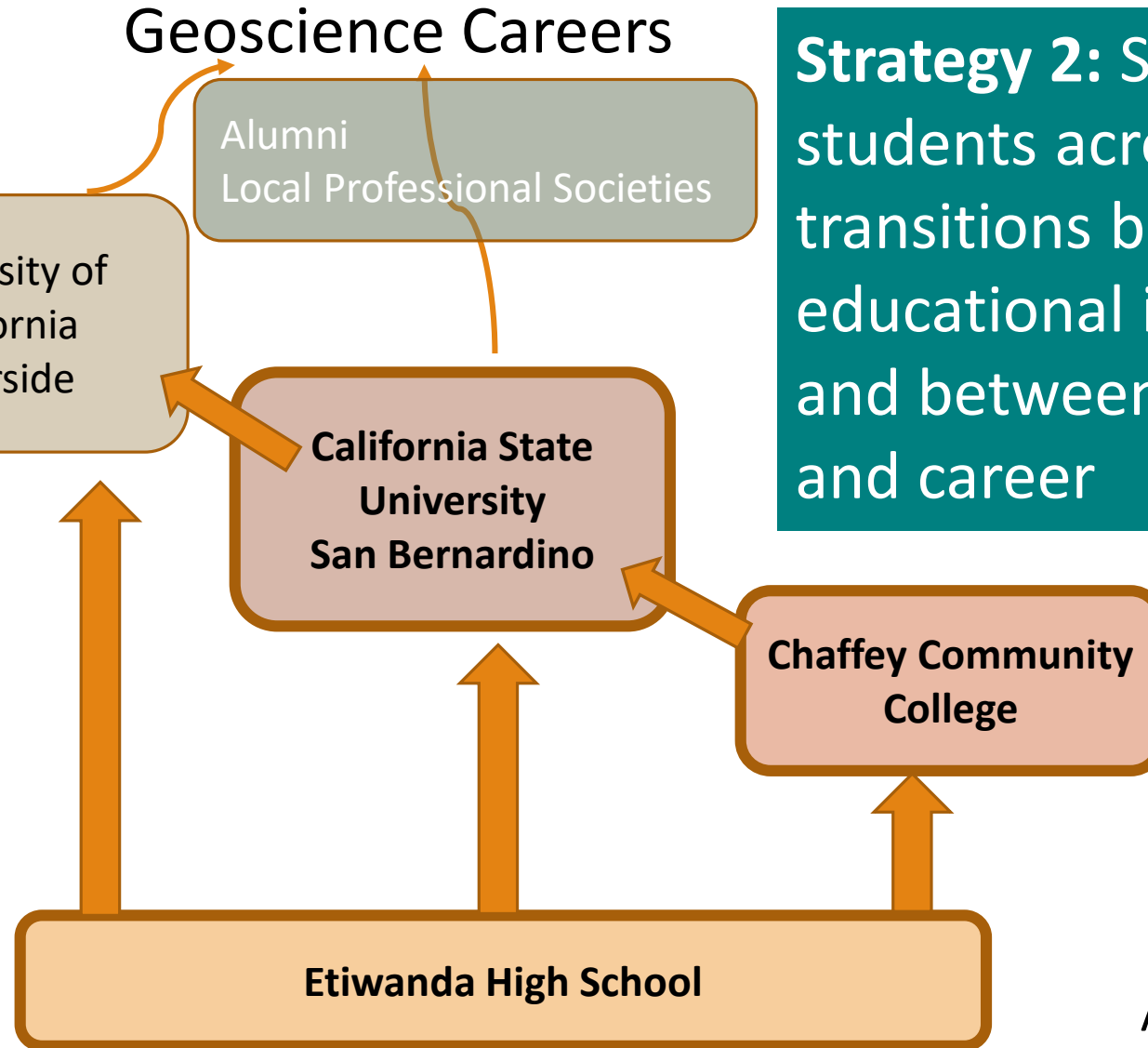
**Strategy 2:** Support students across the transitions between educational institutions and between education and career



Bernadette Vargas (EHS)  
CERT Club  
(Community  
Emergency  
Response Team)



Daniel Keck (EHS)  
Earth Science Club



Anna Foutz (CCC)



# Joint Field Trip to San Andreas Fault

**Saturday, March 25, 2017, 8 am – 2 pm**

- 25 high school students and their teachers
  - 5 community college students and their professor
  - 1 CSUSB master's student
  - 1 professional geology (CSUSB alumnus)
- 
- ½ mile hike to fault from CSUSB
  - Drone demonstration
  - Lunch-time speakers on graduate school and on careers in geology
  - Discussion of local geoscience issues relevant to our communities
  - Tour of seismically retrofitted buildings at CSUSB



Photo taken by drone



# Service Learning

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- CSUSB graduate and undergraduate students
  - Lead hikes from CSUSB to the San Andreas fault
  - Give presentations in K-12 classrooms
  - Attend field trips led by high school teachers as “resident experts”



# Garlock fault paleoseismic trench

- March 2018 (Spring break)
- NSF-funded research project
- M.S. thesis field work for Kyle Peña
- Nine other CSUSB students hired as field assistants
  - three other M.S. students
  - six undergraduate geology majors
  - 70% are from under-represented ethnic groups
- Two Ph.D. students from USC
- Three faculty collaborators (CSUSB, USC, University of Sheffield)

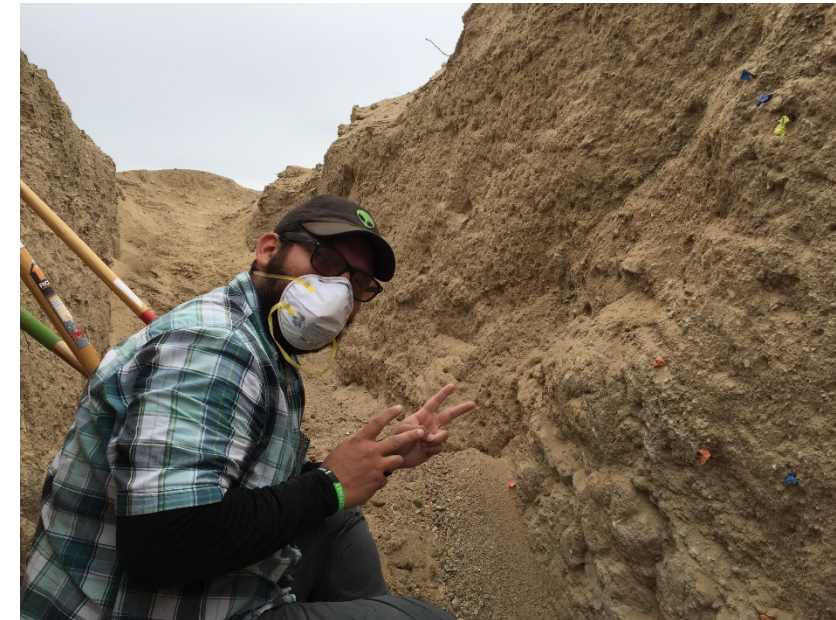




# Garlock fault paleoseismic trench

## Benefits

- Development of relationships between undergraduate, M.S. and Ph.D. students, as well as faculty through shared work and meals
- Social support and broadening of horizons for
  - 2 new undergraduate transfer students
  - 2 new M.S. students
- Extended opportunities for all students to interact with peers who are farther along in their career preparation path and to ask questions about careers and career preparation



# Garlock fault paleoseismic trench

## Benefits

- 5 of the 9 CSUSB students who assisted at the trench completed an anonymous post-activity survey.
- 100% of respondents agreed with the following statements
  - This experience helped me to further develop my sense of identity as an Earth Scientist.
  - I felt a sense of belonging among a community of scientists.
  - I gained confidence in my ability to pursue a career in the geosciences.





# Garlock fault paleoseismic trench

## Participant comments on the survey:

- I have helped open a trench before but I have never experienced logging trench walls. It was fun and interesting how to see the "data" in the trench.
- Working alongside faculty mentors and PhD/Master's degree student's at the Garlock turned out to be fruitful because my relationship with colleagues developed into new friendships, and I was trusted to work with new equipment and learned new terminology geared towards paleoseismology.
- This was a great experience for me and I got to learn new things related to my field of study.





# Upcoming joint activities under consideration

- Multi-institutional faculty learning community to implement the InTeGrate “Map Your Hazards” module

The screenshot displays the InTeGrate website interface. At the top, the InTeGrate logo is accompanied by the tagline "Interdisciplinary Teaching about Earth for a Sustainable Future" and three circular icons representing different Earth science topics. A navigation bar includes a search function, a "Your Account" link, and buttons for "Download" and "How to Use". The main content area features a large aerial image of a flooded residential area. Overlaid on this image is a promotional box for the "Map Your Hazards! – Assessing Hazards, Vulnerability and Risk" module. This box includes a difficulty scale from 100 to 400, with the module positioned at the "Intro-Intermediate Level". It also specifies a duration of "3 Weeks" and a credit value of "3 Units". The authors listed are Brittany Brand (Boise State University), Pamela McMullin-Messier (Central Washington University), and Melissa Schlegel (College of Western Idaho), with David Gosselin (University of Nebraska - Lincoln) as the editor.

**InTeGrate**  
Interdisciplinary Teaching about Earth  
for a Sustainable Future

Earth-focused Modules and Courses for the Undergraduate Classroom

**Map Your Hazards! – Assessing Hazards, Vulnerability and Risk**

100 200 300 400  
Intro-Intermediate Level  
3 Weeks  
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Brittany Brand (Boise State University)  
Pamela McMullin-Messier (Central Washington University)  
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Editor: David Gosselin (University of Nebraska - Lincoln)

# Upcoming joint activities under consideration

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- 2018 Great California ShakeOut at Etiwanda High School
  - Booths for geology clubs from local community colleges and universities on ShakeOut day
  - Booths at a pre- or post-ShakeOut visit of the San Bernardino County seismic simulator
  - Presentations by CSUSB M.S. students at the E.H.S. Geology club and Community Emergency Response Team (CERT) club prior to the 2018 ShakeOut drill



# Summary

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Strategy 1: Support and improve teaching in introductory geoscience courses across institutions

- NAGT traveling workshop (Sept 2017)
- Honors Geol 101 course at Etiwanda High School

Strategy 2: Support students across the transitions between educational institutions and between education and career

- Joint field trip (March 2017)
- Outreach by CSUSB students to K-12 classes
- multi-institution paleoseismology field research experience
- Map Your Hazards module (multi-institution)



# Conclusions

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- Limited funding for regional alliances necessitates capitalizing on projects funded by other sources, infusing EarthConnections goals into those projects
- EarthConnections collective impact backbone provides a community of support (cheerleading, idea sharing, surveys and other assessment measures, website support ...) that enables the regional alliances to be more effective than they would be on their own