Resilient and Equitable Urban Stream Corridors

Experimental Design Framework

Investigators

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California Will Get Hotter and Weter

California's hotter future

Climate change caused by carbon emissions is projected to increase the amount of air conditioning needed in California.

Historical 1981-2010

Future 2080-2099

Average degrees of cooling needed each day.

28.8°F
19.2°F
9.6°F
0
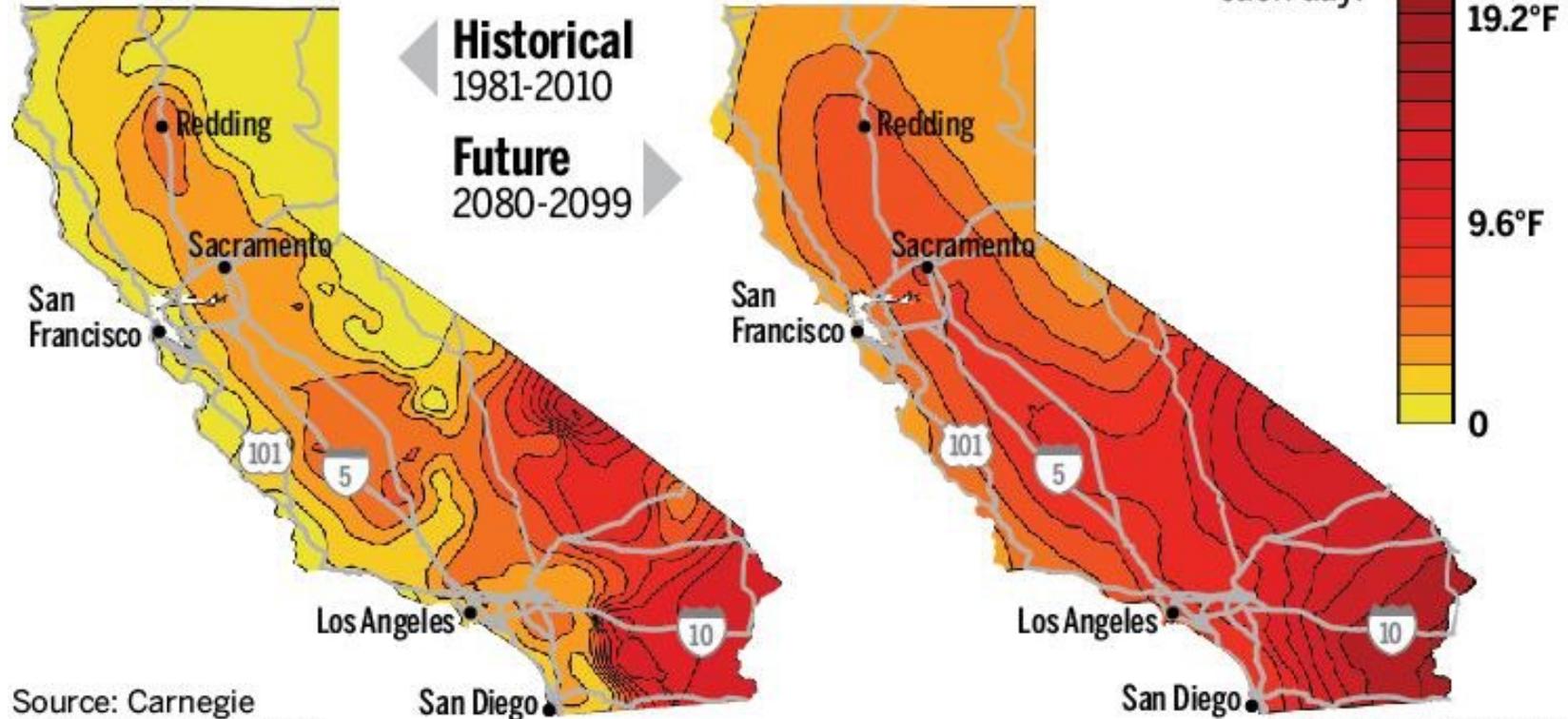
Source: Carnegie Institution for Science

BAY AREA NEWS GROUP

+14.1

+15.2

-3.3

Scientists predict California will see a 12 percent increase in precipitation through 2100. Levels will vary in the north, central and southern parts of the state.
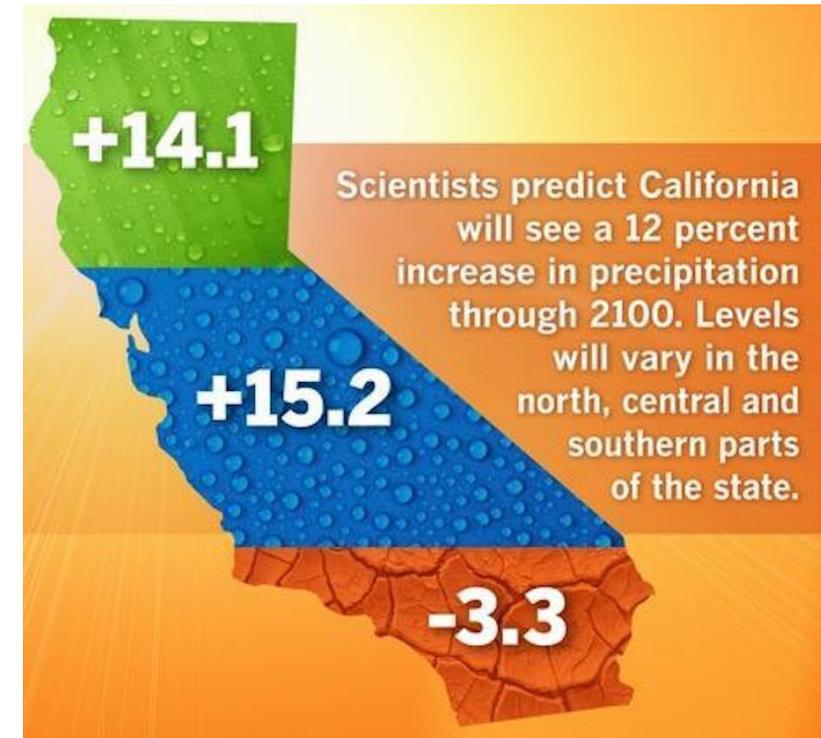
What Is An Urban Area?

- Urbanization refers to the concentration of human populations into discrete areas.

- Urban = core area with population density ≥ 1,000 people per square mile, plus surrounding areas with population density ≥ 500 people per square mile (U.S. Census Bureau, for 2000 Census).

- Urban = areas characterized by ≥ 30% constructed materials, such as asphalt, concrete and buildings (USGS National Land Cover Dataset).
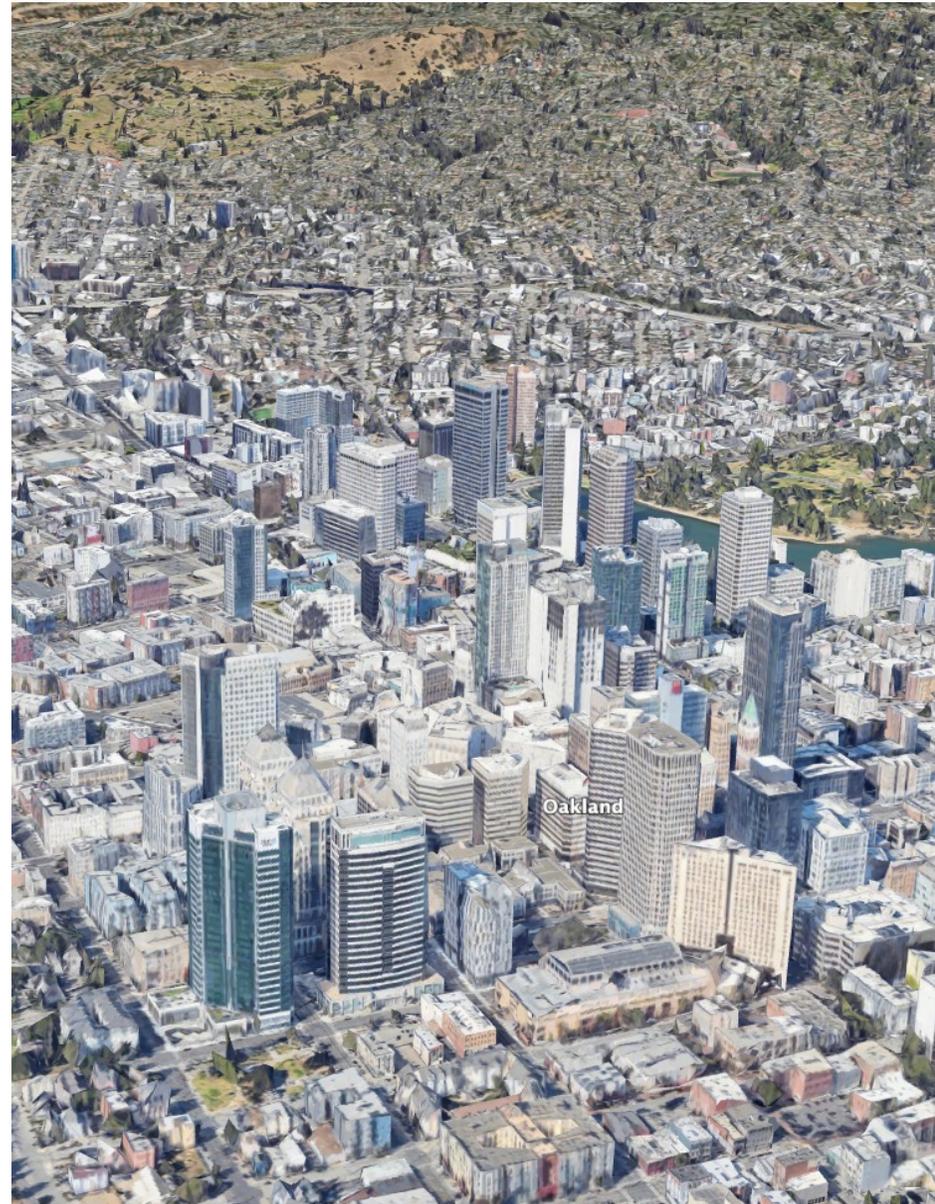
Pillars of Urban Civil & Environmental Management

Broad Framework

- Human Socio-Economic Wellbeing
- Natural Hazards
- Ecosystem Functioning

Focused Project Scope

- Unhoused People
- Water-Droughts & Floods
- Fish Habitat
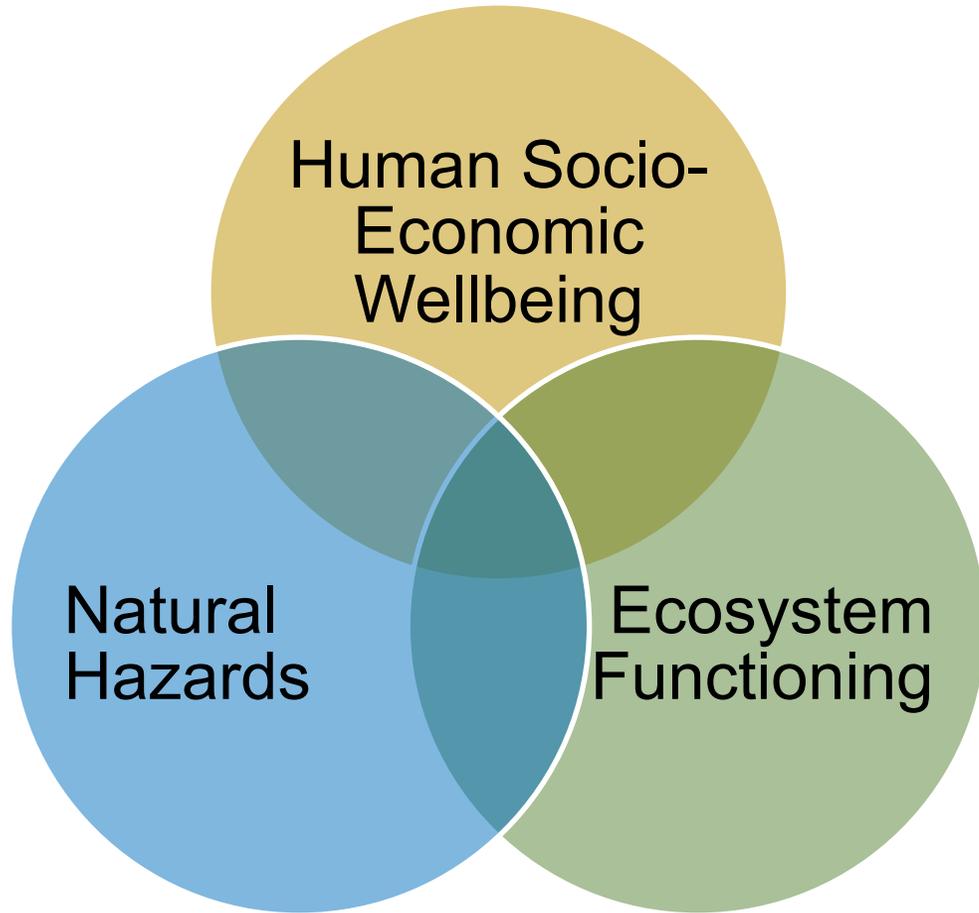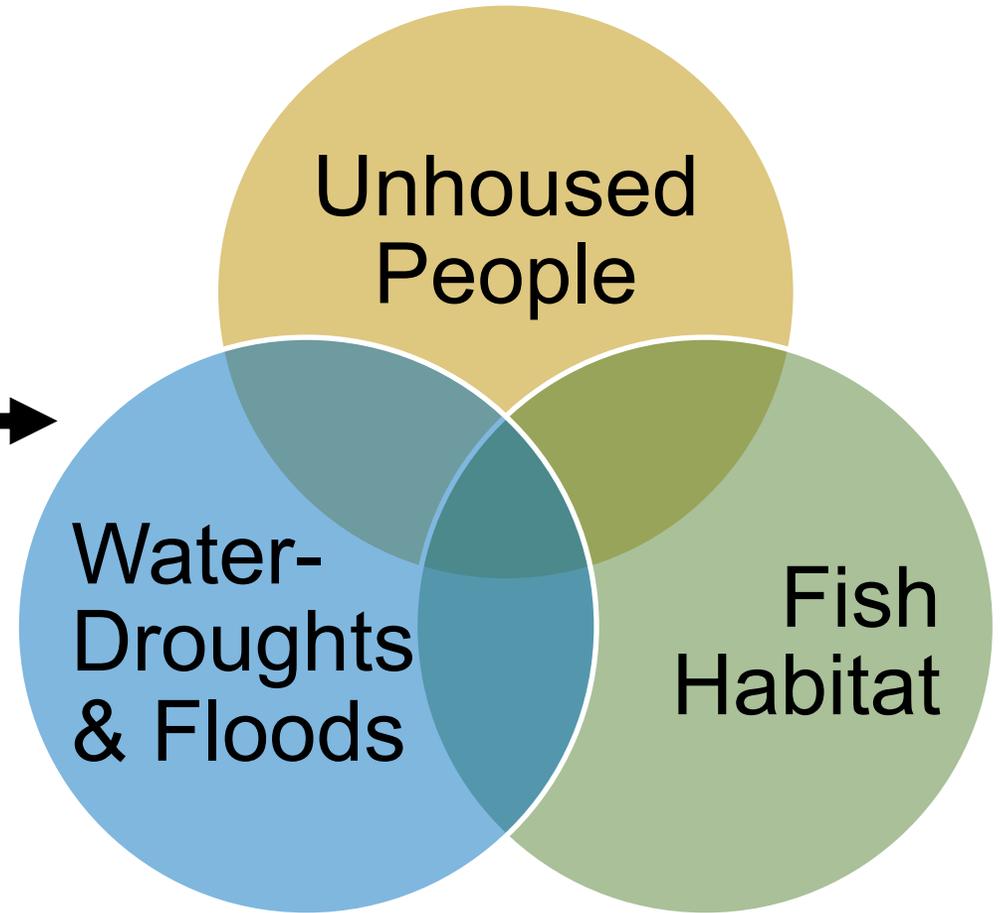
Societal Questions at Climate Change - Urban Nexus

Unhoused People

Water Regimes

Fish Habitat
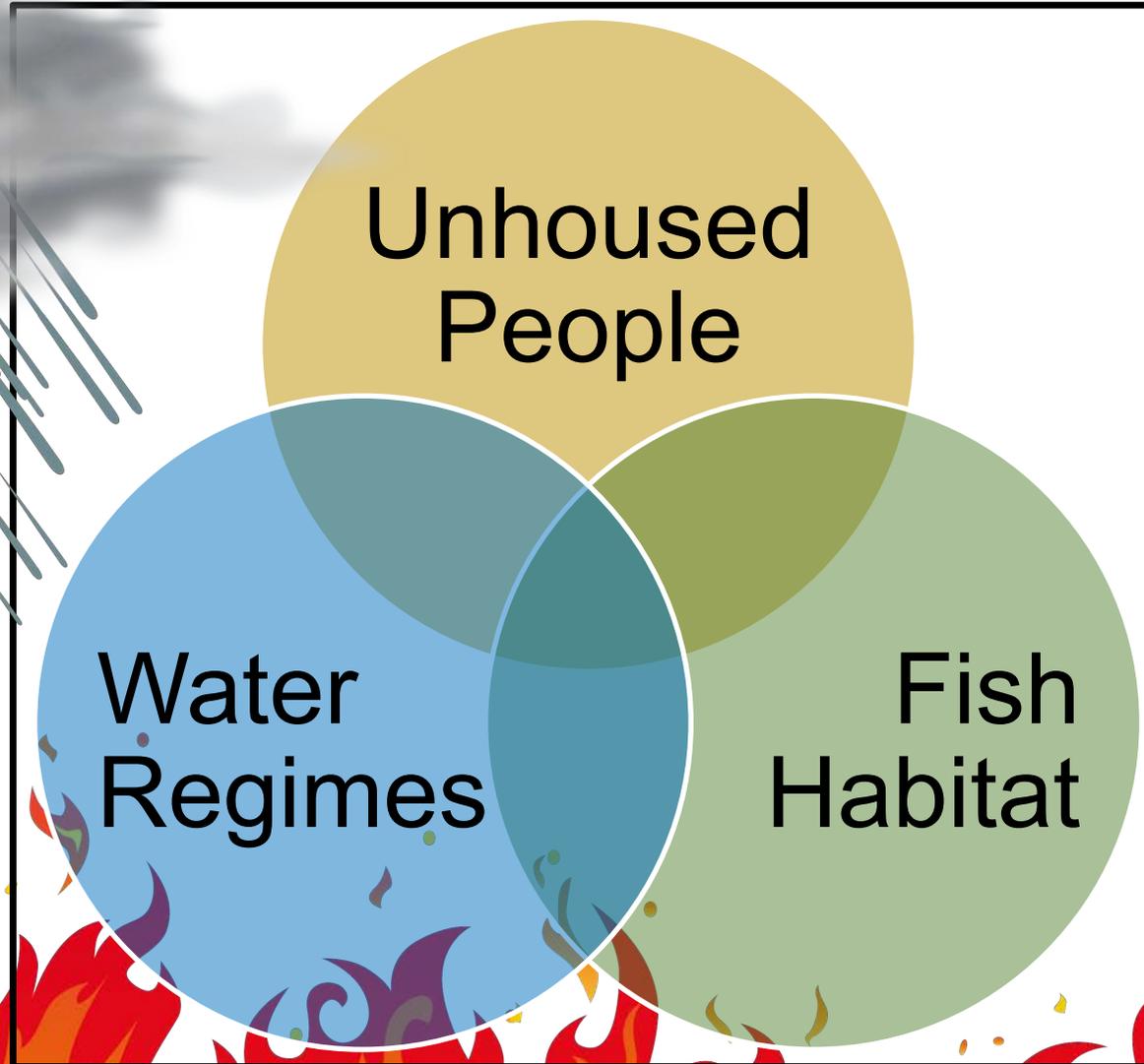
What will happen?

What do we do about it?

Discover Conditions Component

Guiding Question: Do there exist distinct types of urban stream corridors in terms of the hazard-human-ecosystem nexus?

- Phase 1: Design equal-effort "field" sampling campaign based on stratified random methodology.

- Phase 2: Carry out field campaign

- Phase 3: Analyze data to address individual research questions about Hazards, Humans, and Ecosystems, including VULNERABILITY

- Phase 4: Mechanistic modeling of urban stream corridor types

Regionalize Patterns Component

Guiding Question: How will the regional pattern of hazard-human-ecosystem urban stream corridor types change by 2050 and 2100?

- Phase 1: Gather, organize, and analyze regional climate, hazard, human, ecosystem datasets and analyze.

- Phase 2: Train and cross-validate existing AI/ML models using computer cluster to obtain best prediction of local conditions and dynamics

- Phase 3: Extrapolate hazard-human-ecosystem urban stream types across region.

- Phase 4: Apply AI model to future climate scenarios to forecast possible changes to regional patterning.

Ease Suffering Component

Guiding Question: What are the relative opportunities and constraints for implementing climate actions to become more resilient to cope with intransigent challenges and adapt to different conditions?

- Phase 1: Build our partnership and grow our capacities for future steps.

- Phase 2: Engage with the broader community.

- Phase 3: Leverage existing CA resources and partners' projects.

Collaboration Plan
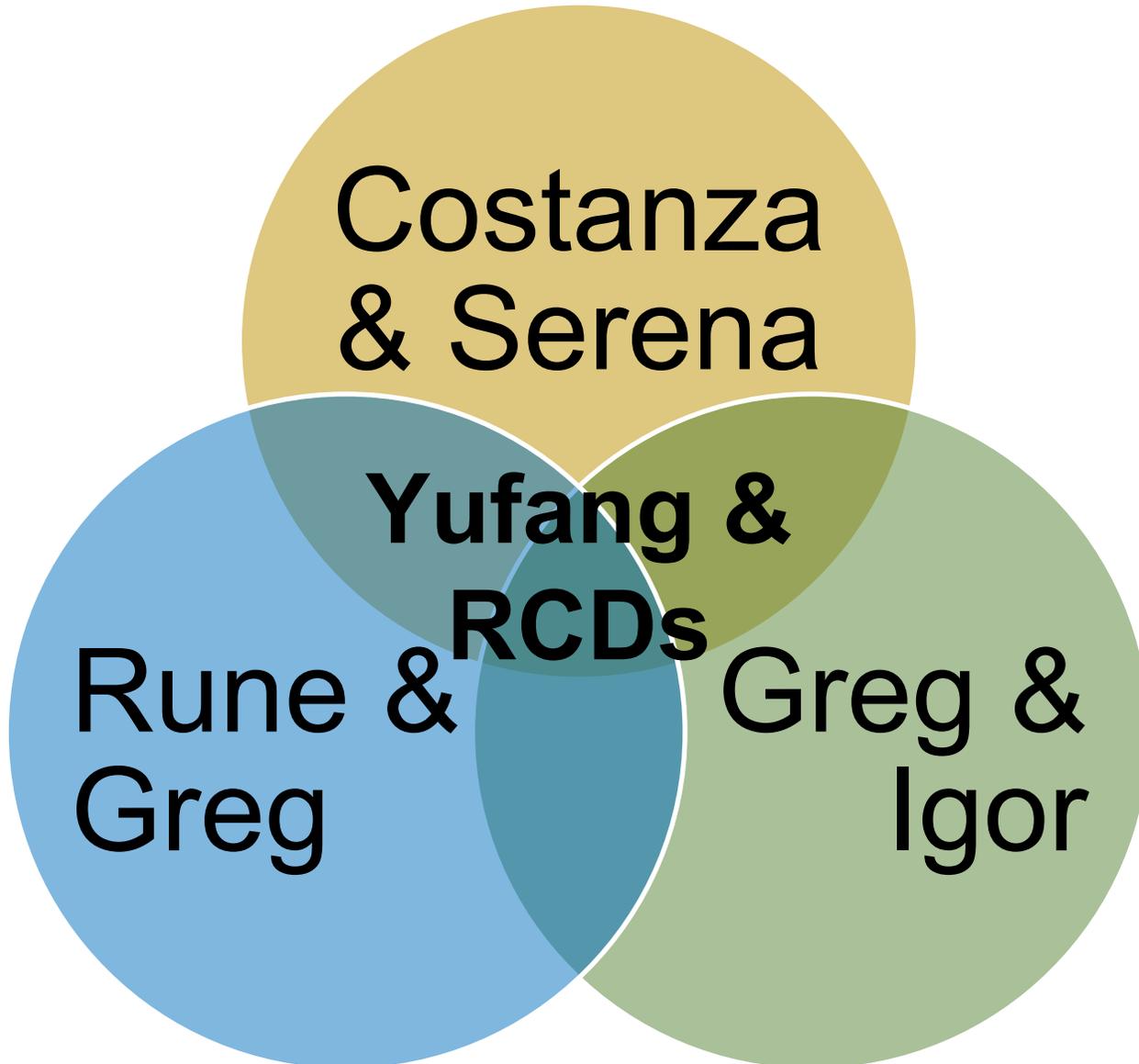
- Horizontal, democratic governance approach

- Topical leaders + integration leaders

- Biweekly online meetings with shared meeting notes file

- 2 annual workshops at SJSU

- Help RCDs host a regional conference on California's urban streams.

Future Grant Leveraging

- This whole vision is very broad and beyond a 2-year scope to achieve in all details, so we plan to seek additional funding to build out individual components over time.

- Invite local stakeholders to "plug in" their stream(s) by funding additional data collection to grow our database, but using our data collection, analysis, and synthesis protocols.

- Would be great to write a National Science Foundation proposal on homelessness in urban stream corridors.

- Seek international collaborations and funding:
  - Spread vision through IAHR
  - Exchange ideas with WERG in Melbourne and BOKU in Vienna.

Community Engagement

- UC outreach through cooperative extension and county advisors

- SJSU faculty have strong ties with local nonprofits & governments and experience working with unhoused people in urban streams

- RCDs leverage a lot of practical action. We have three urban RCD exec. directors on the team to engage us with diverse govt agencies and nonprofits associated with each district, and also connect with remaining urban RCDs

- The founder of the nonprofit SafeR3 will help us to offer risk/crisis management education, technology development, and innovation to maximize enterprise risk management for critical infrastructure.

- We plan to have an outreach coordinator, because there are so many organizations in California's urban areas that we need to have a constant engagement and mutual exchange; this person will run that effort under the supervision of the PIs.

- We plan to build into our project budget annual subawards directly to nonprofits for short-term, service-oriented actions that build community resilience in the face of climate-exacerbated problems.

Leverage Team To Enhance Partner Projects

- **Leverage our seed grant with other on-going, state-funded RCD activities and priorities to synergize for mutual benefits.**

- Produce and share maps of hazard-human-ecosystem nexus in a changing climate to guide public education and government action

- Compile and house historical information for geospatially identifiable projects for better public access and we aim to track the "shifting baseline" of conditions and information

- UC's ANR division is underutilized for addressing urban regions, so use this unique avenue to leverage state resources to enhance this project.