

Does the 1938 Eleven Province System best support student learning?

Should the *Eleven Geomorphic Provinces* framework commonly used to teach *California Geology* classes be revised?



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Objective: Refocus course structure to improve student learning.

California Geology Classes within Geology Departments within the California Community College System, 2015¹

- ✓ Taught at 20 of 113 community college districts.
- ✓ Constituted 1.0 % of geology classes offered.
- ✓ Was in every case (except possibly one) a 3.0 credit-unit class

In all cases:

- Was deemed UC and/or CSU transferable.
- Fulfilled General Education requirements.
- Lacked a Geology or 'hard science' prerequisites.
- Was apparently not coordinated or paired with a laboratory class.

¹ Source: *California Community Colleges Chancellor's Office's Datamart* <http://datamart.cccco.edu/> queried March 22, 2016. Data aggregated for spring, summer and fall semesters of 2015.

Not Addressed in this Presentation

- Classes hosted by Earth Science departments
- Classes hosted by Geography departments
- *California Geology* classes less than 3.0 credit units.

Survey of Instructors* – How do you teach it? How would you like to teach it?

Salient Findings

Textbook vs. Powerpoint:

- 2 used primarily a textbook (Deborah Harden' book), with Powerpoint as a supplemental material.
- 1 used primarily Powerpoint, and a textbook as a secondary source.
- 2 used Powerpoint and little/no other formal material or media.

All 5 would use a textbook if a more updated book (or .pdf) were available.

All 5 use the Eleven Geomorphic Provinces framework to organize content & learning.

**Survey emailed in March 2016 to instructors identified as teaching California Geology in Fall 2015. Anonymous responses were received from instructors at 5 community college districts. n = 5.*

Survey Question: "How would you like to organize the California Geology portion of course content?"

- ✓ Via a statewide system that is less than 11 provinces.
- ✓ Via a chronologic or event-based scheme.

Survey Question: "How should the Eleven Provinces System be improved?" (responses paraphrased, shown in bubble)

Survey Question: "Why Is the Eleven Geomorphic Provinces used?"

Responses ranked by relative importance:

- ✓ Matches a textbook (or similar body of reference material) used in the curriculum.
- ✓ Considers physical geography/California geography.
- ✓ Instructor personally likes the 11 provinces system.
- ✓ How the instructor learned California geology.
- ✓ Specified in the college's official curriculum or catalog.
- ✓ Explicitly or implicitly required by or compatible with the college's accreditation

"I would lump the Basin & Range with the desert provinces since they have so much in common... I might also consider lumping the Sierra and Klamath; not sure about that."

"Harden concludes with a chapter that shows how the regions fit into state geologic history. I have found this transition from small to large effective"

"I tie the Basin & Range, Modoc, Mojave and Salton Trough together, per formerly more widespread (Basin & Range) continental extensional tectonics"

"I teach the Modoc as Basin & Range covered in Cascade volcanism"

"I teach the Klamath as a westward translated portion of the Sierra"

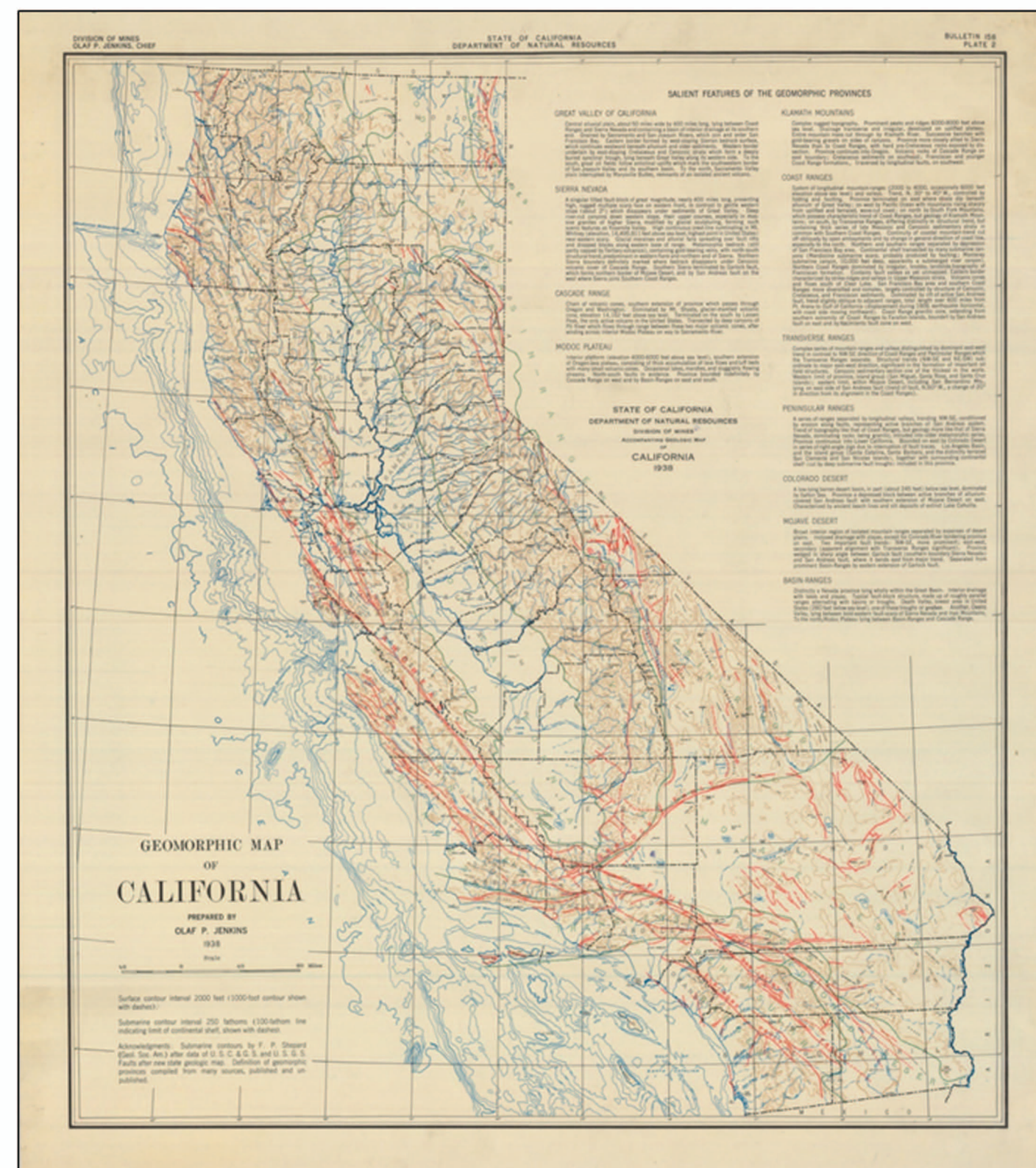
Possible Alternative Learning Frameworks

Magmatic Arc			Abundant / Exposed Accreted Terranes		Current or Former Basin & Range	Dis- sected by SAF system	Dis- sected by ECSZ ¹ / WLB ¹	Major depo- center
Active	Pri- marily Ceno- zoic	Pre- Ceno- zoic						
	x			Basin & Range	x		x	
x	x			Modoc	x		x	
x	x			Cascades	x		?	
	x			Salton Trough	x	x		
	x	x		Mojave	x		x	
	x	x		Transverse Ranges		x		
	x		x	Klamaths				
	x			Peninsular Ranges				
	x		x	Sierra Nevada				
			x	Coast Ranges		x		
				Central Valley				x
				Offshore ² / CA Borderlands ²		x		x

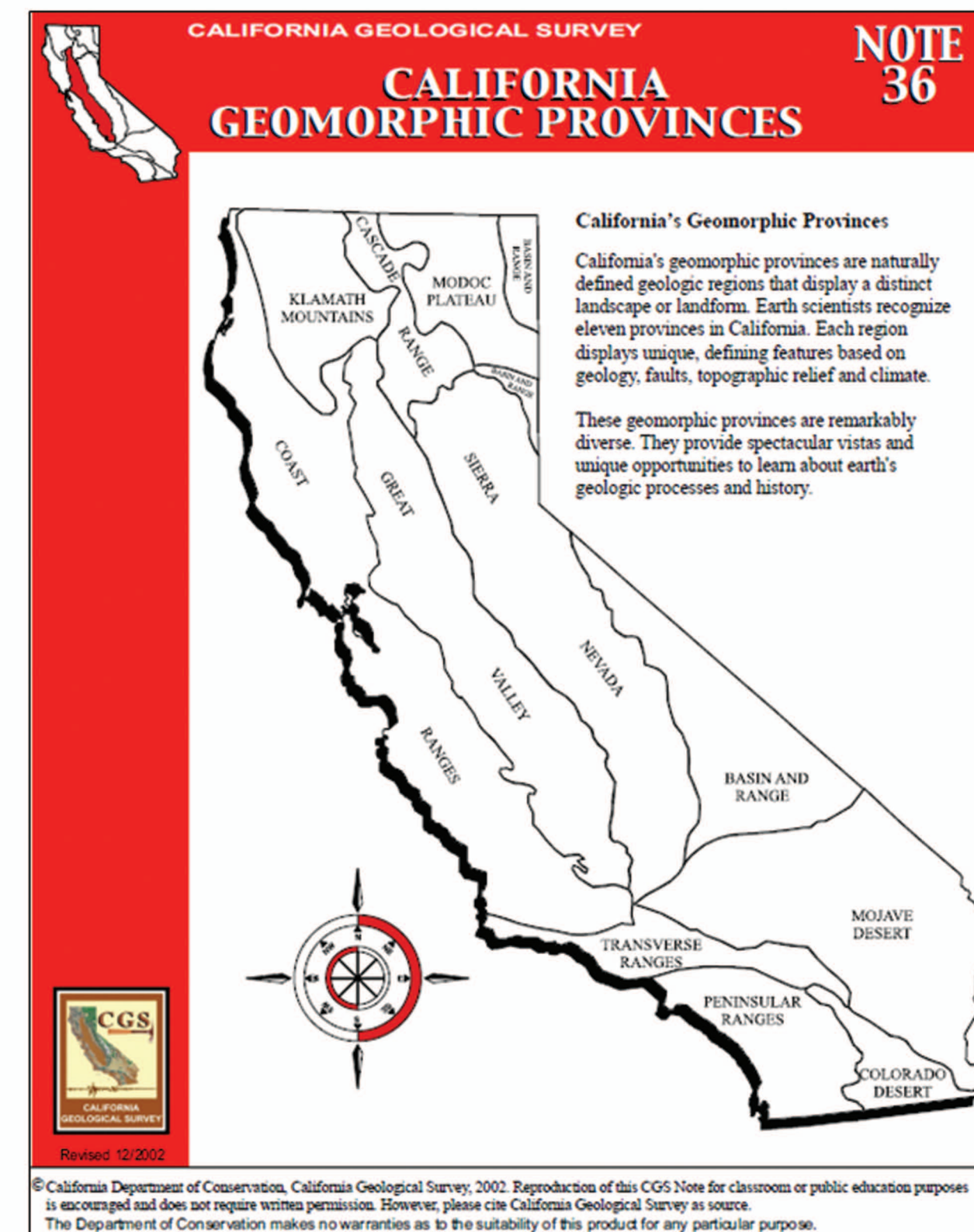
¹ Eastern California Shear Zone & Walker Lane Belt

Is an Offshore or Borderlands province warranted?
The USGS, IODP/DSDP/ODP and others have provided ample salient data.

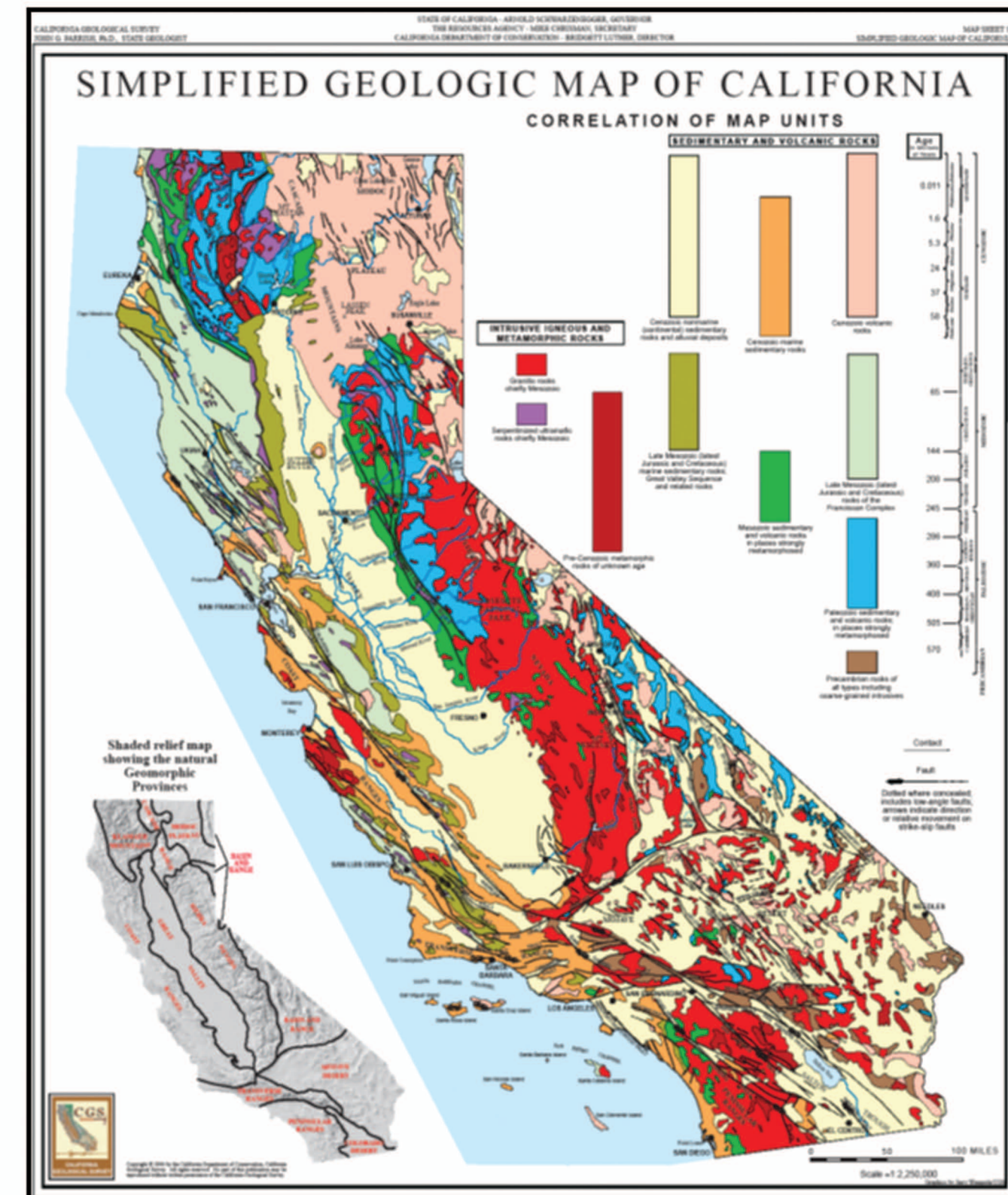
California's Chief Geologist Olaf Jenkins published the *Geomorphic Map of California* in 1938.



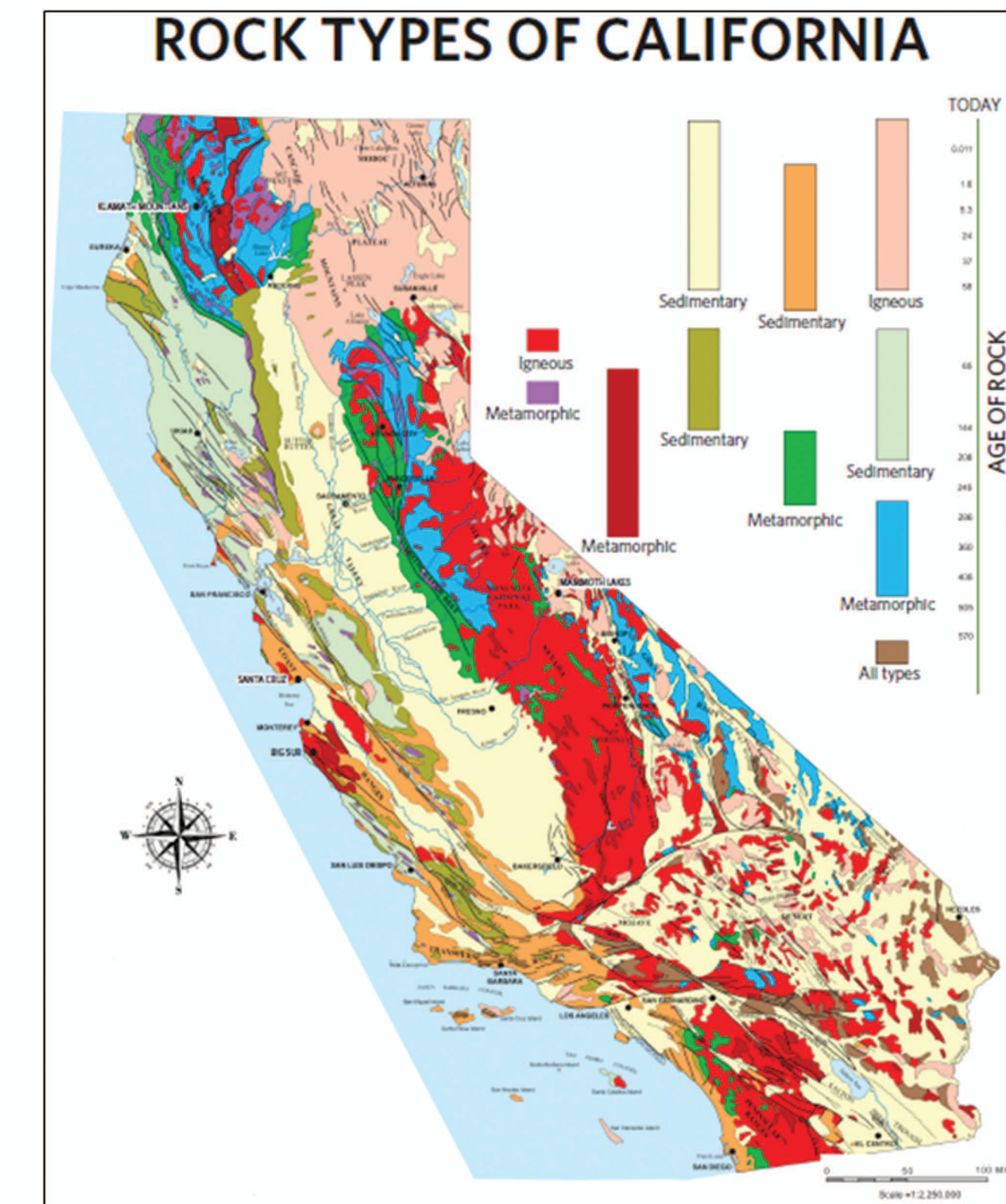
The state's *Geomorphic Map* remains unmodified since 1938.



The State and others have made *simplified geologic maps*.



Source: California Science Content Standards, 2014, calacademy.org/educators



Map widely used in teaching California Geology (map origin/author obscure/unknown)

