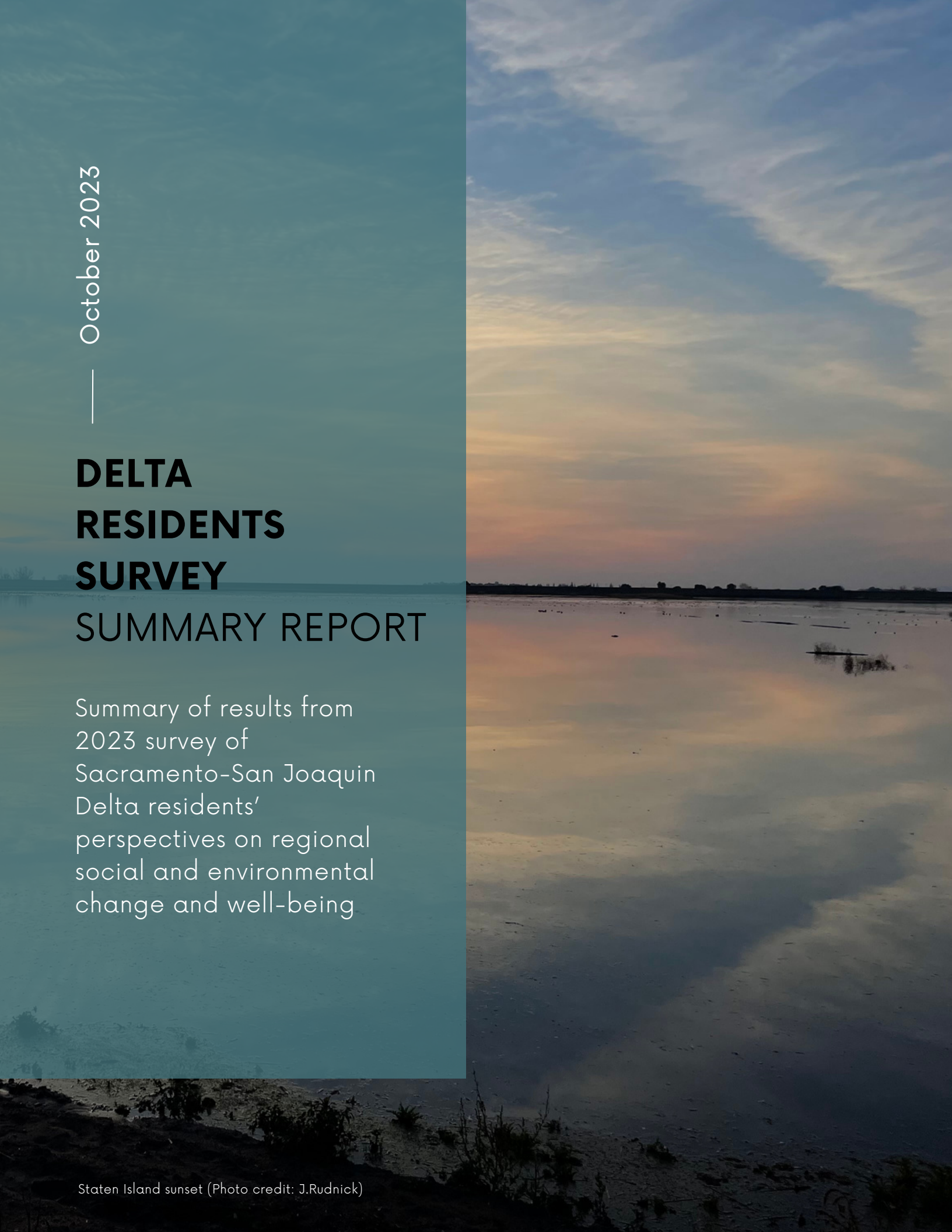
October 2023

DELTA RESIDENTS SURVEY
SUMMARY REPORT

Summary of results from 2023 survey of Sacramento-San Joaquin Delta residents' perspectives on regional social and environmental change and well-being



Staten Island sunset (Photo credit: J.Rudnick)

Research Team

Dr. Jessica Rudnick
Social Science Extension Specialist, CA Sea Grant &
Delta Stewardship Council

Kenji Tomari
PhD Student, University of California Davis

Dr. Kristin Dobbin
Assistant Professor of Cooperative Extension,
University of California Berkeley

Dr. Mark Lubell
Professor, University of California Davis

Dr. Kelly Biedenweg
Professor, Oregon State University

Acknowledgements

We would like to thank the many community groups and Delta residents who made this research possible by participating and providing genuine input in the community meetings, focus groups, interviews, and surveys that informed this work and the results presented in this report. In addition to Delta residents, many additional project partners contributed to the success of this effort. The research team would like to thank the following people and groups for their support:

Delta Stewardship Council and Delta Science Program:
The Delta Stewardship Council's Delta Science Program was established to provide scientific information and syntheses to inform environmental and water decision-making in the Delta. The program fulfills its mission by funding research, synthesizing and communicating scientific information to policymakers and decision-makers, promoting independent scientific peer review, and coordinating with Delta agencies to promote science-based adaptive management. The Delta Science Program provided funding for the Delta Residents Survey research project to fill a research gap identified by the 2020 Social Science Strategy for the Sacramento-San Joaquin Delta (Bidenweg) and the 2022-2026 Science Action Agenda (DeltaScienceProgram).

Special acknowledgements of the following Delta Stewardship Council staff who supported the DRS effort to exceptional degrees are merited. Thank you to Lita Brydie (former Program Analyst) for her work through her Master's Capstone project to support qualitative data analysis informing this project, Annie Merrit (Environmental Scientist) for her help in the community outreach campaign, Rachael Klopfenstein (Program Manager) for her management of the funding contract for this project, Louise Conrad (former Deputy Executive Officer of Delta Science Program), Laurel Larsen (Delta Lead Scientist), and Jeff Henderson (Deputy Executive Officer for Planning and Performance Division) for their consistent support and attention to this research effort, and to Emily Ryznar, 2021 California Sea Grant State Policy Fellow within the Delta Science Program, for her contributions to background research efforts.

Sacramento State University Institute for Social Research:
The Institute for Social Research (ISR) supports community partners in finding data-informed answers to their most pressing questions. ISR offers a broad range of expertise in conducting applied survey research and working with state government agencies to inform program and policies across the state.

Special thanks to Julia Tomassili, Robert Rodriguez, Mayra Adame, Sebastian Cambre, and Shannon Williams on the ISR team who supported the Delta Residents Survey research effort by providing expertise on survey sampling and survey design, translation, programming, and distribution of the survey to respondents, and collating, cleaning and anonymizing survey data.

Survey Advisory Committee:

Advisory committee members volunteered their expertise to support the Delta Residents Survey research effort, advising on survey design and supporting community outreach and beta-testing. Members are listed alphabetically:

Ajay Singh - Sacramento State University
Alejo Kraus-Polk – UC Davis
Alex Thompson - San Francisco Estuary Partnership (2021 Sea Grant State Policy Fellow)
Barbara Barrigan-Parilla – Restore the Delta
Bob Erlenbusch - Sacramento Regional Coalition to End Homelessness
Brett Milligan - University of California Davis
Caleb Scoville – Tufts University
Campbell Ingram – Delta Conservancy
Darcie Luce – San Francisco Estuary Partnership
Darcy Bostic – Rural Community Assistance Partnership
David Trimbach - Oregon State University
Erik Vink – Delta Protection Commission
Gilbert Cosio – River Delta Consulting
Isa Avanceña – Valley Vision
Josue Medellín-Azuara - UC Merced
Krista Harrington – Oregon State University
Kristi Matal - Office of the Delta Water Master
Lita Brydie - Delta Stewardship Council
Matt Holmes - Little Manilla Rising
Matto Mildenberger - University of California Santa Barbara
Megan Wheeler – San Francisco Estuary Institute
Michael George – Office of the Delta Water Master
Randy Fiorini - Former Chair of the Delta Stewardship Council
Rosemary Kosaka – NOAA Fisheries Southwest Fisheries Science Center
Tanya Heikkila - University of Colorado, Denver
Tim Stroshane – Restore the Delta
Sherri Norris - California Indian Environmental Alliance
Virginia Gardiner – Delta Protection Commission
William Muetzenberg – Public Health Advocates

Funding:

Data collection for this project was funded by a contract agreement between the Delta Science Program, Delta Stewardship Council (Contract DSC-21143), California Sea Grant, and California State University Sacramento. The contents of this report may not necessarily reflect the official views or policies of the State of California.

Data Analysis:

We are very grateful to Thomas Lumley for the {survey} package he developed in R to support complex survey analysis, and for the {Tidyverse} package developed by Pivot.

Report design:

Thank you to Elle Rudnick for the graphic design of this report.

Suggested citation:

Rudnick, J., Tomari, K., Dobbin, K., Lubell, M., and K. Bidenweg. 2023 Delta Residents Survey Summary Report. Report developed for the Delta Stewardship Council, Delta Science Program. Sacramento, CA.

Outreach for Delta Residents Survey, December 2022 (Photo credit: J.Rudnick)

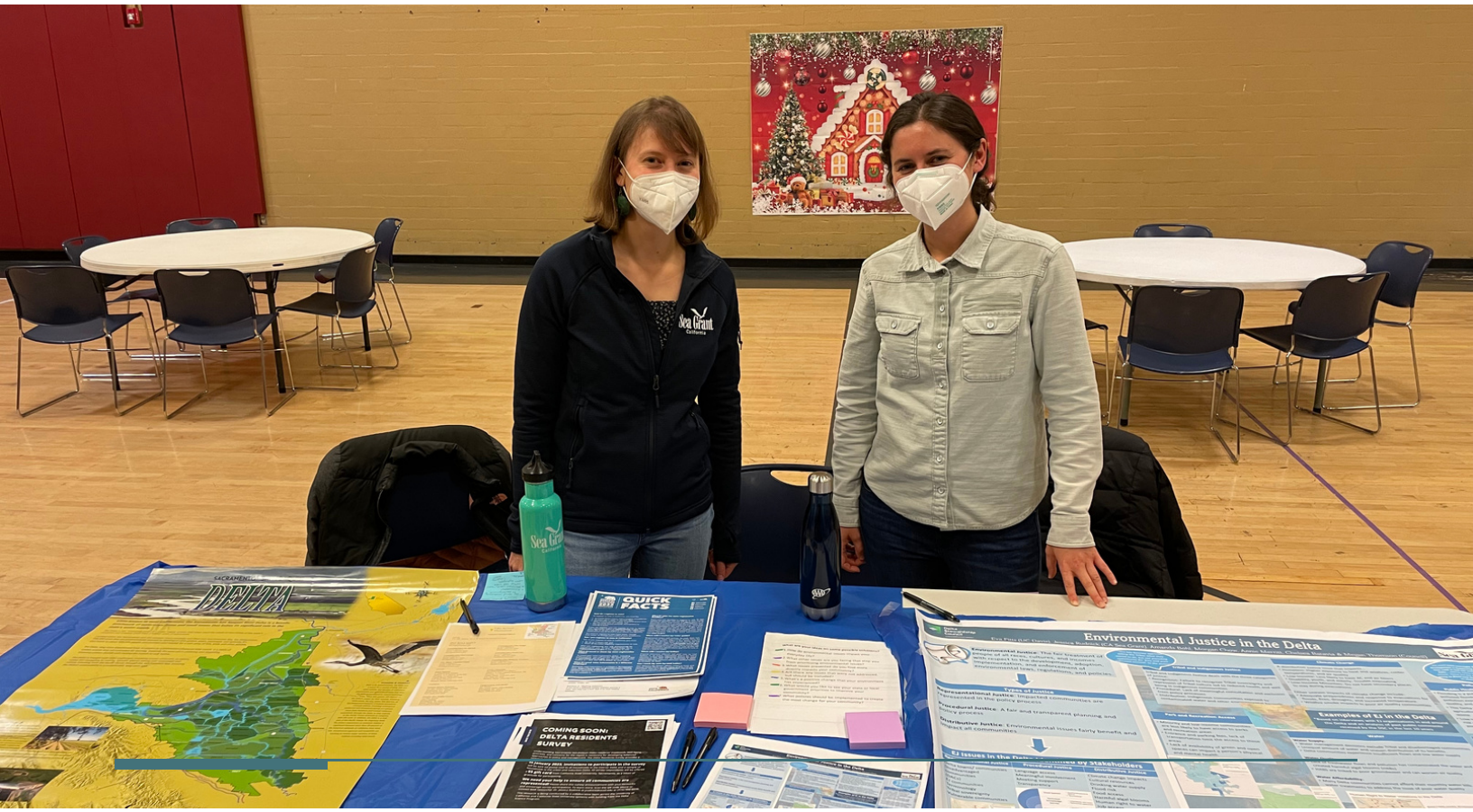


Table of Contents

Overview

Background:
California relies on the Sacramento-San Joaquin Delta, the largest estuary on the west coast, that serves as a hub for freshwater resources distributed across the state, a biodiverse ecosystem, productive agricultural land, and a crossroads for statewide infrastructure and transportation networks. Historic towns, cultural resources, and recreational opportunities pepper the rural interior Delta, which lies only miles away from the significant metropolitan areas that make up the urban Delta perimeter. In 2009, the Delta Reform Act created the Delta Stewardship Council to advance California's "coequal goals" for the Delta: "a more reliable statewide water supply and a resilient Delta ecosystem – in a manner that protects and enhances the unique characteristics of the Delta as an evolving place where people live, work, and recreate" (Wat. Code, § 85000 et seq.). The Council houses the Delta Science Program, which is tasked with providing the best possible scientific information to inform water and environmental management decisions for the Delta that aim to advance the coequal goals.

Despite statutory guidance calling for a complex balance of competing needs in the estuary and science-informed decision-making, the social and human dimensions of the Delta have been vastly understudied to date, in comparison to the physical and ecological components of the system (Bidenweg; Delta Independent Science Board, Monitoring Enterprise Review; Delta Independent Science Board, Review of Research on the Sacraemnto-San Joaquin Delta as an Evolving Place). While decades of monitoring the ecological health of the system have informed management approaches for ecosystem recovery, there has been significantly less attention to monitoring or evaluating the social health of the estuary, including how people influence ecological outcomes of interest.

In contexts like the Delta where people deeply impact and are impacted by the state of the natural system, understanding the people who live, work, play and depend on the environment is essential to developing effective and equitable management approaches. Moreover, people are at the heart of designing, supporting and implementing estuary recovery and resilience-building efforts, which are necessary in order to meet the state's coequal goals for the Delta. Understanding and tracking change in the human dimensions of the estuary– such as residents' opinions on regional priorities and concerns, stewardship behaviors, and experiences– will be essential to achieving the coequal goals.

The development of the 2023 Delta Residents Survey is one of multiple recent efforts supported by the Delta Stewardship Council's Social Science Integration Team and the Bay-Delta Social Science Community of Practice to begin better understanding and incorporating the human dimensions of the Delta into decision making. The Delta Residents Survey (DRS) was designed by a team of social science researchers working closely with Delta Stewardship Council staff, other partner state and local agencies, and community partners.

The DRS had four substantive research aims:

1. Characterize residents' sense of place;
2. Assess well-being of a diverse and evolving population living in the region;
3. Understand residents' experiences and perceptions of environmental and climate changes across the estuary;
4. Evaluate residents' civic engagement and perceptions of governance in the region.

The data were collected via a survey (available online and print version), with survey invitations sent by mail to a random sample of 82,000 households in the rural "Primary Zone" of the Delta (survey Zone 1), the suburban and urban "Secondary Zone" of the Delta (survey Zone 2) and Delta-adjacent "EJ Communities" in South Sacramento and South Stockton (survey Zone 3). The survey was available in English and Spanish. The survey included 43 multiple choice and short response questions, based on well-tested survey questions with input from the survey advisory group and Delta community members to ensure questions were appropriately locally tailored. See Table 1 below for a summary of the survey sections and Appendix A for the full survey tool.

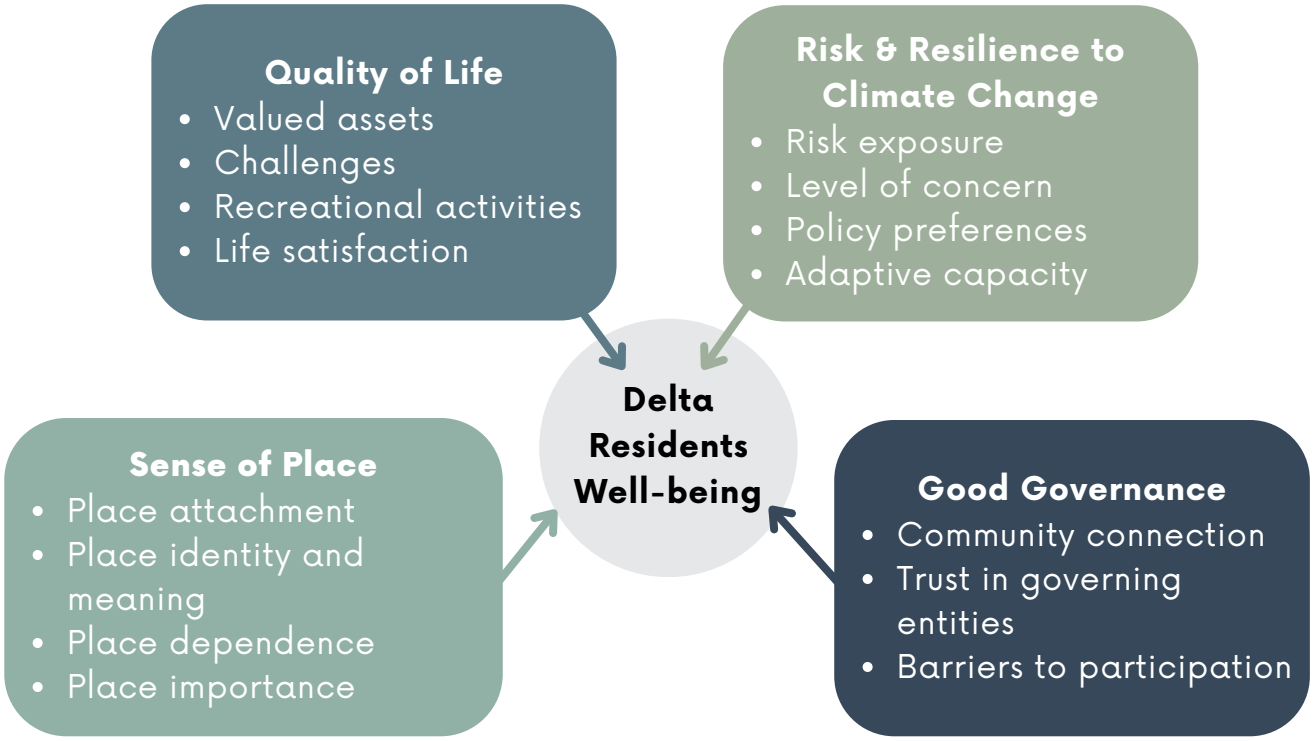
A total of 2,208 usable responses were received, constituting a 2.9% response rate, which is better than recent average response rates for randomized household surveys (CSU Institute for Social Research), and a margin of error of plus or minus 2.1%, given a 95% confidence interval. Survey analyses are based on weighted data to ensure results reflect demographically-representative sentiments. All details on methodology for survey design, distribution, data weighting and analysis can be found in Appendix B.

This report describes overall survey response trends, and when relevant, differences across demographics and geographies. These analyses include:

- Reporting averages, minimums/maximums, frequencies and standard deviations of responses on all survey questions;
- Tests for significant differences for key survey questions across demographic variables and survey zones; differences reported are significant at $p<0.05$ level;
- Maps showing how key survey responses vary across geography;
- Word clouds summarizing free response comments and text answers provided on different survey sections.

Anonymized DRS data will be made publicly available in early 2024. Datasets, interactive data viewing tools, and all reports will be made available here: https://ktomari.github.io/DeltaResidentsSurvey/.

Measuring Well-Being:



The conceptual figure above shows concepts measured through Delta Residents Survey that aim to better understand and assess overall well-being of Delta residents. The initial well-being components that the 2023 DRS survey measures were developed through a collaborative research and engagement process conducted by the research team from 2021-2023; however these concepts were not intending to be all encompassing of well-being. Future research and efforts to monitor and track residents' well-being should continuously evaluate what is most important to measure and how to do so; see Conclusions and Recommendations for more.

Table 1: Overview of Survey Sections

Concept	Example question wording	Question number(s)
Section I: Sense of Place		
Sense of Place: • Place attachment • Place identity & meaning • Place dependance	**Which of the following describe your relationship with the Delta:** • I am proud do live in the Delta • I depend on fishing or gathering in the Delta as a food source	Q1, Q3, Q4, Q5
Section II: Quality of Life		
Valued qualities of life in the Delta	**Which of the following do you value about living in the Delta?** • Access to outdoor recreation • Access to waterways	Q6
Challenges to life in the Delta	**Which of the following challenge your quality of life in the Delta?** • Affordability of basic needs • Environmental decline	Q7
Activities central to life in the Delta	**Do you engage in any of the following activities?** • Water-based recreation • Attend cultural events/ festivals	Q8
Life satisfaction	**Rate your overall satisfaction with your quality of life in the Delta.**	Q10

Concept	Example question wording	Question number(s)
Section III: Risk and Resilience to Climate Change		
Environmental impacts experienced	**Have you experienced any of the following environmental impacts while living in the Delta?** • Flood • Excessive heat	Q12
Concern for environmental changes	**How concerned are you about the following affecting the Delta in the next 25 years?** • Rising sea levels • Drought	Q13, Q14
Climate change beliefs	**How much do you believe these environmental changes are due to climate change?**	Q15, Q16
Adaptation policy preferences	**To prepare for environmental and climate change impacts to the Delta, would you support any of the following policies?**	Q17, Q18
Drought attitudes and experiences	**How much do you think California should be preparing for more severe droughts in the future?**	Q19, Q20, Q21, Q22, Q23
Adaptive capacity	**Which of the following resources do you have access to?** • Flood/ Home/ Health insurance	Q24
Section IV: Civic Engagement and Governance*		
Community connections	**Are you involved in any community groups?**	Q40
Feel represented in governance	**Who best advocates for your interests in the Delta?**	Q9

Concept	Example question wording	Question number(s)
Trust in governance	**How much do you trust the following entities to represent your interests in the Delta?** • Policy makers • Scientific experts	Q41
Civic engagement	**How likely are you to participate in Delta issues that matter to you by…?** • Attending public meeting • Volunteering with advocacy group	Q42
Barriers to engagement	**Do you face barriers to engaging on Delta issues that matter to you?**	Q43
Demographics		
Gender	**What is your gender?**	Q26
Age	**Which age group do you belong to?**	Q27
Race & Ethnicity	**Which of the following best describes your race/ ethnicity?**	Q28
Education	**What is the highest level of education you have completed?**	Q29
Income	**What was your household income in 2022?**	Q30
Home ownership	**Is your residence owned/rented/other?**	Q31
Languages spoken	**Which languages are spoken in your home?**	Q32
Area of residence	**Would you describe the area you live in as… urban/ suburban/ rural/ historic town**	Q2
Political ideology	**Which best describes your political views?**	Q34

*Section IV of the survey was offered to respondents as an optional section if they were willing to spend additional time responding. Approximately 50% of respondents continued through Section IV.

For full survey instrument, see Appendix A.

Discovery Bay neighborhoods (Photo credit: CA DWR)

Results Highlights

Sense of Place: Delta residents across the region hold strong shared understandings of why the Delta is important— as a critical ecosystem, California's water hub, a good region for outdoor recreation, and an important agricultural region for the state. Yet, the diverse Delta community also holds multiple place meanings and identifies with many different aspects of the Delta. For example, rural residents are attached to the region's quiet and solitude and report significantly more pride for the Delta and connection to the natural environment, while urban residents are more attached to the outdoor recreational access the Delta provides. Place attachment is higher overall among respondents identifying as men, older age, White, higher education, higher income, homeowners, or living in households speaking only English; whereas, respondents identifying as men, Latino or Hispanic, younger in age, lower education, or living in multilingual households report significantly higher dependence on the Delta for their jobs, livelihoods, or subsistence.

Quality of Life: Many residents across the region value the scenic beauty and access to recreational opportunities that the Delta provides. When it comes to regional concerns, many residents also share concerns about aging infrastructure in the region, including the levees, bridges and roads. Rural residents express significantly greater concerns for the Delta Conveyance/ Tunnel project and access to highspeed internet, while urban residents express greater concern for traffic and transportation options. Furthermore, social inequality in the Delta is apparent from the survey results. More than one-quarter of respondents indicate affordability of basic needs (housing, food, transit, healthcare) as a major challenge to their quality of life; people of color report these challenges at significantly higher rates than White residents.

Risk and Resilience to Climate Change: Unsurprisingly, following recent years of significant environmental and climate change impacts including the early 2023 major floods, 2020-2022 extreme drought conditions, 2020 record-breaking wildfire year, over three-quarters of Delta residents are concerned about the threats that climate change poses to the Delta over the next couple of decades. While residents have varying perspectives about what approaches should be taken to adapt to climate threats, the majority support the state funding sustainable agriculture and increasing land for habitat restoration. The diversity of residents in the Delta also means there is a variety of preparedness among residents to face climate change impacts.

For example, low-income residents and people of color have significantly less access to important resources for climate resilience, such as climate-controlled environments, mobile devices with internet, and emergency financial resources.

Civic engagement and governance: A majority of respondents indicate placing greater trust in scientific experts, local residents and community advisory groups, than in policy makers at local, state or federal levels, to make decisions in the best interest of the Delta. Membership in community groups and organizations was low across all respondents, though older and rural residents tended to be more involved in community groups than younger and urban residents.

"It is a beautiful place to live, full of life, trees, plants, animals. The land is rich and great place to grow food, the waterways are fun to play in and if we are responsible, we will have it for many many years to come..."

– Delta resident's description of the region

Fishing Lookout Slough (Photo credit: CA DWR)

By the Numbers

I Sense of Place

- Respondents' average residence time in the Delta is 24 years (max 84 years).
- Respondents' average overall sense of place score is 4 (0 being lowest, 12 being highest).

II Quality of life

- A majority (53%) of respondents associate strong recreational value as central to the Delta's identity & two-thirds of respondents (66%) do land-based recreational activities.
- About 60% of respondents say they are satisfied or very satisfied with their quality of life. Life satisfaction was significantly higher among rural region residents, than suburban/urban residents.

III Environmental & climate change

- On average, respondents report experiencing 2 out of 7 environmental and climate change impacts, most commonly extreme heat and worsening air quality.
- Less than 20% of residents have flood insurance.

IV Civic engagement and governance

- The majority of respondents said they were very likely or likely to vote in an election (87%) or sign a petition (75%). For all other engagement activities, a minority of respondents said they were likely or very likely to engage.
- One-third of respondents indicate being too busy or feeling like their input will not affect decision-making as key barriers preventing them from engaging in Delta issues that matter to them.

Staten Island sunset (Photo credit: J.Rudnick)

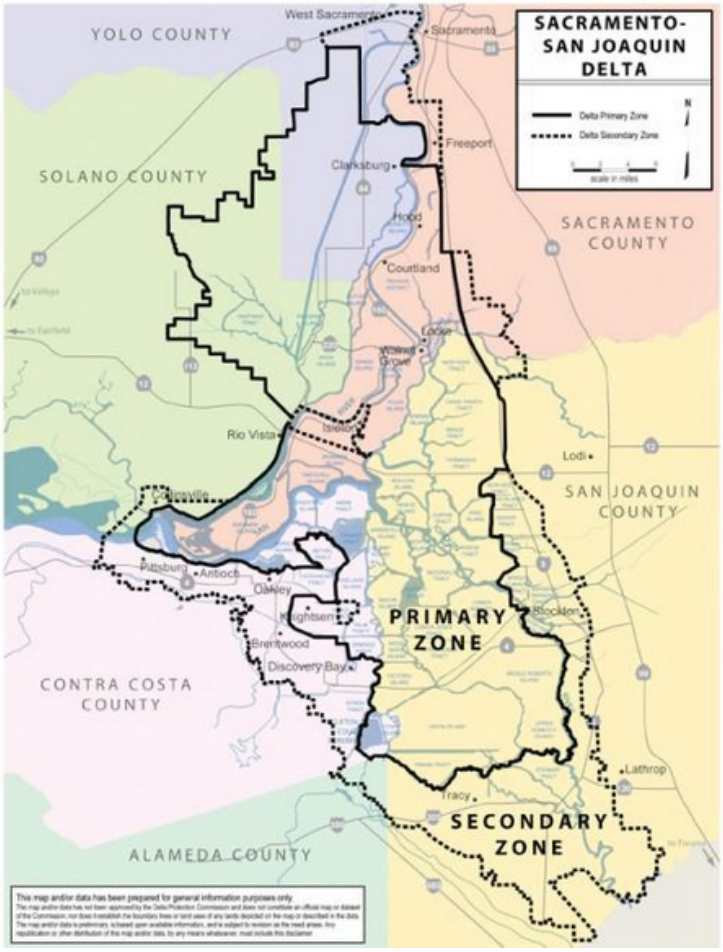
Research Context

Understanding the physical, environmental, and social context in which surveys are conducted are important considerations in interpreting results. Particularly if the Delta Residents Survey is repeated across time to evaluate longitudinal social changes, consideration of contextual factors specific to when the surveys are fielded will be important to understanding trends over time.

Geographic Context:
The Sacramento-San Joaquin Delta is formed by the confluence of the Sacramento and San Joaquin rivers that flow out of the Sierra Nevada mountains and westward to the San Francisco Bay. The Delta is home to over 600,000 people across portions of six counties: Alameda, Contra Costa, Sacramento, San Joaquin, Solano and Yolo.

The region stretches approximately 500,000 acres and is made up of hundreds of islands which were constructed from the mid-1800s to present, by draining and converting wetlands into year-round productive agricultural land, maintained by hundreds of miles of levees constructed around the islands. Approximately 700 miles of rivers and sloughs create a water network surrounding the islands, providing the backbone of the through-Delta water conveyance system and habitat for countless species of animals and plants.

In 1988, the state defined boundaries for different permitted land uses in the Delta, leading to distinct "Primary" and "Secondary" Zones (see Map 1).



Map 1: Legal Delta boundaries (Source: Delta Protection Commission)

The Delta Protection Act of 1992 provided authority to the Delta Protection Commission to develop a Land Use and Resource Management Plan that designates permissible land uses in each zone. The Primary Zone, which corresponds with survey Zone 1, is comprised of the "land and water area of primary state concern and statewide significance" and makes up the agricultural core of the Delta, where agriculture, wildlife and recreation uses are permitted and development is highly restricted. The Secondary Zone (survey Zone 2) is made up of the urban and suburban areas surrounding the Delta's rural core and includes parts of the cities of Stockton, Lathrop, Tracy, Oakley, Antioch, Pittsburg, Brentwood, Sacramento, and West Sacramento. Development is permitted in the Secondary Zone, subject to local land use restrictions.

The Delta Residents Survey research team wanted to be careful to consider the arbitrary nature of the Delta legal boundaries and evaluate if and how residents in areas adjacent to, but outside of the legal Delta boundaries held similar or different attitudes and opinions about the Delta. Moreover, community partners involved in informing the research project identified concerns that the communities most impacted by cumulative environmental burdens in close proximity to the Delta are often overlooked in decision-making because they lie just beyond the legal Delta boundaries. Thus, the research team decided to define an additional region of focus for the survey research which is referred to throughout the report as survey Zone 3. Zone 3 was comprised of two regions, one in South Sacramento and one in South Stockton, with communities known to be exposed to disproportionately high cumulative environmental harms. The research team elected to define the boundaries of Zone 3 to be consistent with communities identified by the California Community Air Protection Program1 (CAPP; responsive to 2017 Assembly Bill 617), which conducted an extensive engagement process to identify communities highly impacted by environmental harms and socially-vulnerable and define their spatial boundaries. The CAPP program identified two highly impacted and vulnerable communities near the Delta, one in South Stockton and one in South Sacramento/ Florin. These two communities comprise Zone 3 (see Map 2).

Climate Context:

The 2023 DRS survey was fielded from February to April 2023. The survey period followed one of the wettest California winters on record (December 2022-March 2023), that resulted in significant flooding and power outages from wind and downed trees, which directly affected the Delta and surrounding areas.

Preceding the wet winter however, 2020-2022 were two exceptionally dry and hot years, where the entire state was classified into drought and extreme drought conditions (California Department of Water Resources) and experienced drought impacts ranging from reduced water allocations, to mandatory water conservation measures, to large wildfires across the state.

Political Context:
Water and land management decisions in the Delta have a long history of controversy. At present, multiple contentious management approaches are currently being discussed, planned and reviewed. We briefly summarize two salient processes that we consider as important context, given their potential to influence how respondents may have perceived or approached the survey.

The first of these is the Delta Conveyance Project, or the idea to build a canal or tunnel around the Delta to convey water from the Sacramento River to the State Water Project south of the Delta. The project has been proposed in multiple different forms since the 1970s (e.g. Trans-Delta System, Peripheral Canal, Bay Delta Conservation Plan, California Water Fix), with the current form being referred to as the "Delta Conveyance Project". Each time the project is proposed, communities and stakeholders engage in activism to both support and oppose the project (Delta Conveyance Project). The Delta Conveyance Project is currently in its permitting and review phase, and the draft Environmental Impact Report was released for public comment in late 2022. There was heightened attention and awareness to this project around the time the DRS was fielded, though notably the DRS release was postponed to early 2023 in order to avoid conflicting with the project public comment period. Additionally, it is important to recognize that the Department of Water Resources and Delta Conveyance Authority conducted their own survey of Delta community members entitled "Your Delta Your Voice" in late 2020, to gather input on the project from disadvantaged communities in and around the Delta (California Department of Water Resources). Our research team took careful effort to ensure the Delta Residents Survey was NOT confused as being related to the Delta Conveyance Project in any way.

Second, there has been an on-going and contentious process related to the Bay Delta Water Quality Control Plan Update that has recently garnered more attention by advocates and impacted stakeholders across the Delta.

The Department of Water Resources has led a multi-year process known as the Voluntary Agreements, in which the state and water users negotiate on voluntary, non-regulatory approaches to meeting updated water quality standards that protect beneficial uses and endangered species. The process has been critiqued by various non-governmental organizations as being non-transparent and delaying progress through the established regulatory mechanism of updating the Bay-Delta Water Quality Control Plan (Roos-Collins, Obegi and Buckman). In fact, in late 2022, multiple environmental justice organizations and Native American Tribes filed a complaint to the U.S. Environmental Protection Agency, claiming the California State Water Resource Control Board has failed to uphold their statutory duties to update the Bay-Delta Water Quality Control Plan, resulting in disproportionate harm placed on Native American Tribes and communities of color around the Bay-Delta impacted by poor water quality (Becker). Water quality issues have been particularly visible and salient during the recent past drought years.

Finally, the DRS was fielded in a non-election year. Initially planned for release in late 2022, the research team and survey advisory group members decided it would be best to postpone survey fielding to early 2023 in order to avoid overlap with November 2022 congressional, state and local elections (See Lessons Learned Section for more information).

Survey Results

We received a total of 2,381 survey responses across all three zones, for an overall response rate of 2.90%. 2,208 responses were complete enough to be weighted and fully usable, giving us an overall margin of error of +/- 2.1% for the full sample. All analyses presented in this report are based on the 2,208 weighted responses. Breakdowns of response numbers and response rates by zone are included in Table 2.

Table 2: Survey sampling and response rates by zone

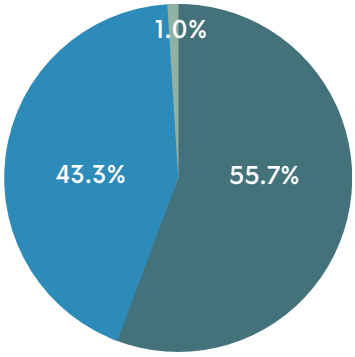
Survey sampling zone	Total population	Household Sampling rate	No. addresses invited to survey	No. survey responses received	Response Rate (%)	Margin of error (%)
Zone 1	11,727	~100%	6,042	344	5.69%	5.4%
Zone 2	540,340	25%	59,175	1,462	2.47%	2.6%
Zone 3	166,085	25%	16,940	575	3.39%	4.1%
TOTAL	**718,152**	-	**82,157**	**2,381**	**2.90%**	**2.1%**

Survey respondents were asked how many individuals lived in their residence with them (Q33). Based on responses, approximately 5,400 people reside in the homes that participated in the survey.

Historic building in Locke, CA (Photo credit: J.Rudnick)

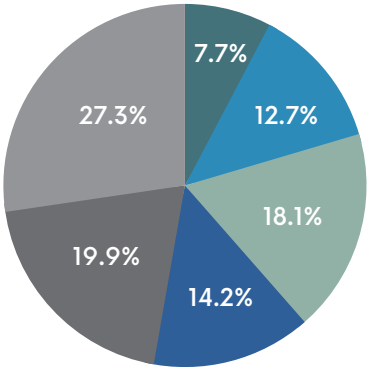
Characteristics of Survey Respondents:

DRS respondents demonstrate the broad diversity of communities across the Delta. Respondent characteristics reported here are based on 2,208 respondents that provided usable data to be included in rest of analyses; respondents characteristics are unweighted.



Gender

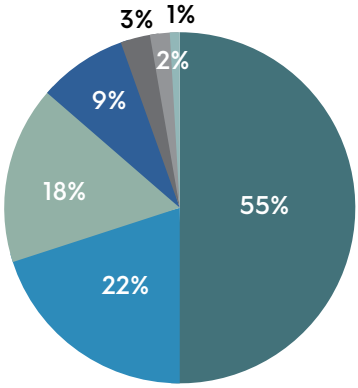
- Women
- Men
- Non-binary, non-conforming, transgender



Age

Average age is 50 years.

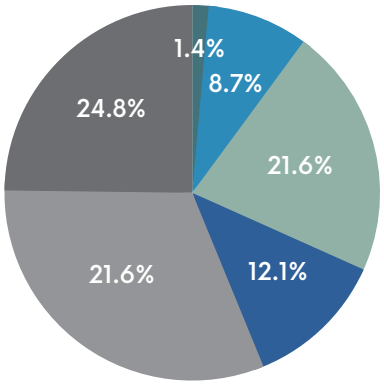
- 18-24 years
- 25-34 years
- 35-44 years
- 45-54 years
- 55-64 years
- 65+ years



Race & Ethnicity

Respondents permitted to select all that apply; numbers do not add to 100%.

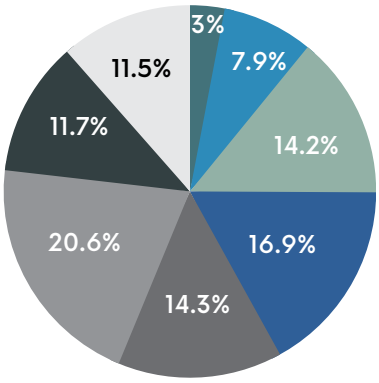
- White
- Hispanic or Latino/a
- Asian or Asian American
- Black or African American
- Native American or Native Alaskan
- Native Hawaiian or Pacific Islander
- Other



Education

Over 55% of respondents have at least a college degree.

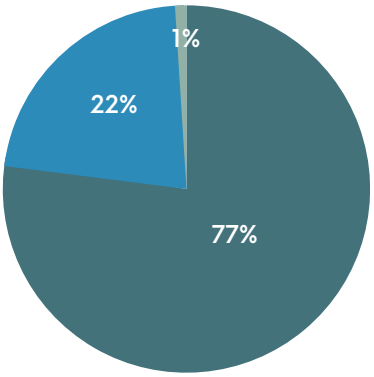
- No high school degree or GED
- High school degree or GED
- Some college, no degree
- Associate degree
- Bachelor degree
- Graduate or professional degree



Income

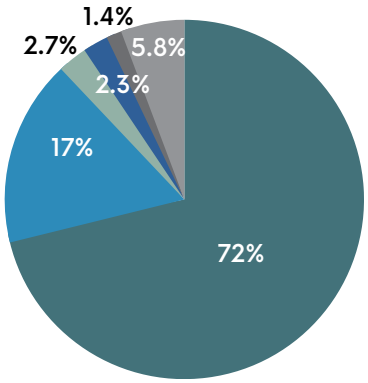
Average income is ~$105,000.

- Less than $10,000
- $10,000-$24,999
- $25,000-$49,999
- $50,000-$74,999
- $75,000-$99,999
- $100,000-$149,999
- $150,000-$200,000
- Greater than $200,000



Home ownership

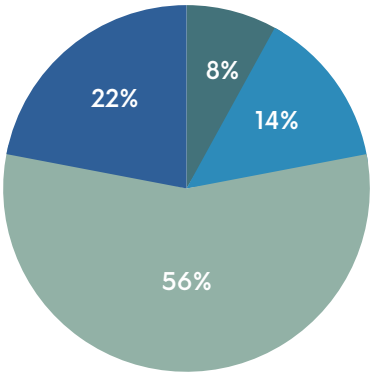
- Own home
- Rent their home
- Occupy home without paying rent



Languages spoken

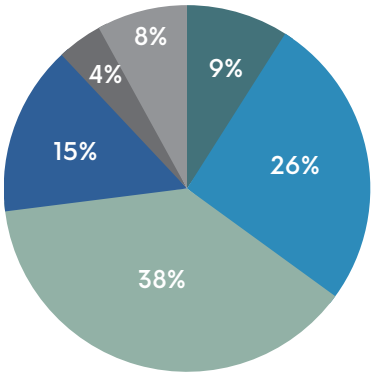
93.5% of respondents report speaking English in their households; 29% speak an additional language.

- English only
- Spanish
- Chinese
- Tagalog
- Vietnamese
- Other



Residential designation

- Historic or "legacy" Delta town
- Rural
- Suburban
- Urban



Political ideology

- very liberal
- liberal
- moderate
- conservative
- very conservative
- do not identify with any point on this political spectrum

- Due to the small number of individuals identifying as non-binary, tests of statistical significance throughout remainder of report compare men and women only.
- Age and income questions asked respondents to identify the bracket they fit into; averages reported are median age/income determined through midpoint coding of weighted brackets
- Few respondents identified their race or ethnicity in categories other than White, Hispanic/ Latino, Black, Asian American Pacific Islander, or 'multi-racial'. Due to the small number of individuals in other categories, other categories are combined into an 'other/ mixed race' category to allow for statistical analyses.

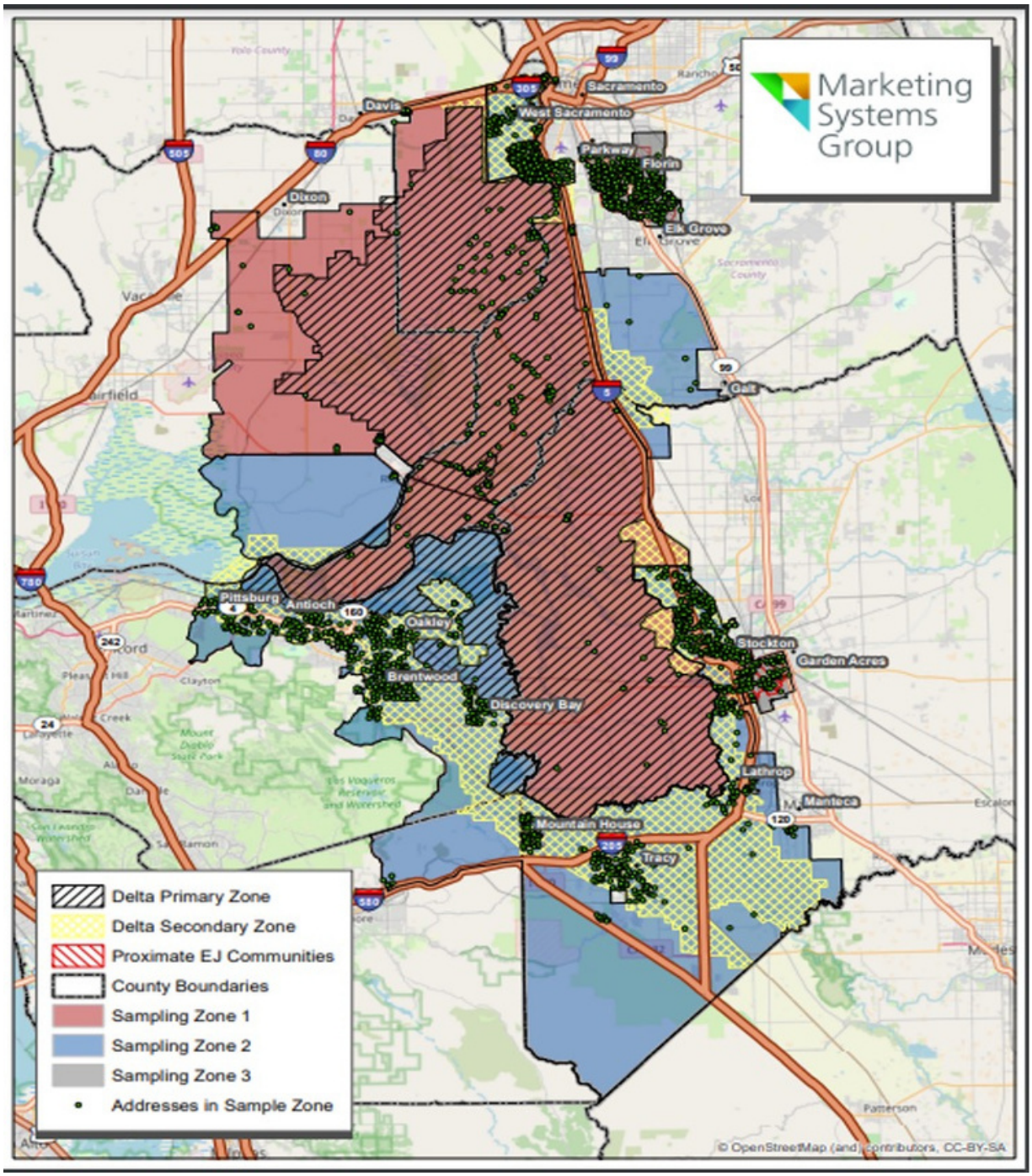
Political ideology estimates for likely voters in California in 2022-23: 38% Liberal, 32% Moderate, 30% Conservative (PPIC Statewide Surveys 2022-2023; see Baldassare et al.).

Representativeness of survey respondents compared to full population

Respondents' answers to demographic questions above were compared to available demographic data for the full population in each survey zone. Overall, we find that respondents tend to slightly over-represent certain demographic groups that are more responsive to surveys in general (U.S. Census Bureau): women, older age groups, white, higher education and higher income. These skews vary slightly between the three zones. See Appendix C, Tables 2-7 for side-by-side comparisons of respondents' demographics compared to the full population demographics of each Zone. On political ideology, survey respondents were more moderate than state reported averages (Baldassare, Bonner and Lawler, California Voter and Partie Profiles). Data were weighted following standard weighting procedures to adjust for the overrepresentation of certain groups, compared to their proportions in the full Delta population. See Appendix C for complete details on data weighting.

Respondents' geographic distribution

Survey respondents were spread geographically across the Delta. Respondents' locations are indicated by point markers on Map 2, with survey zones indicated by different shaded regions. 344 respondents reside in Zone 1, 1,462 respondents reside in Zone 2, and 575 respondents reside in Zone 3.



Map 2: Survey sampling zones and survey respondents

While the largest number of responses came from higher population cities of Sacramento (n>600), Stockton (n>400), Tracy (n>150), West Sacramento (n>150), Brentwood (n>100), Antioch (n>100) and Elk Grove (n>100), responses were received from 9 of the 11 small historic "legacy" Delta towns (n>250).

Differences in demographics across survey sampling zones

Demographics of the full populations across the survey zones differ along the lines of race, education and income. Zones 2 and 3 have significantly lower percentage White (Non-Hispanic/ Latino) populations. Zone 3 has a significantly higher percentage of the population identifying as Asian, Asian American or Pacific Islander (AAPI) compared to both Zones 1 and 2. With respect to education, Zone 3 population has significantly lower levels of education than Zones 1 and 2. Regarding income, Zone 3 is significantly lower income than Zones 1 and 2, with a greater portion of the population in the lowest income bracket (<S25K/ year), and significantly smaller portion of the population in the highest income bracket (>S200K/ year).

These differences are reflected in the survey respondents' demographics from each survey zone. Significantly higher percentages of survey respondents from Zone 3 identify as Black, AAPI, mixed race or other races, as compared to respondents from Zone 1 and 2. Significantly higher percentages of survey respondents from Zone 2 identify as AAPI, as compared to Zone 1. Significantly higher percentages of survey respondents from Zone 3 have lower levels of education and income, as compared to respondents from Zones 1 and 2.

With respect to political ideology, a significantly higher proportion of survey respondents in Zone 1 identify as very conservative (10%), as compared to Zones 2 and 3 (4%), and a slightly higher proportion of respondents from Zone 3 identify as liberal (25%), as compared to Zones 1 and 2 (20%). Proportions of respondents identifying with other points on the political spectrum (conservative, moderate, very liberal) are very similar across Zones.

Respondents from all three survey zones are similar in their age, gender, and ethnicity (Hispanic/ Latino or Not Hispanic/Latino) characteristics.

Section I: Sense of Place

Sense of place is a concept from human geography describing an individual's meaningful relationships with their place. Sense of place often combines multiple constructs, such as **place attachment** or an individual's connection or bond, emotions and beliefs about a place, **place identity** or how a place contributes to an individual's identity, and **place dependence** or how much a place contributes to meeting an individual's needs and goals. **Place meaning** is an additional component to understand what the individual associates with the place.

Sunset at Rio Vista Bridge (Photo credit: J.Rudnick)

The first section of the survey asked respondents a series of questions about their relationship to the Delta region. This included questions on length of residence in the Delta region and their "sense of place" or the extent to which people identify with and feel positively attached to the Delta. Research from other contexts demonstrates that understanding residents' relationships with and sentiments about their environment can predict their stewardship behaviors and attitudes on key social and environmental issues; a first key step in understanding these relationships is beginning to characterize Delta residents' relationships with their environment.

Identifying as a "Delta Resident" (Q1): Respondents were first asked if they "live in or near the Delta region". This question sought to assess whether respondents considered themselves "Delta residents". Overall, 87% of survey respondents reported that they "live in or near the Delta region", though this varied slightly across the survey zones. 93% of the rural Zone 1 residents, 89% of suburban and urban residents in Zone 2 residents, and 75% of urban residents in Zone 3 reported that they live in the Delta.

Residence Time (Q1): On average respondents reported living in the Delta for 24 years (maximum of 84 years).

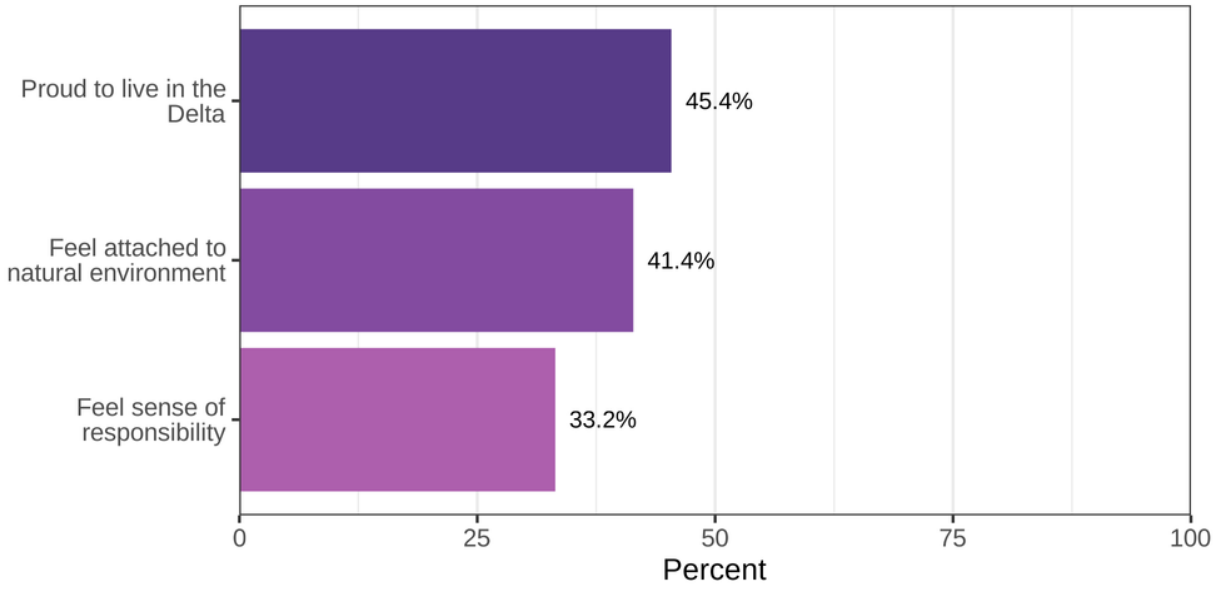
Sense of place (Q1 and Q3): To measure different aspects of sense of place, respondents were presented with a series of statements and asked to "Select which you feel describes your relationship to the Delta".

Respondents most agreed with enjoying recreating in the Delta (53%) and visiting the Delta for fun, feeling proud to live in the Delta (45%), feeling attached to the natural environment of the Delta (41%), and feeling a sense of responsibility for the Delta (33%). Less than one-third of respondents reported that any of the other statements presented resonated with them. Graphics 1a-1c show responses grouped by different sense of place concepts (e.g. place attachment, place identity, place dependence) .

A sense of place index was created combining measures of place attachment, place identity and place dependence into a single score ranging from 0 to 12 (0 being low, 12 being high) for overall sense of place. On average, respondents score 3.9 (standard deviation =0.91) out of 12, meaning they identify with and feel positively attached to ~4 factors about the Delta. Men, homeowners, and respondents with higher education reported significantly higher overall sense of place than their counterparts. Additionally, residents in the rural region of the Delta (Zone 1), report significantly higher overall sense of place scores than residents in the urban or suburban regions of the Delta (Zones 2 and 3).

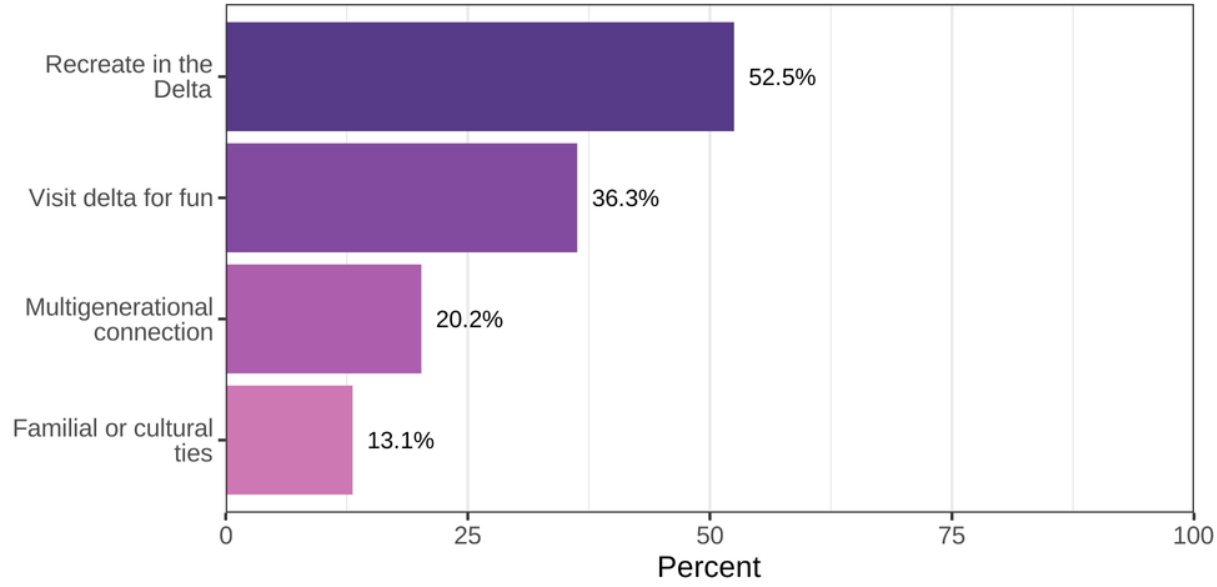
Statements indicating place dependence resonated with a small proportion of overall respondents, with less than a quarter of respondents selecting any factors for which they depend or rely on the Delta. However, place dependence was significantly higher among men, younger in age, lower education, Hispanic/ Latino, and living in households speaking languages other than English.

1a. Place Attachment



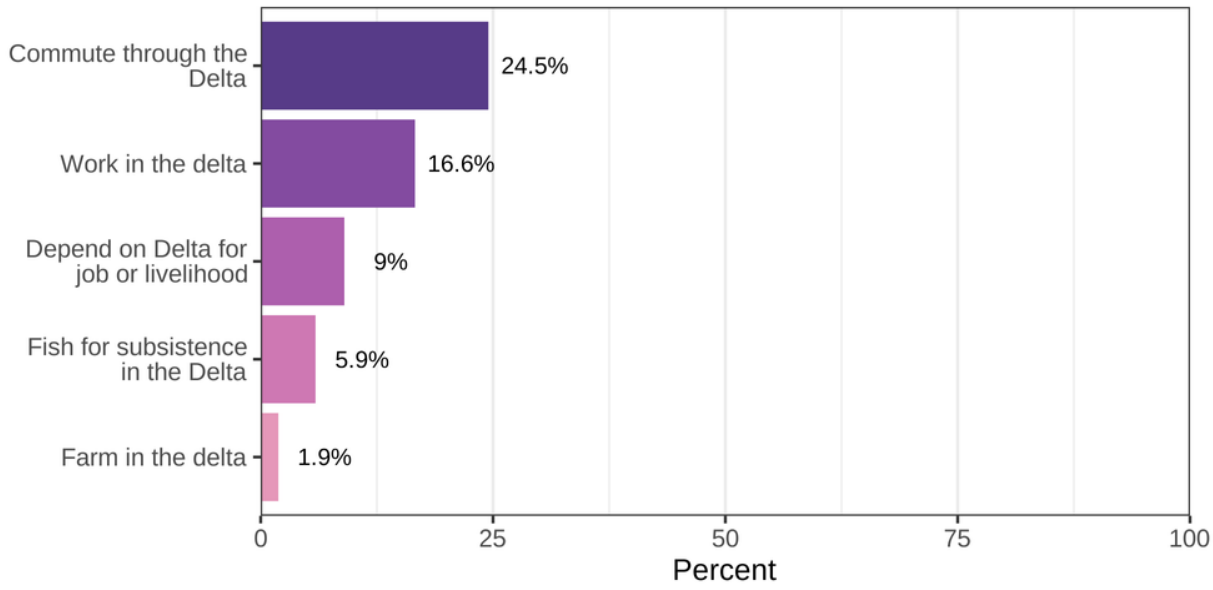
2208 survey respondents. Question type was "Select all of the above."

1b. Place Identity & Meaning



2206 survey respondents. Question type was "Select all of the above."

1c. Place dependence

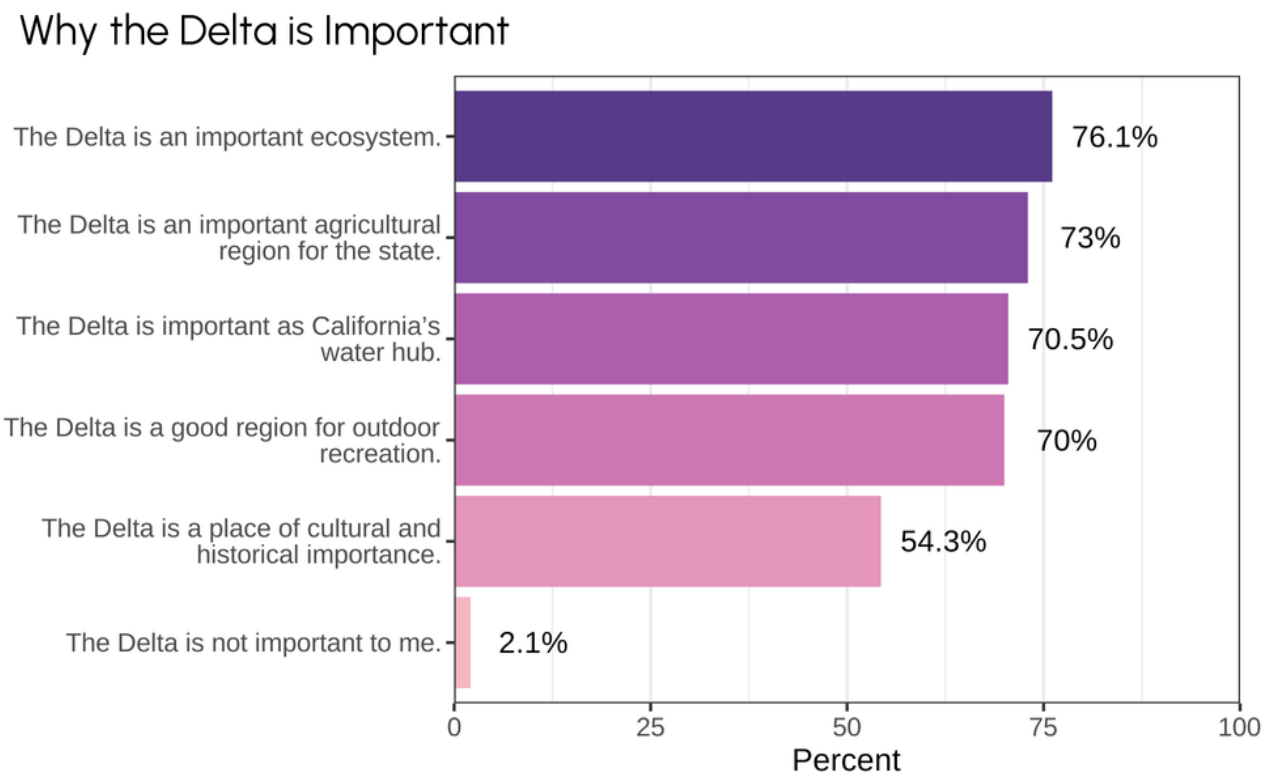


2206 survey respondents. Question type was "Select all of the above."

Comparative perspective:

The Puget Sound Partnership Human Wellbeing Survey measures Sense of Place of Puget Sound residents, and reports an average score of 5.5 on a scale of 1-7; we estimate this is approximately equivalent to a score of 9.5 out of 12 on the Delta Sense of Place scale.The factors that resonate most with Puget Sound residents include: 'feeling very attached to the natural environment' and 'feeling proud to live in the region' (Puget Sound Partnership). A research survey of 1,200 residents in the San Francisco Bay Area conducted in 2014 similarly found higher sense of place reported among rural residents, than urban residents, particularly with regards to connections to aspects of their biophysical environment. This study reported an average sense of place score of 8 out of town, which we estimate to be approximately equivalent to a score of 9.5 out of 12 on the Delta Sense of Place scale (Ardoin, Gould and Lukacs).

Place Importance (Q4): To understand how residents view the importance of the Delta, respondents were asked "which of the following describe why you feel the Delta is important?"



Q4 prompts users to, "Select all that apply". 2113 survey respondents. Data are weighted.

In Their Own Words

Respondents were asked an open-ended question to "Describe the Delta to someone who was unfamiliar with the region" (Q5). Respondents' descriptions provide additional understanding of how residents associate with the region, both positively and negatively:

"It is a unique, beautiful vibrant area in all seasons. There is so much rich history out here. It is a place where neighbors, no matter how far, still know each other, watch out for each other and care for each other. It's like no place on earth."

"Fairly flat low-lying region with rich agricultural soils and a long, rich history as old as (and older than) the state of California. It is also an economically-challenged area with limited educational and job opportunities with accompanying crime and sociological issues. It is a key nexus for limited critical resources (farmland, water) that many wish to exploit for financial reasons despite the irreversible damage that would be done to this key, mediating ecosystem."

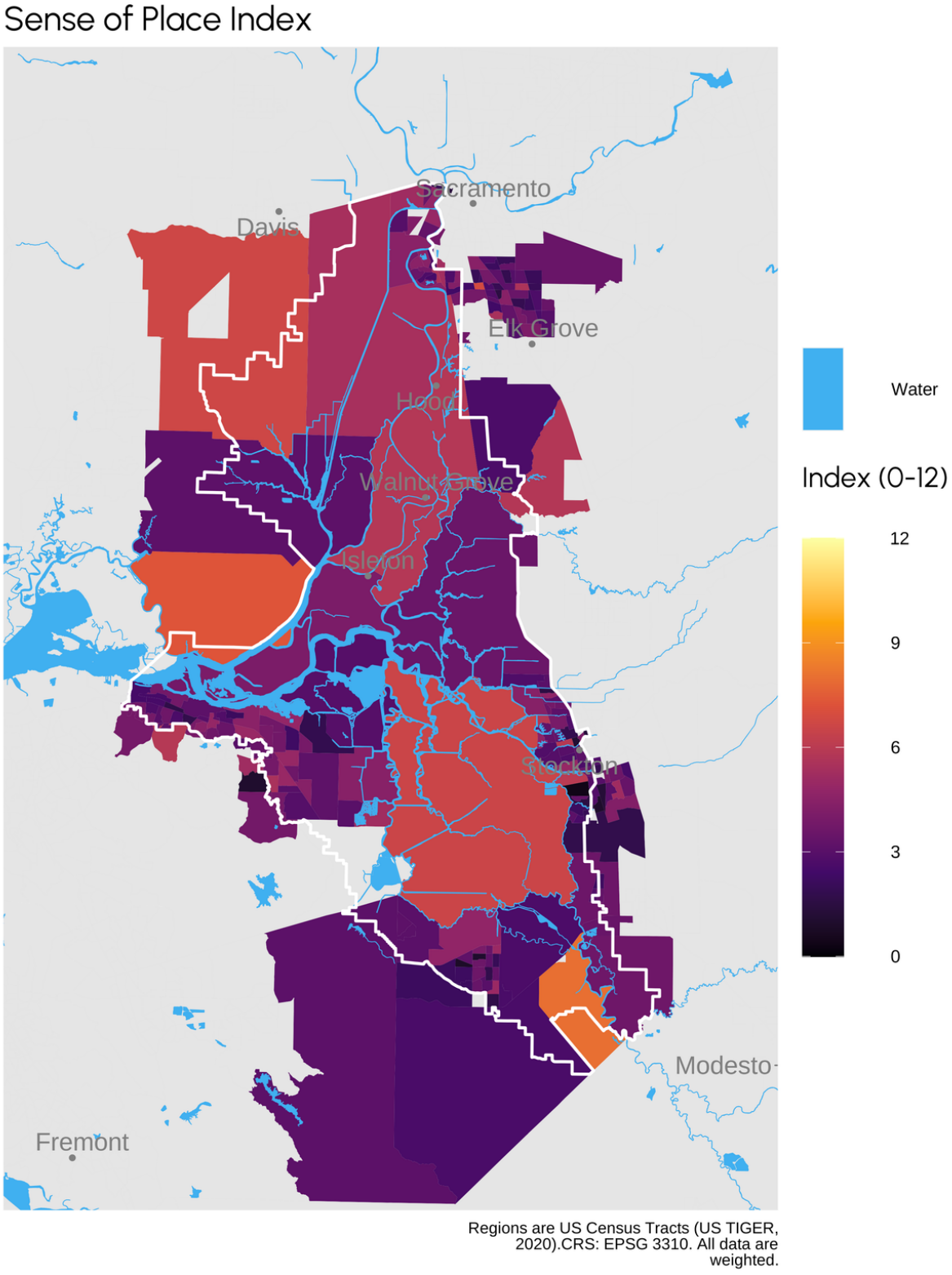
"The Delta is the forgotten waterfront of CA that is used and abused by many with only a few folks caring about the impact that has on the communities near it. Wealthy families can access it with watercraft, but most view it as dirty, neglected, or don't even know it's there."

How does sense of place vary across Delta geography and community diversity?

Table 3: Comparison of sense of place measurements across Delta communities

	Overall Sense of Place (Q1 & Q3)	Place Attachment (Q3)	Place Identity & Meaning (Q1 & Q3)	Place Dependence (Q1)
Geography	Zone 1 significantly higher overall	Zone 1 significantly higher overall	No significant differences	Zone 1 significantly higher on Livelihood
Demographics	Men, higher education and homeowners significantly higher	Men, older age, white, higher education, higher income, homeowners, English-only significantly higher	White, homeowners significantly higher	Men, younger age, Hispanic/Latino/a, multilingual respondents significantly higher

Map 3: Average sense of place scores for each Census tract across the Delta. Darker colors indicate lower average scores, lighter colors indicate higher average scores.



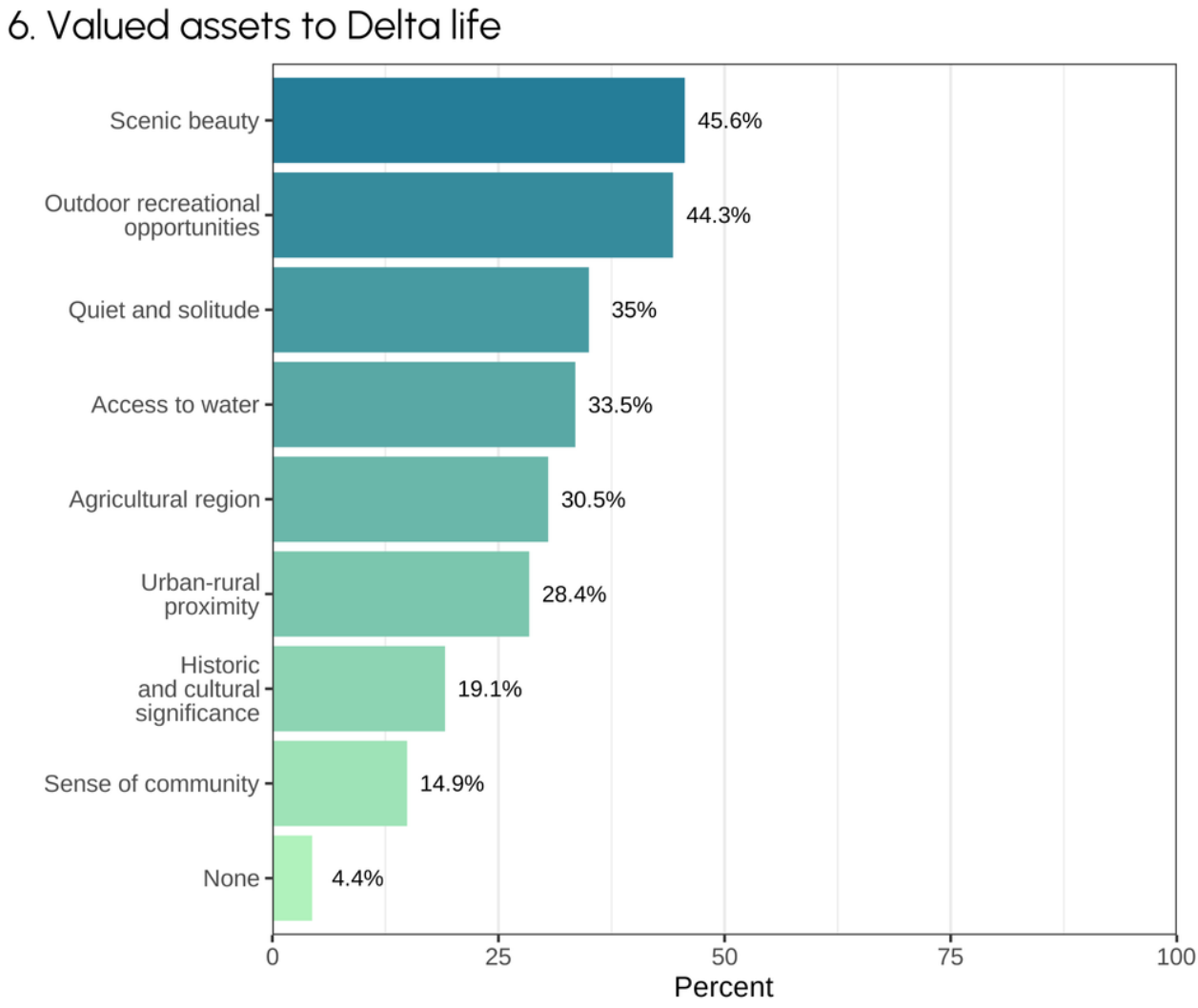
Section II: Quality of Life in the Delta

Staten Island rice farming (Photo credit: J.Rudnick)

The second section of the survey asked respondents a series of questions about their quality of life in the Delta. This included questions about what respondents valued most about living in the Delta, the biggest challenges to their life in the Delta, what activities are central to their life in the Delta, their overall life satisfaction, and their hopes for the future of the Delta. Quality of life is an essential aspect of social health, and in other contexts is often found to correlate with pro-environmental attitudes and behaviors. A first step in tracking social health of the Delta is beginning to better understand what contributes to or retracts from the quality of living for the diverse population residing in the region.

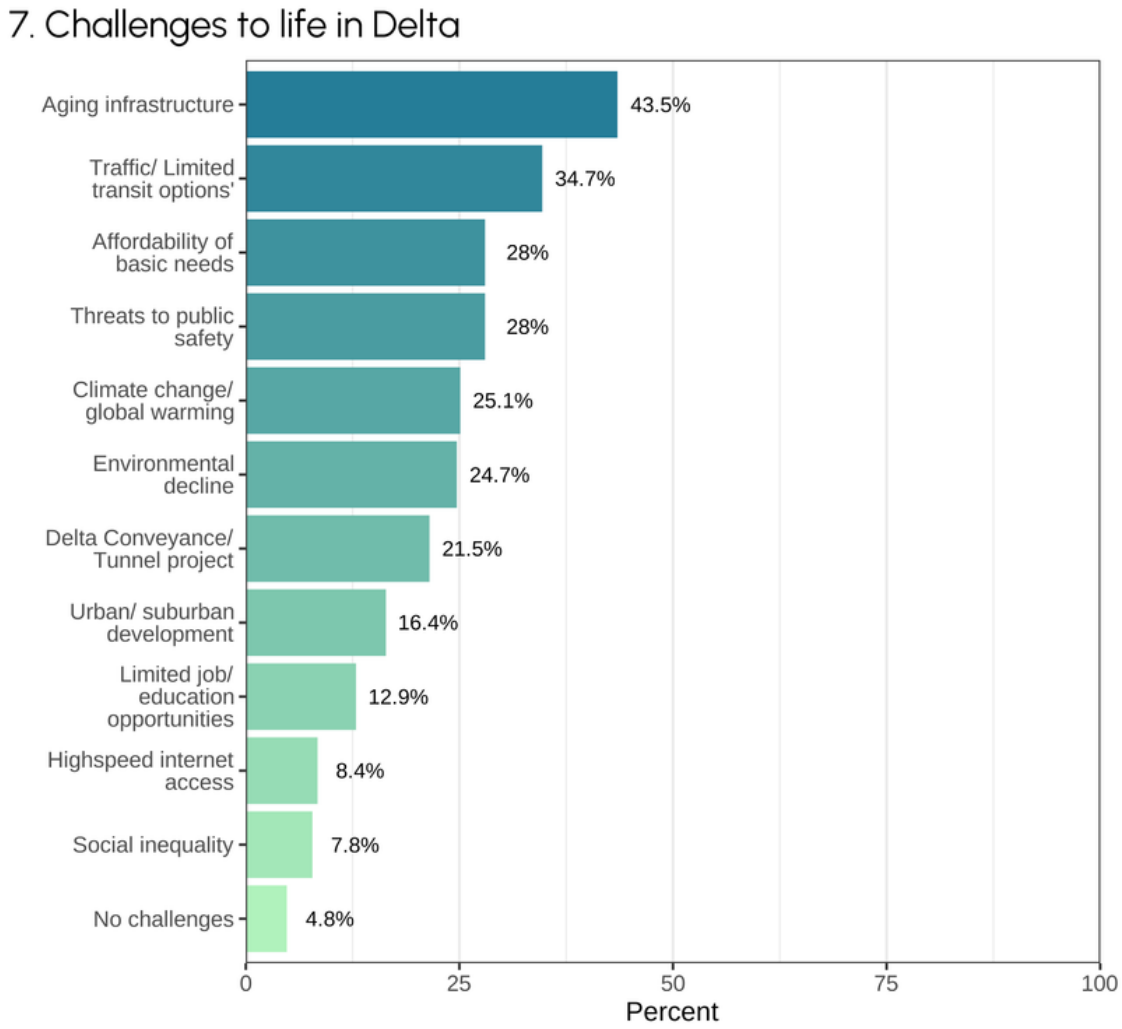
Isleton crawdad festival (Photo credit: CA DWR)

Contributions to quality of life (Q6): Respondents were asked "Which factors, if any, do you personally value most about living in the Delta area?"

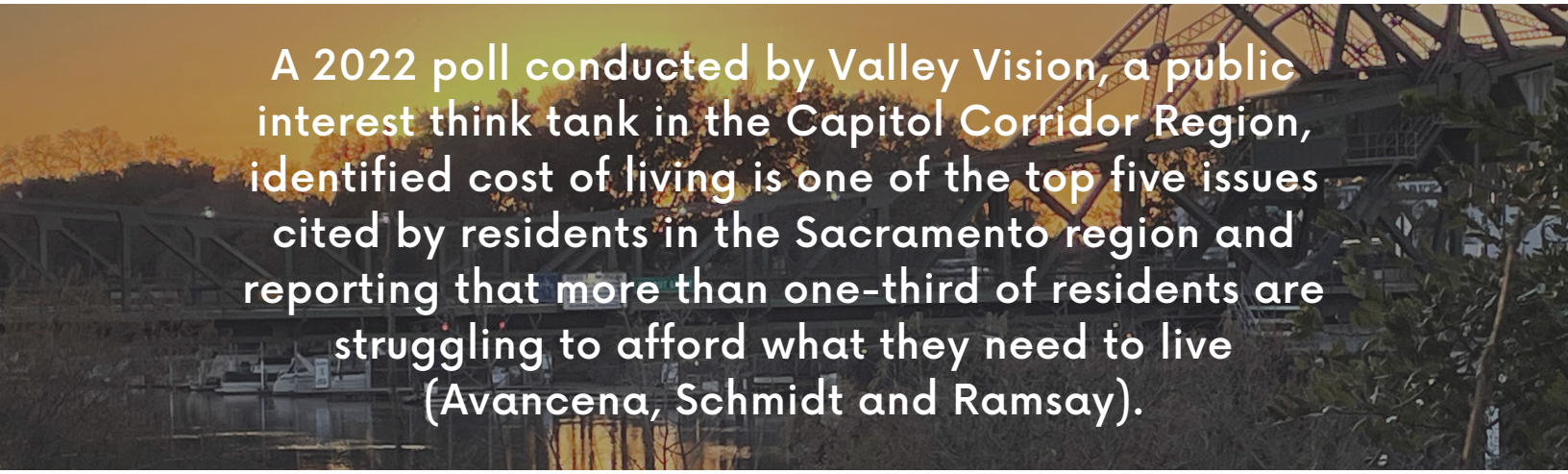


2171 survey respondents. Question type was "Select up to 3."

Challenges to quality of life (Q7): Respondents were asked "What factors, if any, present the largest challenges to your well-being living in the Delta area?"

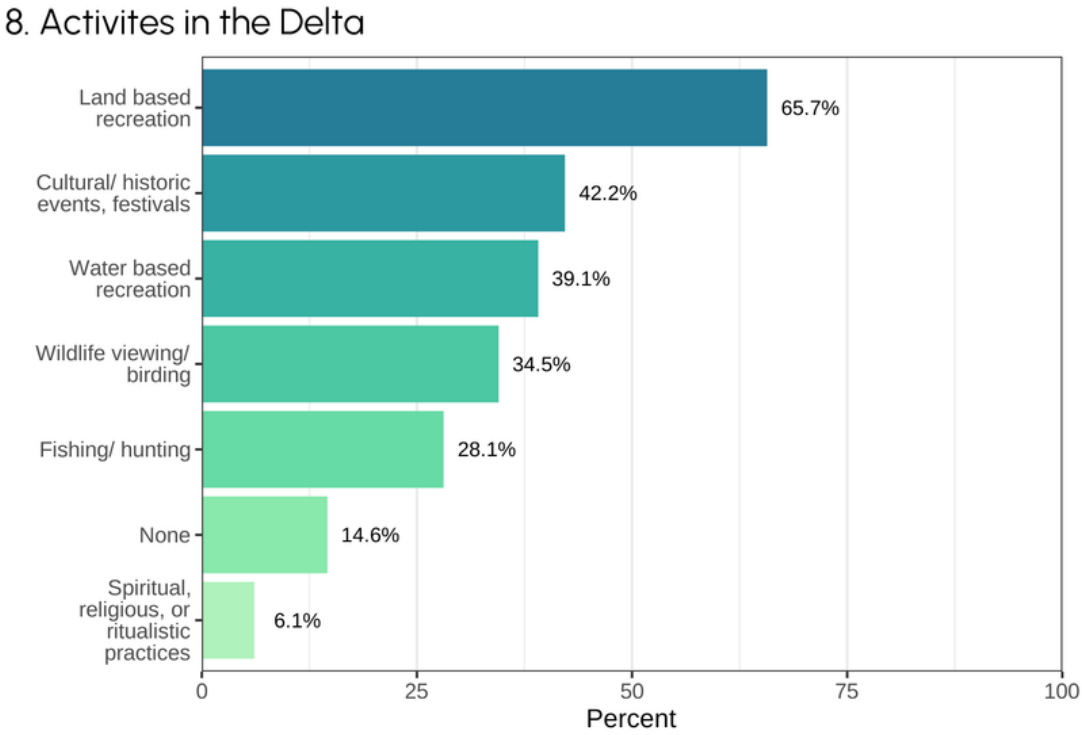


2185 survey respondents. Question type was "Select up to 3."



Walnut Grove historic bridge (Photo credit: J.Rudnick)

Activities in the Delta (Q8): Respondents were asked "Which of the following activities do you engage in in the Delta?"



2205 survey respondents. Question type was "Select all of the above."

Life Satisfaction (Q10): Respondents were asked to "rate your overall level of satisfaction with your quality of life in the Delta."

Across all respondents, the average life satisfaction was **2.4 out of 5**, equivalent to **59%** of respondents saying they are satisfied or very satisfied with their quality of life. Life satisfaction was significantly higher among Zone 1 respondents, than Zones 2 and 3 and among older, higher income, and White respondents.

Life Satisfaction is a robust metric of subjective well-being that serves as a baseline to understand how trends in environmental health and engagement in activities related to the environment are affecting overall human wellbeing.

Comparative perspective:
To compare the Delta to the full U.S. population on a similar survey question, on the 2022 Gallop World Poll, the average life satisfaction score was 6.89 on a 10-point scale (comparable to 3.5 on the DRS 5-point scale) (Helliwell, Layard and Sachs).

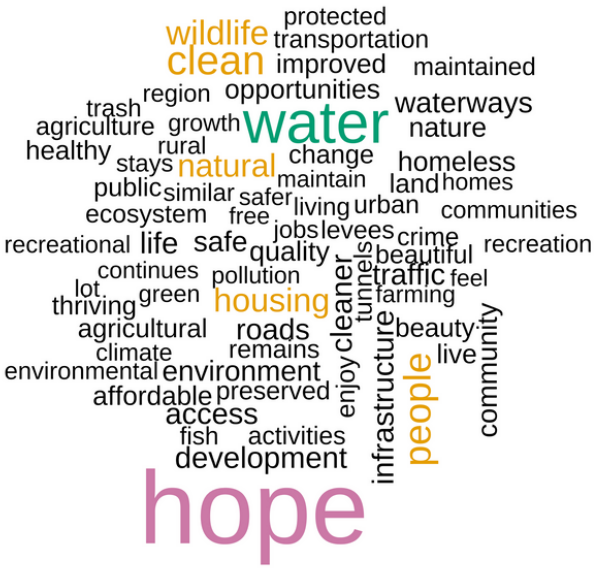
In Their Own Words

Respondents were asked an open-ended question: "When you imagine life in the Delta one generation from now, what do you hope it looks like?" (Q11). Respondents' descriptions demonstrate both hopefulness for positive change and fear of negative change:

"I hope that life in the Delta is relatively unchanged in the next 25 years, with the exception of improving infrastructure and strengthening ties to the greater Sacramento region. With regards to water issues, I hope that any movement of water from the Delta to other areas of the state is fair to residents of the Delta and not done strictly to benefit those living in areas with less water resources."

"I hope the area is safe, culturally diverse, and there are high-paying job opportunities and industries in the area. I also hope the ecosystem is healthy and unpolluted, and there are opportunities to explore and interact with nature."

"I worry that with the declining economy, income inequality, lack of affordable housing, and continued gentrification of the entire state... the Delta as we know (or knew it... once upon a time I could eat fish out of certain waterways I no longer can) will be nearly non-existent due to overuse and climate change."



How does quality of life vary across the diverse Delta community?

Table 4: Comparison of quality of life across Delta communities

	Contributions to well-being (Q6)	Challenges to well-being (Q7)	Activities (Q8)
Geography	Zone 1 significantly higher for **Quiet and Solitude & Sense of Community** Zone 2 & 3 significantly higher for **Outdoor Recreation & Scenic beauty** Zone 3 significantly higher for **Historic/Culturally Significant Areas**	Zone 1 significantly higher for **Conveyance** and **Access to Internet** Zone 2 & 3 significantly higher for **Climate change, Affordability of basic needs, Traffic**	Zone 1 significantly higher for **Wildlife Viewing** and **Water-based Activities**
Demographics	White respondents significantly higher for **Access to Waterways** and **Scenic Beauty** Higher education and multilingual households significantly higher for **Urban-rural Proximity**	People of color significantly higher for **Lack of jobs/ Opportunities, Social Inequality**, and **Affordability of Basic Needs** Men, older, white, conservative, and homeowner respondents significantly higher for **Conveyance** Liberal respondents significantly higher for C**limate Change**	Men **fish and hunt** significantly more than women Older respondents **View wildlife/ birding** significantly more than younger respondents

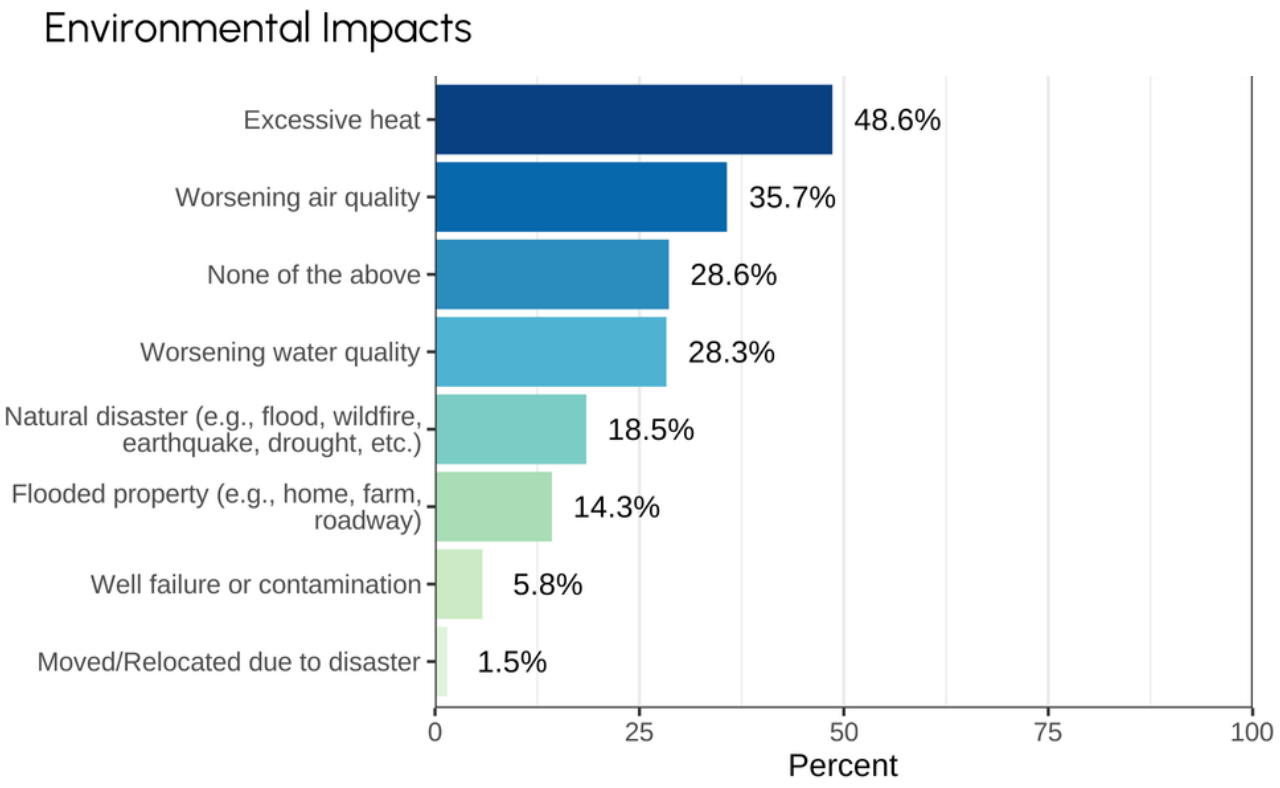
Section III: Risk and Resilience to Climate Change

West False River Salinity Barrier (Photo credit: CA DWR)

The third section of the survey asked respondents a wide range of questions about their experiences with and perceptions of environmental and climate changes. This included questions about what environmental impacts respondents had experienced, their level of concern for different environmental and climate change impacts, their beliefs on climate change, their preferences for different policy approaches to adaptation, their perceptions of drought, and their adaptive capacity, measured as the resources they have access to that may facilitate resilience in the face of environmental and climate impacts. Understanding individuals' experiences, attitudes and preferences with regards to climate changes are critical to more effective communication on climate risks and preparation, and to developing adaptation actions that are responsive to community members' concerns and needs.

Delta tour for Water Education for Latino Leaders (Photo credit: J.Rudnick)

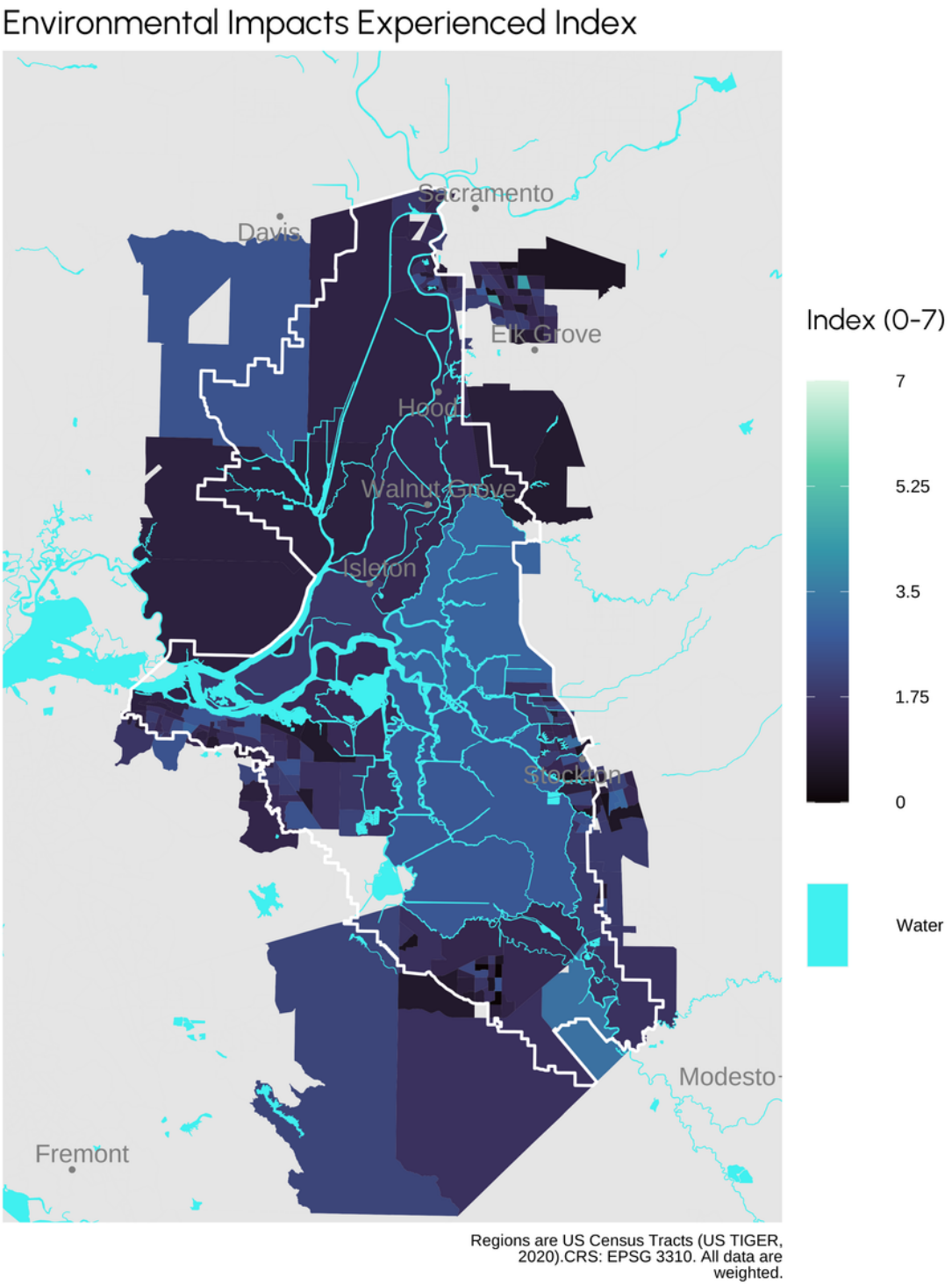
Environmental Impacts experienced (Q12): Respondents were first asked "Have you or anyone in your home experienced the following impacts while living in the Delta?" On average, respondents report experiencing 2 out of 7 of the following impacts.



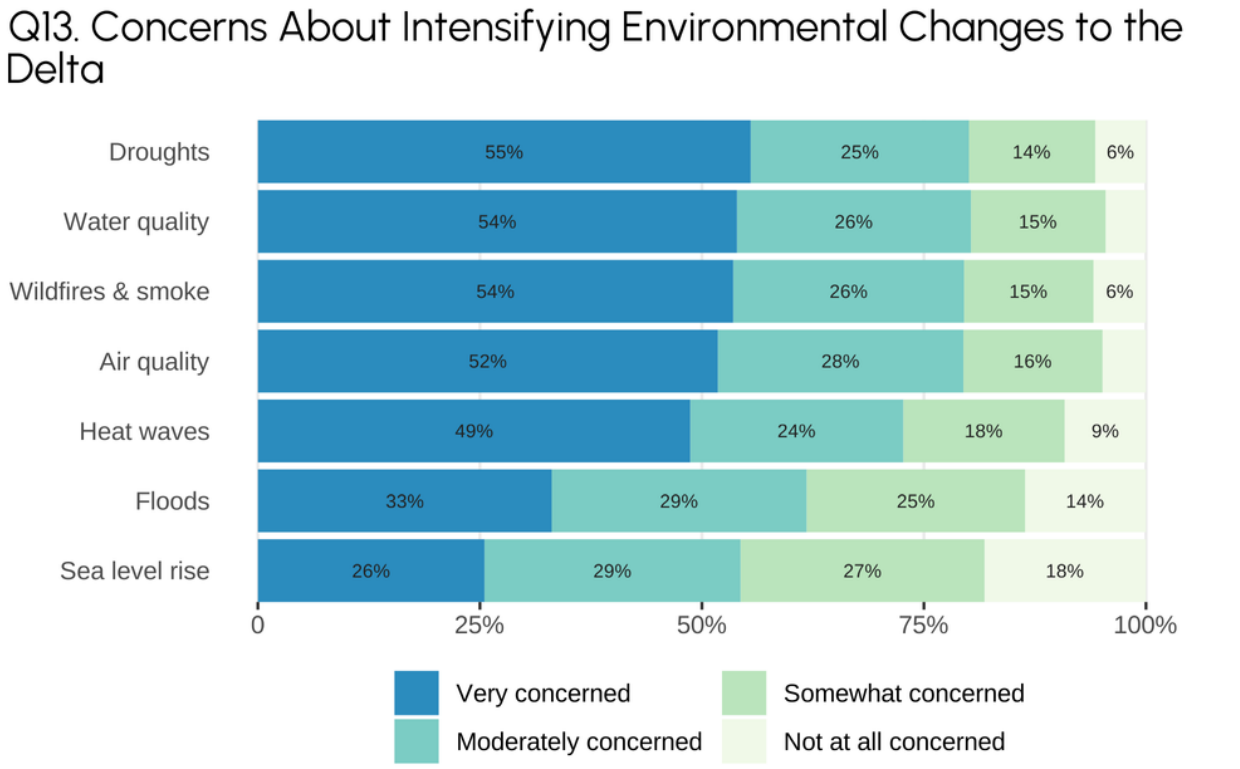
Q12 prompts users to, "Select all that apply". 2204 survey respondents. Data are weighted.

Research in other contexts shows that individuals' personal experiences with environmental extremes or climate change hazards can have significant influences on their climate change beliefs, preparedness for future extreme events, and preferences for climate policy.

Map 4: A total count of environmental impacts experienced was calculated for each respondent, and then averaged across all respondents within each census tract across the Delta region to assess if and how impacts experienced varied across the Delta geography. Dark colors indicate fewer impacts experienced, light colors indicate more impacts experienced.



Environmental and Climate Change Concerns (Q13): Respondents were then asked about their concerns for many of the same environmental impacts to continue impacting the Delta in the future: "How concerned are you about each of the following environmental changes affecting the Delta over the next 25 years?"

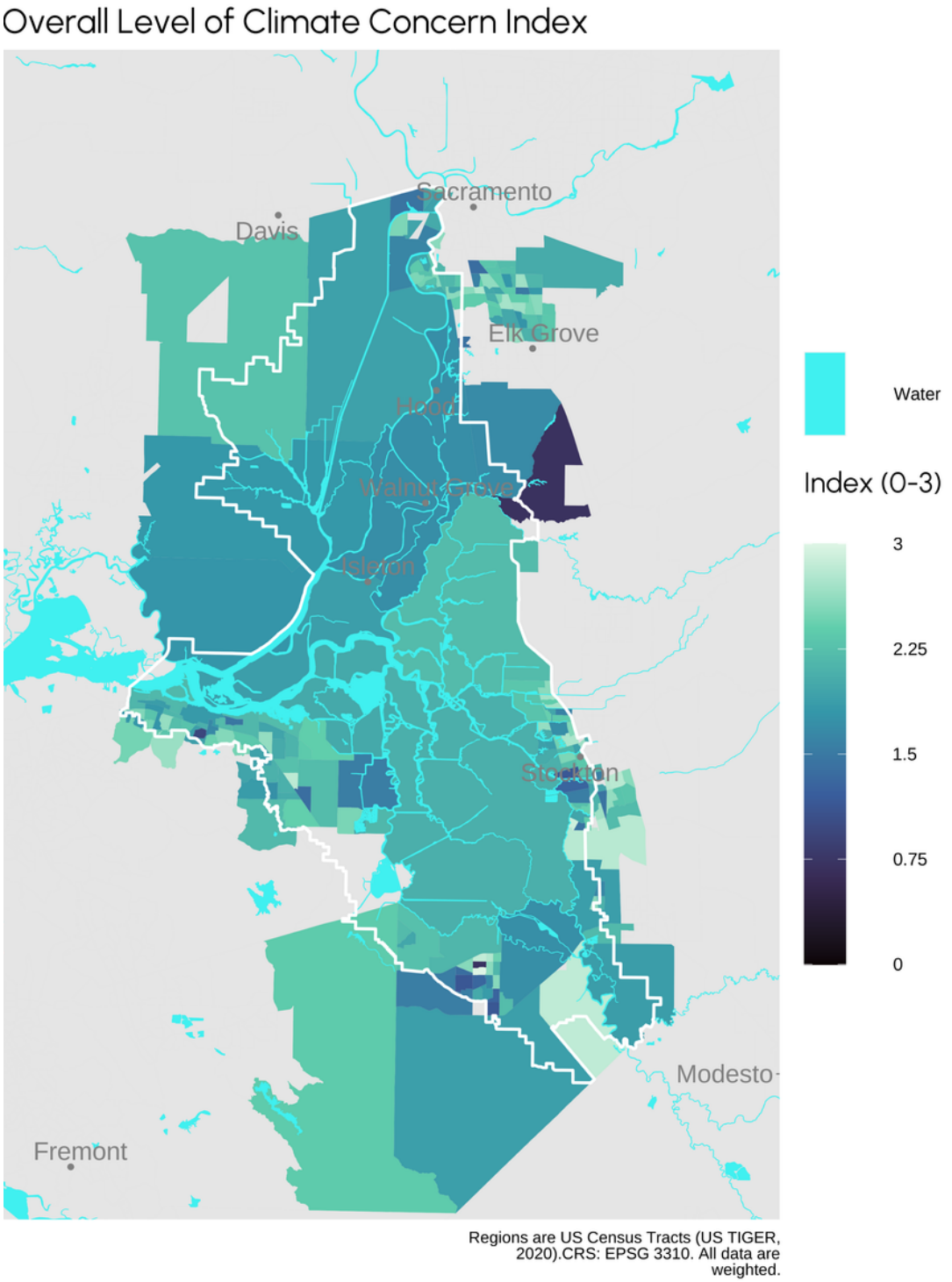


2089 survey respondents. Data are weighted.

The majority of respondents (>50%) indicate being very or moderately concerned about all potential environmental and climate changes. More than 50% of respondents indicated being very concerned about droughts, water quality, wildfires, smoke, and air quality.

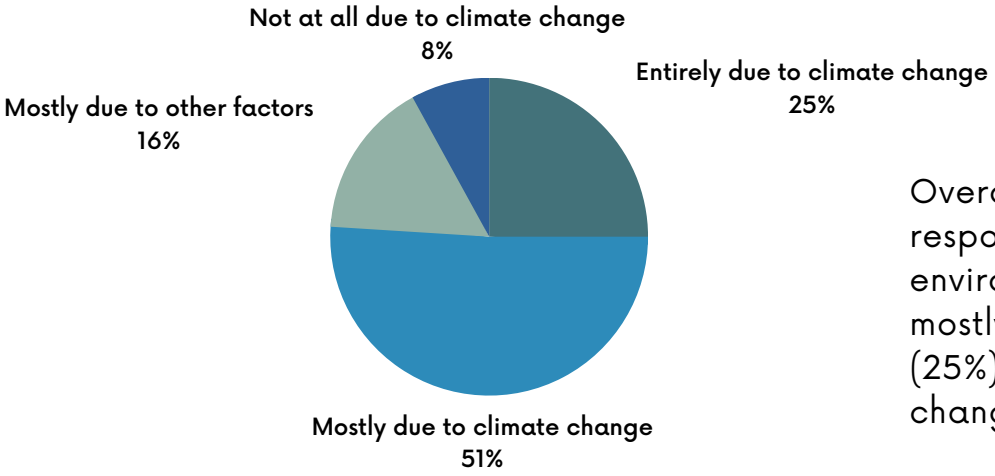
An overall level of concern index, ranging from 0 (not at all concerned) to 3 (very concerned) was created for each respondent, by averaging their level of concern across all 7 environmental changes. Overall level of concern is significantly greater among women versus men, people who identify as politically liberal versus conservative, and residents in the urban and suburban regions of the Delta (Zones 2 and 3) versus residents in the rural part of the Delta (Zone 1).

Map 5: Average level of concern index shown by census tract. Dark blue (index score = 0) indicates respondents on average are 'not at all concerned' about any of the environmental or climate changes, light green (index score =3) indicates respondents on average are 'very concerned' about all of the environmental or climate changes.



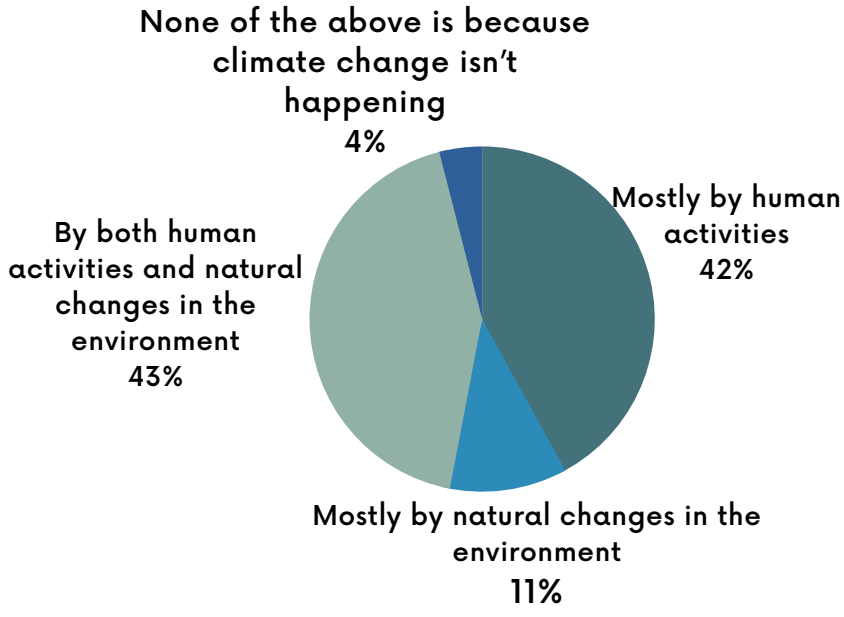
Climate Change Beliefs (Q15 & Q16): Respondents were also asked their beliefs about climate change through two questions that asked about climate change impacts and attribution. Q15 asked: "How much do you think the environmental changes above are a result of climate change?" Q16 asked: "What do you believe causes climate change?"

Q15. Environmental Changes due to Climate Change



Overall, three-quarters of respondents believe the environmental impacts are mostly (51%) or entirely (25%) due to climate change.

Q16. Cause of Climate Change



Overall, 42% of respondents believe climate change is caused mostly by humans and 43% believe climate change is caused by both humans and natural changes in the environment. 4.1% of respondents say climate change isn't happening.

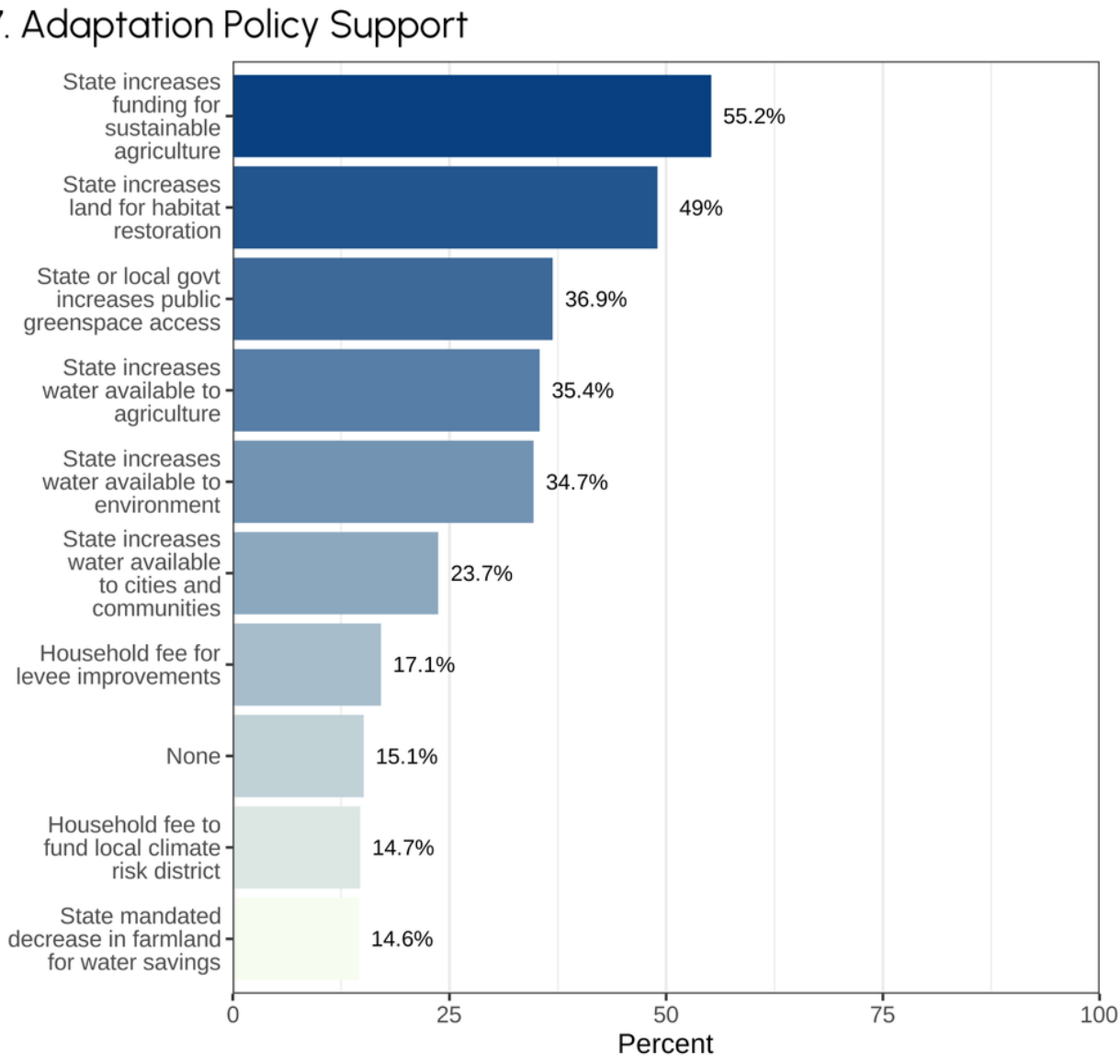
Comparative perspective:
2021 data from the Yale Climate Change Communication Study, a national-scale regularly recurring survey that assesses opinions on climate change of representative samples across the U.S., show how Delta residents compare to the full population of California and the U.S. (Marlon, Neyens and Jefferson):

- 53% of Californians and 46% of all US residents have personally experienced the effects of global warming
- 73% of Californians and 65% of all US residents are worried about the effects of global warming
- 63% of Californians and 57% of all US residents believe climate change is caused mostly by human activities

2022 data from a Public Policy Institute of California statewide survey "Californians and the Environment" show that 8 out of 10 Californians say climate change is very or somewhat serious threat to California's future economy and quality of life (Baldassare, Bonner and Lawler, PPIC Statewide Survey).

Outreach talk on California water and climate change at Cosumnes River Preserve (Photo credit: CA DWR)

Adaptation policy support (Q17): To better understand what Delta residents would like to see from state and local policy to prepare for future environmental changes in the region, respondents were asked: "To prepare for possible environmental and climate change impacts in the Delta, would you support any of the following policy approaches?"

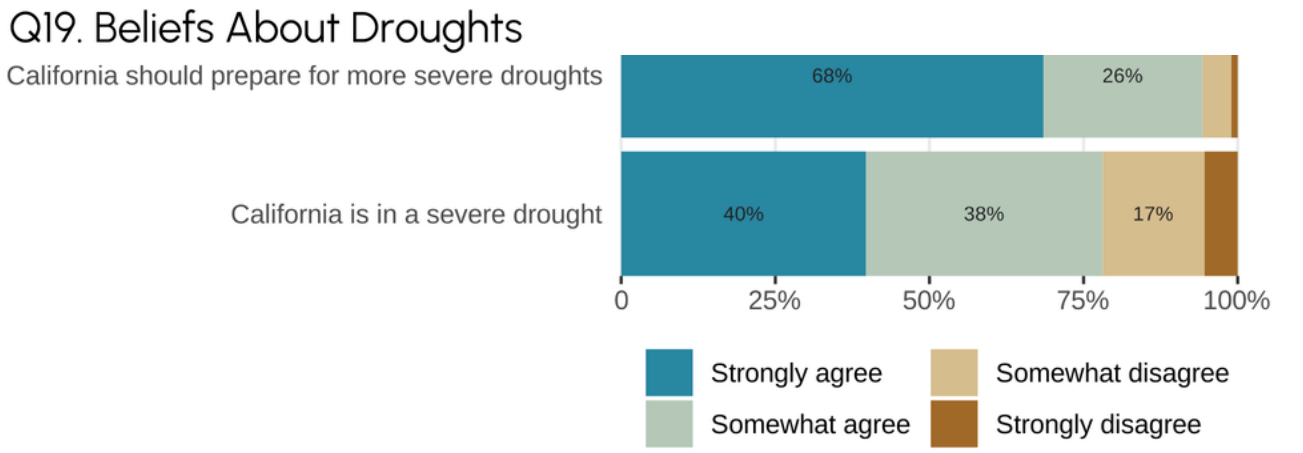


2196 survey respondents. Question type was "Select all of the above."

Policy support varied across geography and demographics. The approaches with approximately majority support included 'State funded sustainable agriculture' (55%) and 'State increases land for habitat restoration' (49%). No other policy options had majority support. Respondents with higher education or identifying as politically liberal were significantly more likely to support nearly all policy approaches, as compared to those with lower levels of education or identifying as politically conservative.

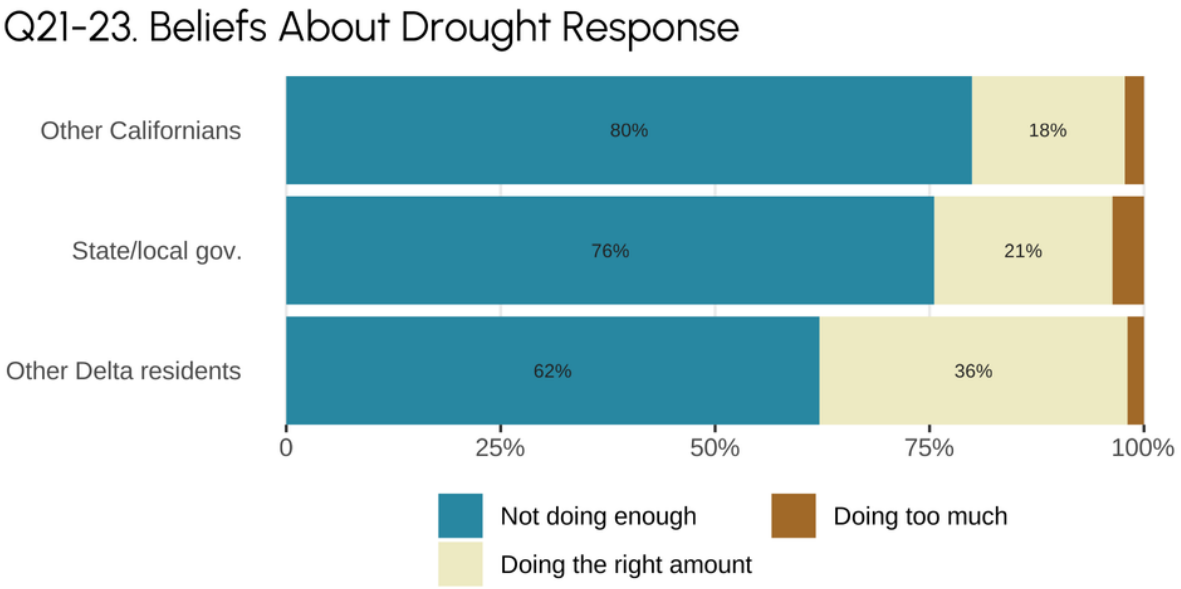
Drought Perceptions (Q19-Q23): Respondents were asked a series of questions specific to drought in California and what they believed needs to be done to address future droughts. These questions were designed in early 2022, while the region was experiencing impacts from over two years of ongoing drought conditions; the survey was fielded in early 2023 amidst severe winter storms.

Respondents were asked to rate their level of agreement with the following statements on the current state of drought in California (Q19):



2146 survey respondents. Data are weighted.

Respondents were then asked to rate how they felt different entities were responding to the current drought in California (Q20). Responses suggest that a majority of Delta residents believe that no one is doing enough in response to the drought.



1777 survey respondents. Data are weighted.

Comparative perspectives:

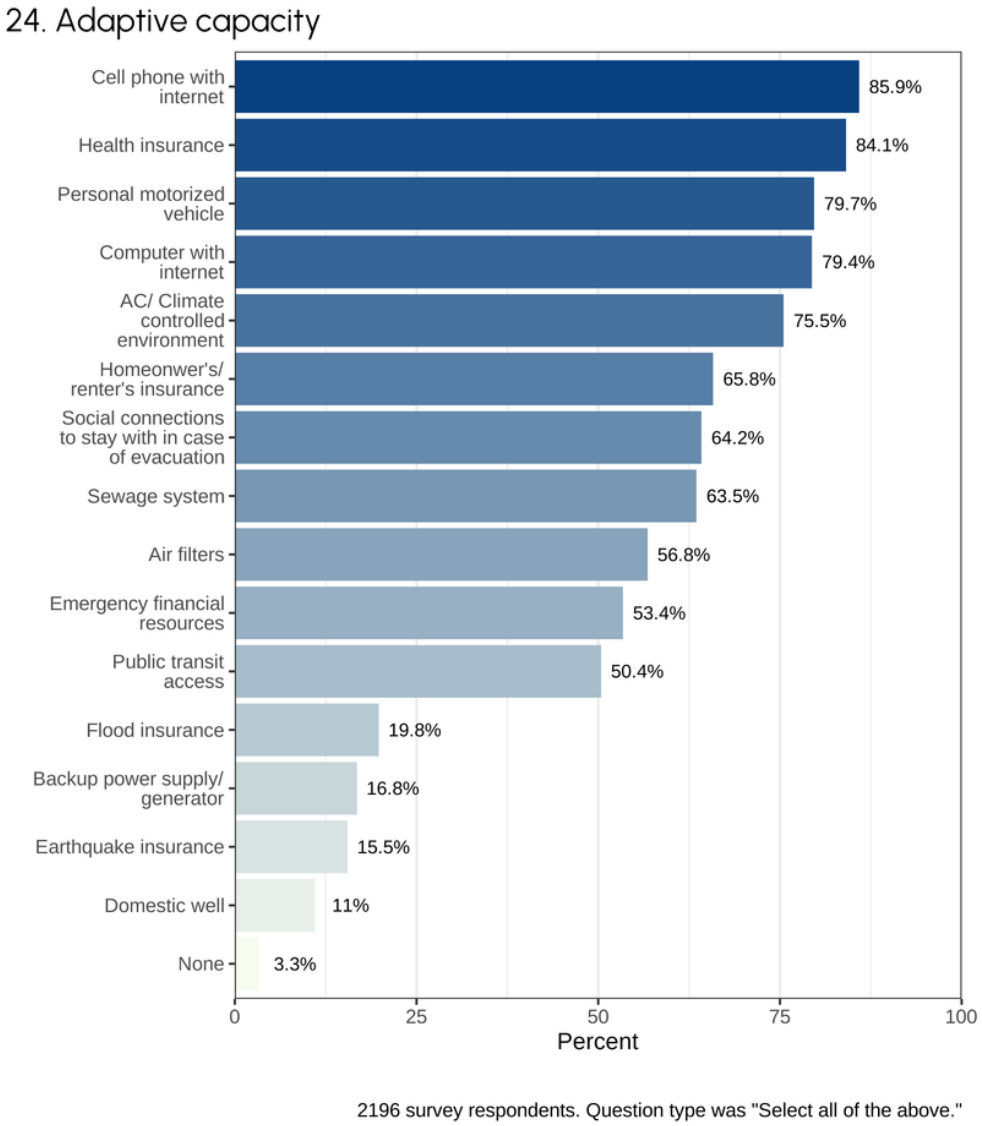
Data from a survey conducted by FM3 in 2014 of a representative sample of California residents allow us to compare drought opinions of Delta residents in 2023 to drought opinions of California residents during the 2011-2016 drought (Fairbank, Maslin, Maullin, Metz & Associates (FM3)):

- 91% of Californians strongly or somewhat agreed that California was in a severe drought in 2014
- 82% of Californians strongly or somewhat agreed that California needed to make investments to prepare for continued drought and water supply problems in 2014

The PPIC 2022 "Californians and the Environment" survey shows Delta residents follow statewide trends in opinions on drought (Baldassare, Bonner and Lawler, PPIC Statewide Survey: Californians and the Environment).

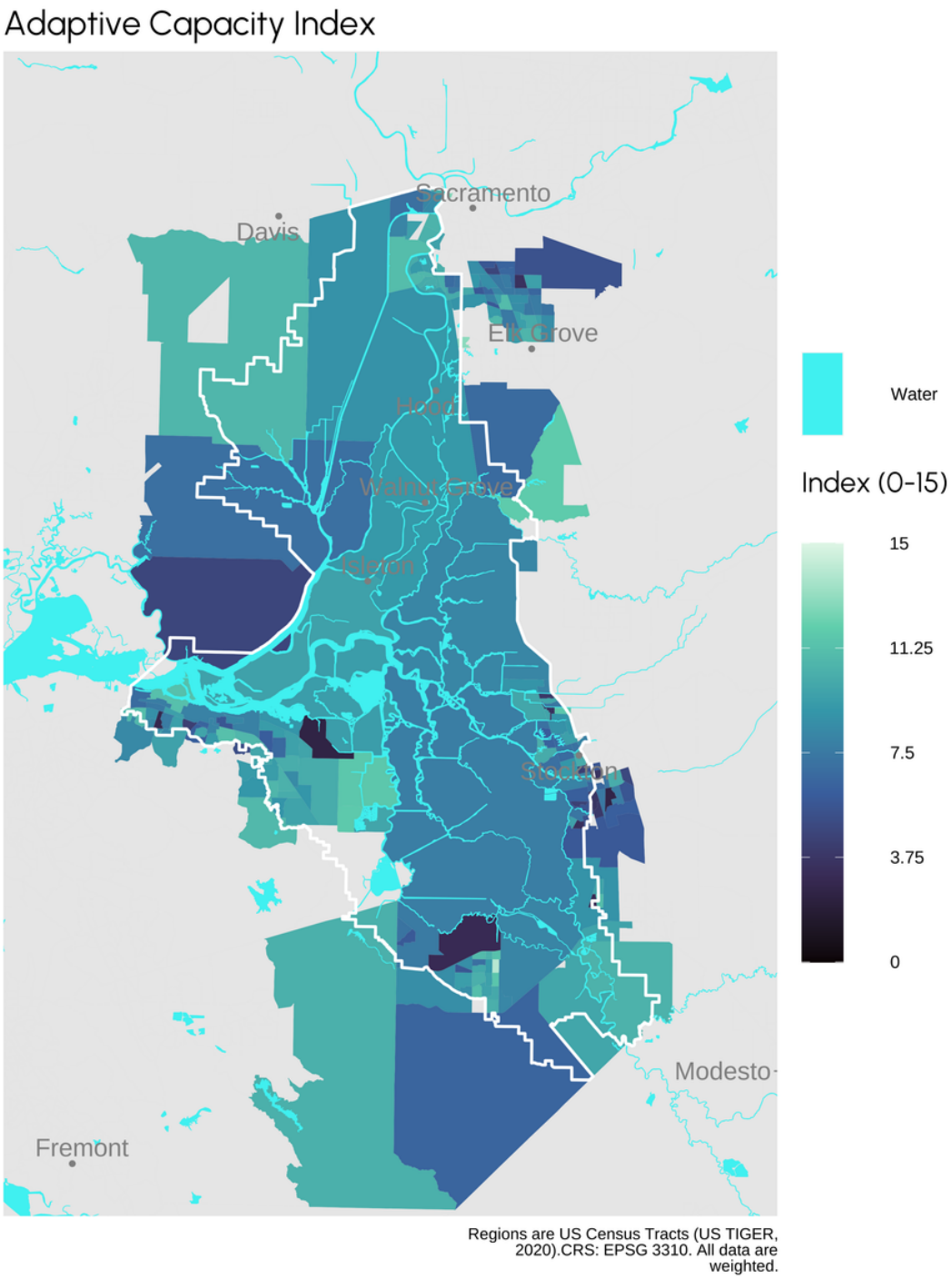
- 68% of Californians say state and local governments are not doing enough to respond to the current drought
- 69% of Californians say that people in their part of California are not doing enough to respond to the current drought

Adaptive Capacity (Q24): Finally, to measure likely resilience and ability to access necessary resources in the occurrence of an extreme event or climate change impact, respondents were asked "Which of the following resources do you currently have access to?"



Over 50% of respondents had most resources asked about; however, access to resources differed across geography and demographics. Significantly lower access to climate-controlled environments, mobile devices with internet, and emergency financial resources was reported by Zone 3 residents, as compared to Zones 1 and 2. This likely reflects the lower income of Zone 3 residents, demonstrating how income can influence climate resilience. Furthermore, younger age, Hispanic/ Latino, Black, mixed/ other race, low education, low income, multilingual, and non-homeowner respondents reported significantly lower overall access to adaptive resources.

Map 6: An adaptive capacity "index" was developed by totaling the number of resources each respondent indicated having access to. Across all respondents, the average number of accessible resources was 8. The average adaptive capacity index score is mapped for each census tract across the Delta, with dark blue (0) indicating access to no listed resources, and light green (15) indicating access to all listed resources.



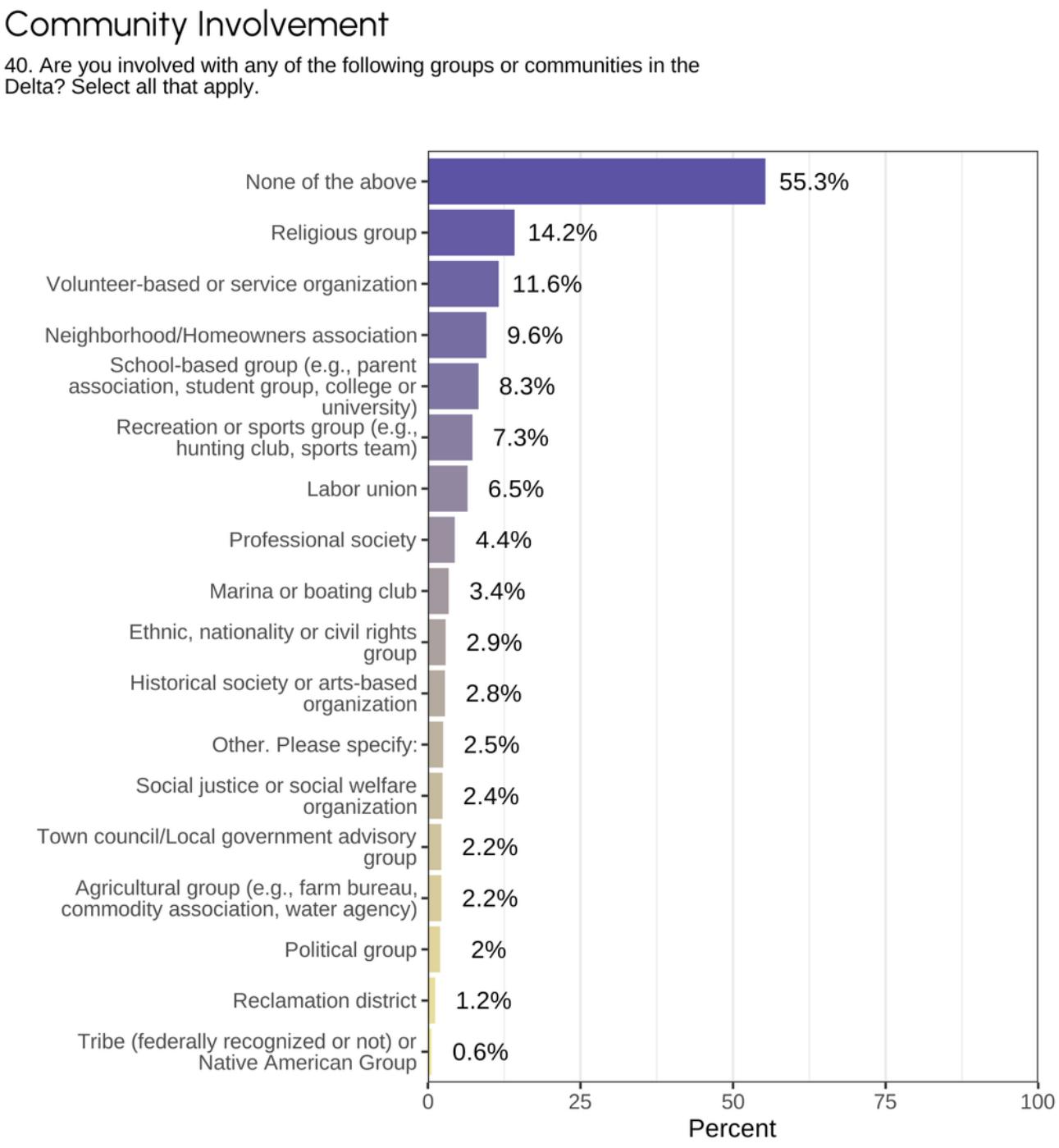
Levee repair after flood damages (Photo credit: CA DWR)

Section IV: Civic Engagement & Governance

The final section of the survey focused on residents' civic engagement and perceptions of good governance. This included questions on respondents' participation in community groups, engagement in Delta issues that matter to them, how much they trust governing entities to act in the best interests of the Delta, and who they feel advocates best for their interests in the Delta. Understanding community members' level of civic engagement and perceptions of governance tell us whether people agree with how environmental issues in the Delta are being managed and whether they feel like their perspectives are heard. This can inform improved outreach by governing bodies that motivate enhanced public participation and lead to greater public literacy on environmental issues and management options.

This section was offered to respondents as an optional additional survey module (with the exception of Q9 which was placed earlier in the survey to optimize response rate on the question), if respondents were willing to spend an additional 10 minutes on the survey. This design choice was made in order to keep average response time to the core sections of the survey under 20 minutes. 51% of respondents (n=1,112) opted to participate in the additional survey section. Rate of continuation to the additional survey module varied across Delta zones, with nearly 60% of Zone 1 respondents opting into the additional section, where as 49% Zone 2 and Zone 3 respondents opted in to the additional section.

Community Group membership (Q40): Respondents were asked: "Are you involved in any of the following groups or communities in the Delta?"



Q40 prompts users to, "Select all that apply". 1310 survey respondents. Data are weighted.

While a majority of respondents (55%) report not participating in any community groups or organizations, 45% of respondents participate in one or more groups. The highest membership rates belonged to religious groups (14%), volunteer/ service-based organizations (12%) and neighborhood/ homeowners associations (10%). Group membership is significantly higher among rural residents (Zone 1 residents), and especially so for specific group types, including volunteer/ service-based organizations, marinas/ boating clubs, historical or arts-based organizations, town councils, local agriculture group, and reclamation districts. Aside from geographical differences, respondent groups that report significantly higher group membership include men, older age respondents, or respondents with higher education (graduate education).

Comparative perspective:

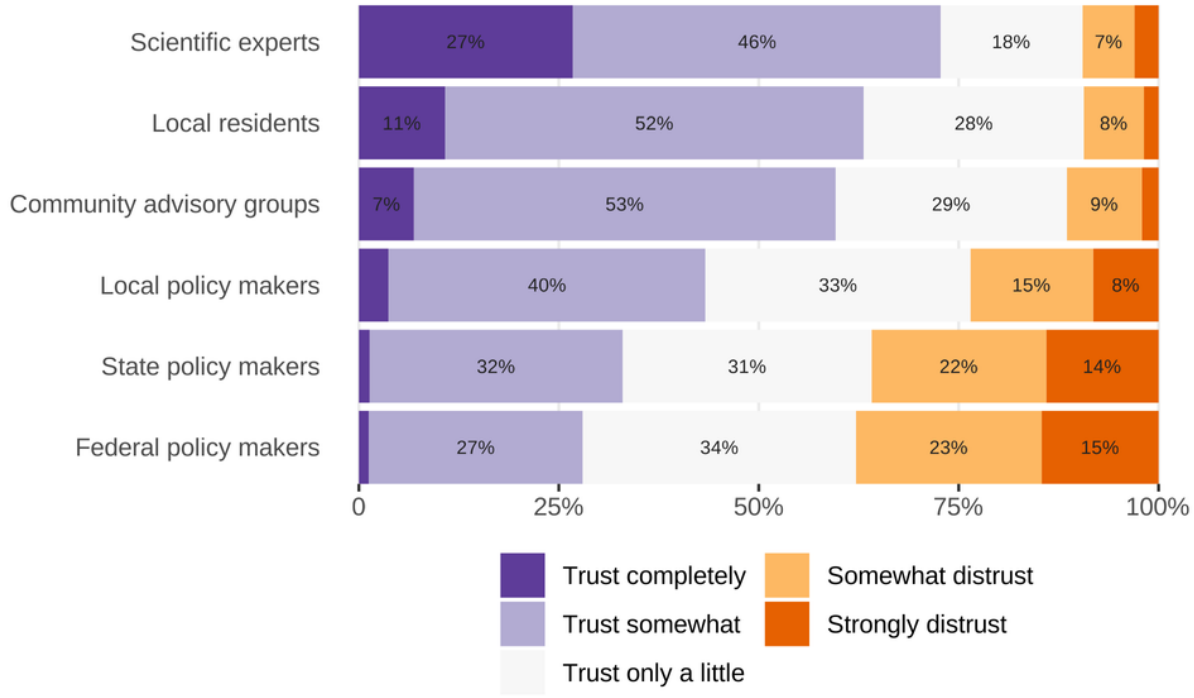
A 2017 Pew Research Center national poll shows that Delta residents are relatively similar to national averages around community engagement (Sandstrom and Alper).

- **57% of U.S. residents participate in at least one community group, with religious organizations, hobby organizations, and charitable/ volunteer groups being the most common**
- **U.S. adults who have higher education, higher income, and who have reached retirement age (65+ years) are significantly more involved in community groups than their counterparts**

Delta tour with Water Education for Latino Leaders (Photo credit: J.Rudnick)

Feelings of representation (Q41): Respondents were asked to "Rate the following entities on how much you trust them to act in the best interests of the Delta."

Q41. Trust in decision-making bodies



1310 survey respondents. Data are weighted.

Scientific experts, local residents and community advisory groups were trusted somewhat or completely by a majority of respondents (>50%), while policy makers at local, state and federal levels were trusted significantly less.

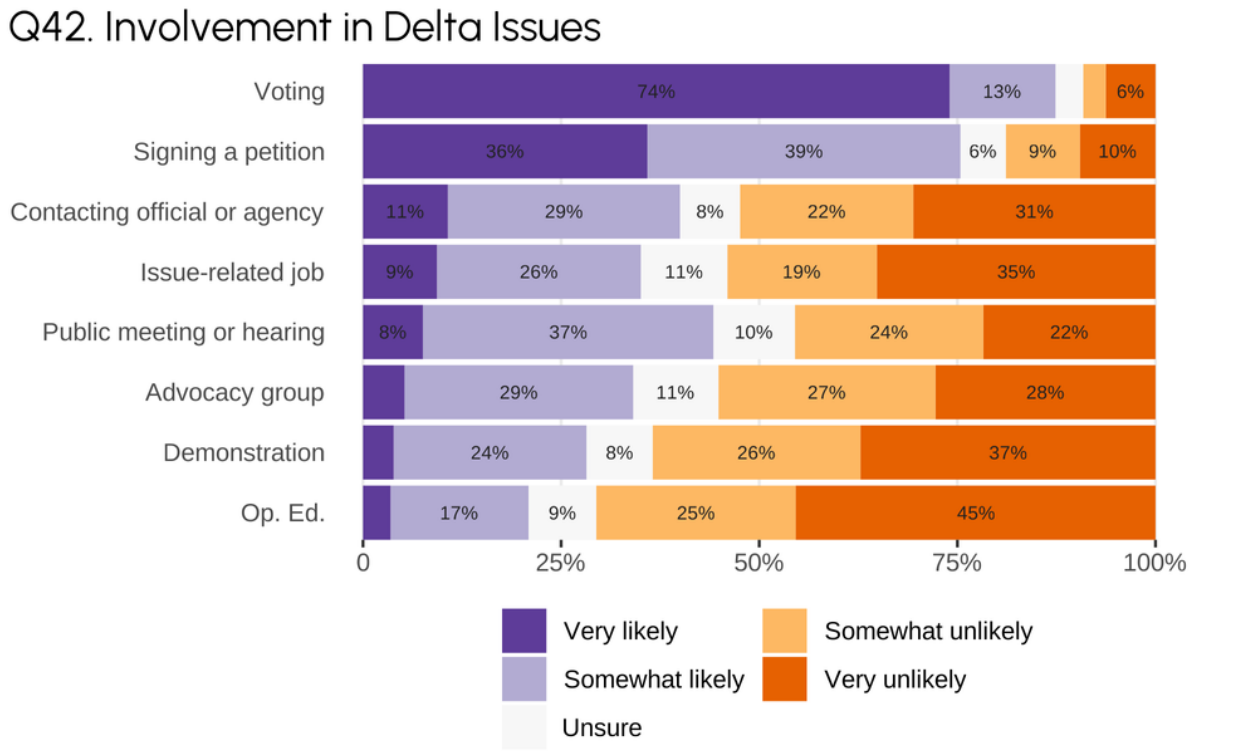
Respondents were also asked an open-ended question (Q9): "who do you feel best advocates for your interests in the Delta?"

20% of respondents (n=450) wrote in individuals and groups they felt advocated for their interests. Entities named by 2 or more respondents are listed in Table 5 below.

Table 5: Respondent-nominated Delta advocates

	Entities	Number of mentions
State Government	California Department of Natural Resources	3
	California Environmental Protection Agency	2
	Delta Protection Commission	13
	Delta Stewardship Council/ Science Program	5
	Department of Water Resources	9
	Fish and Game/ CDFW	10
	Sacramento San Joaquin Delta Conservancy	4
Local Government	East Bay Regional Parks	8
	Sacramento City Council	2
	West Sacramento City Government	2
Non-governmental organizations	Audubon Society	5
	California Striped Bass Association	2
	California Farm Bureau	3
	Recreational Boaters of California	4
	Sierra Club	10
	The Nature Conservancy	2
Community-based organizations	Consumnes River Preserve	2
	Delta Counties Coalition	5
	Delta Keepers	9
	Friends of the Library	2
	Locke Foundation	2
	North Delta Cares	6
	Pocket-Greenhaven Community Association	2
	Reclamation Districts	9
	Restore the Delta	47
	Save the Delta	18
	Stop the Tunnels	10
	Volunteer Fire Districts	3
	Rotary Clubs	3
Elected Officials	Contra Costa County Supervisor	3
	Sacramento County Supervisor	7
	Yolo County Supervisor	2
	1 State Assembly Member	5
	CA Governor	6
	3 U.S. House Representatives	23

Civic engagement (Q42): Respondents were asked: "How likely are you to get involved in any of the following ways for a Delta issue that is important to you?"

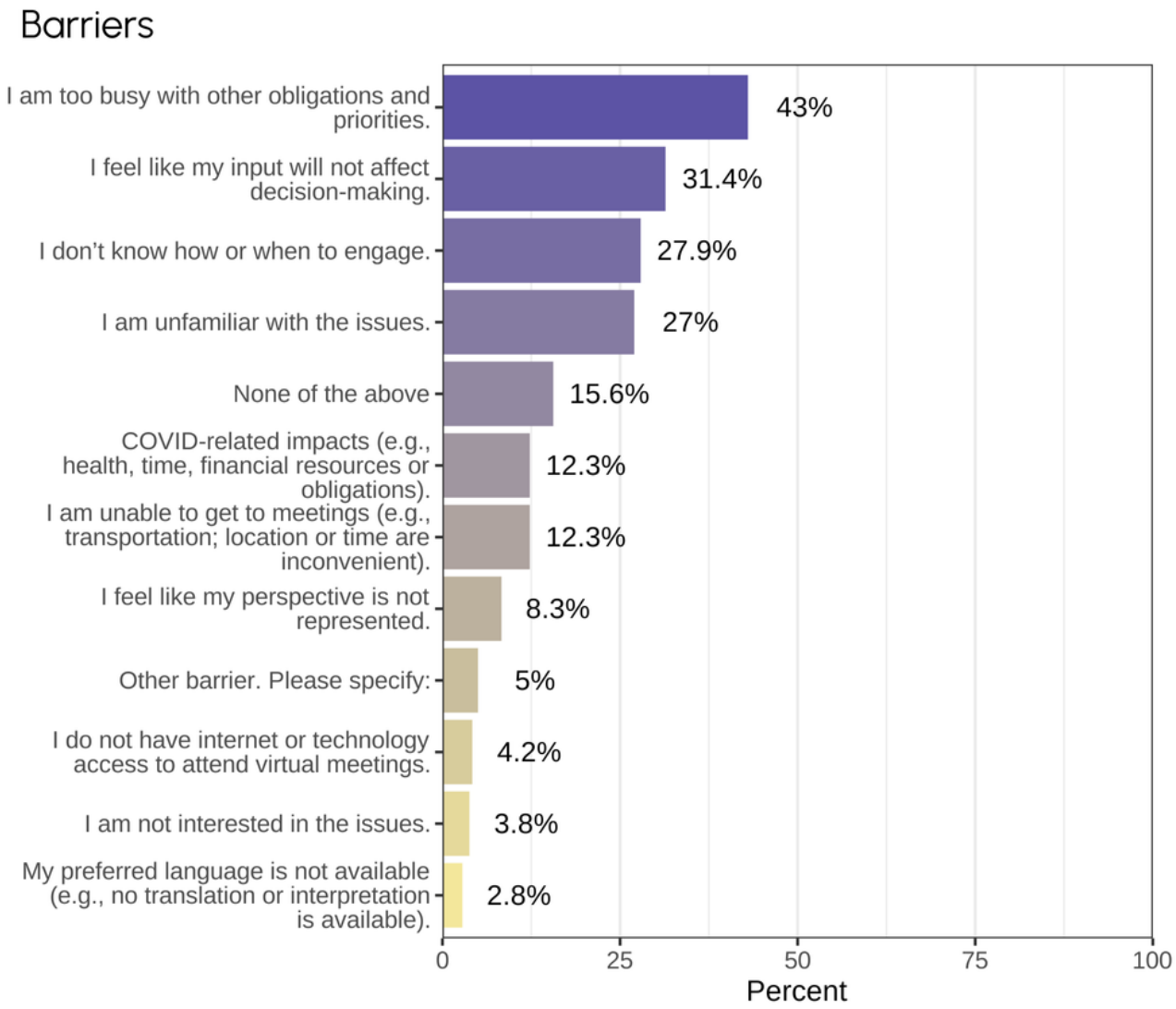


1307 survey respondents. Data are weighted.

On average, respondents report engaging in 2.5 activities of the 8 asked about. The majority of respondents said they were very likely or likely to vote in an election (87%) or signing a petition (75%). For all other engagement activities, a minority of respondents said they were likely or very likely to engage. Residents in urban regions of Sacramento and Stockton (Zone 3) were significantly more likely to participate in multiple modes, as compared to residents in the rural region of the Delta (Zone 1).

Barriers to engagement (Q43): Respondents were also asked: "Are any of the following barriers to engaging with issues facing the Delta?"

Top barriers to engagement included not having enough time, feeling like one's input will not affect decision-making, and not knowing how to engage.



Q43 prompts users to, "Select all that apply". 1308 survey respondents. Data are weighted.

Conclusions

Key Takeaways:

In complex social-ecological systems, there is growing national and international attention to measuring and integrating social and ecological indicators to better understand interactions between the human and non-human components of these systems and to monitor change in outcomes of interest over time and in response to management interventions. The 2023 Delta Residents Survey was a first effort of its kind in the Sacramento-San Joaquin Delta to develop a rigorous survey research methodology to begin to assess important social indicators affecting Delta residents' well-being. The DRS research effort was successful in achieving many of its stated objectives, including developing a reproducible methodology that aimed to reach a demographically and geographically representative sample of Delta residents, achieving a strong response rate to have confidence that the survey's results are reliable and representative of the full population of Delta residents, and establishing baseline measures of key opinions, attitudes, experiences and perspectives of Delta residents. Below we reflect and report extensively on lessons learned related to the efficacy of this survey-based approach in order to improve future research in this area. Furthermore, the research effort effectively engaged a diverse array of community-based organizations across the rural and urban Delta and served as a convening project to bring together social scientists and practitioners from many different agencies, organizations, and research institutions to collaborate on advancing understandings of the human dimensions of the Delta.

The DRS results improve our understanding of Delta residents' sense of place, quality of life, values, priorities and concerns for the region, experiences and attitudes regarding environmental and climate change, civic engagement, and perceptions of good governance. Importantly, the DRS helps to better understand where there are dominant shared opinions and perspectives across Delta residents, and where there is a diversity or multiplicity of opinions and perspectives that vary across geography, demographics, and other socio-behavioral characteristics of residents. For example, the DRS illuminated that a high proportion of all Delta residents have a shared understandings of the Delta's importance and appreciate the Delta for its recreational value and scenic beauty. However, sense of place and particularly feelings of attachment and identifying with the Delta were significantly higher among rural residents, and respondents identify as older age, White, higher income, higher education, men or homeowners (relative to their counterparts).

This has important implications, as the "traditional" or dominant view of the Delta is not necessarily one that resonates strongly with the majority of the present population, urban residents, and importantly residents of many demographic groups: younger age, people of color, lower income, lower education, renters, or women. It will be important to understand, characterize, and adopt other place meanings that are held by the wide diversity of residents across the Delta, in order to equitably and effectively communicate in ways that resonate with what these residents care about and seek to prioritize.

The DRS also helped to better understand how residents across the Delta are experiencing environmental and climate changes. The vast majority of residents are very or somewhat concerned that climate changes will negatively impact the Delta in the next 25 years and are supportive of the government taking additional action to adapt and prepare for more extreme events. A majority of respondents support policy approaches that provide support for more sustainable agriculture, restore more land for habitat, and increase preparation for future droughts. Next steps by our research team will include evaluating residents' sense of place, regional values and concerns, and climate change opinions side by side, as these types of crosswalks within the DRS data can inform more effective climate change communication strategies for the Delta. Future analyses will also aim to contribute to on-going work to, identify high-priority communities where climate change outreach and adaptation support should be focused, and how to frame climate change conversations in ways that most resonate with different communities.

Finally, the DRS illuminates initial patterns in community and civic engagement, and uplifted residents' opinions on governance in the region. Delta residents have relatively low levels of community engagement and involvement, with less than half of DRS respondents reporting they are involved in a single community group. While these community group membership rates are similar to recent national averages, current research also shows that social connectivity across the U.S. is lower in modern times as compared to years past. Regardless of national trends, low social connectivity in the Delta region can have multiple adverse implications. Social capital is a critical ingredient to community resiliency. Particularly in times of hardship and environmental disaster, community involvement and social capital aids response efforts, allowing increased information and resource diffusion through trusted entities, and facilitating mutual aid which can help communities bounce back faster. Beyond community involvement, DRS results show Delta residents also currently have low trust in government entities.

Residents report placing higher trust in scientific experts, community advisory groups and local residents, as compared to local, state or federal policy makers, to make decisions in the best interest of the Delta. This suggests that decision-making processes seeking residents' input and trust should integrate and partner with the aforementioned entities, as well as the specific groups nominated by respondents as trusted entities (see Section IV, Q9). Increasing residents' participation in governance in the Delta will also require addressing barriers to engagement, which respondents reported include being too busy with other obligations to engage, not feeling like one's input will actually influence decisions, not knowing how to engage, or not feeling informed on the issues.

Lessons Learned:

A key learning from the Delta Residents Survey was the feasibility of conducting surveys of randomly selected households in the Delta, as this provides insight into the viability of survey-based research going forward in this region and the opportunities to continue monitoring social health of the estuary. The research team encountered many challenges throughout the implementation of the DRS; some are likely to persist in future survey-based research in this region, while others were important lessons learned that we hope can be avoided in the future.

First, the Delta is a challenging region to design a survey sampling frame for, and more generally to analyze publicly available data on the local residential population, given that the region's boundaries do not overlay cleanly with other commonly-used social geographies (e.g. counties, cities, zip codes, census geographies). Regarding survey sampling specifically, the mismatch of the legal Delta boundaries from any U.S. Census or U.S. Postal Service- used boundaries make it difficult to use public datasets to determine which residential addresses lie within the legal boundary and challenge the ability to leverage public datasets to compare respondent data to full population data. This challenge was overcome to the best of our ability through the technical support provided by Sacramento State University Institute for Social Research and their sub-contractor, Marketing Systems Group, by conducting a GIS query to intersect U.S. Census Block Group (CBG) boundaries with the legal Delta boundary, and include all mailing addresses within all CBGs that intersected the Delta boundary in the available sampling frame. This spatial intersection approach did result in some sampled addresses for Zones 1 and 2 lying outside of the Legal Delta boundary, thus resulting in approximately 10% of survey responses for Zone 1 and 2 coming from residential addresses beyond the Legal Delta boundary.

Furthermore, we also learned that there are approximately 1,600 "traditional" post office box addresses in the Primary Zone of the Delta that are not automatically included on USPS standard mail address databases, because these PO boxes are associated with residential addresses that in theory can receive mail at the physical address. In reality, the residential addresses are unlikely to have mail delivered to the physical address in a timely manner, if at all, thus these residents pay for a PO box in town. The 1,600 PO boxes are essential to include in mailing lists aiming to reach Primary Zone residents, as it is the reliable way these residents receive mailers. The list of PO boxes must be purchased separately from the physical mailing address file from USPS or verified third party data provider.

Second, the timing of survey mailers and accessibility of the survey instrument through various modes are important factors to consider in order to achieve desirable response rates. The DRS was initially planned to be fielded in summer 2022. Due to unforeseen administrative delays, the survey was delayed until fall 2022, at which point the research team decided to delay launch further to not overlap or interfere with political election season. We are confident this delay was important to improving our response rates, as we received feedback during the survey beta test phase (October 2022) that the survey mailer was lost by multiple people in the many election mailers they received at the same time. Moreover, the research team was also careful in deciding to not launch the survey during periods of extreme weather, delaying the early 2023 launch by a few weeks to not field the survey during the extreme winter storms, flooding and power outages in January 2023. While the vast majority of respondents completed the survey online, accessing it via their mobile device or typing the link into a browser, 3.4% (n=82) respondents did request and complete a printed physical copy of the survey. These respondents were almost exclusively located in the rural regions of Zone 1, where broadband internet access is known to be limited and the population is older.

Third, small monetary incentives for respondents (S5 gift card offered to every respondent who completed >75% of the survey) and the community outreach campaign that the research team, survey advisory group members, and the Delta Stewardship Council conducted throughout the year prior to the survey launch (see Appendix B for details) were likely very influential in improving the response rates achieved.

Stratified random sampling approaches result in every residential address in the region having the same likelihood of being invited to participate in the survey and thus are likely to reduce response biases; in fact, the Pew Research Center compared error in different surveying approaches and found that opt-in survey methods result in approximately two times as much error in representative sampling, as compared to probability-based sampling (Mercer and Lau). While random sampling has the benefit of achieving much more representative samples, its drawback is lower overall response rates as compared to surveys distributed through trusted communication channels (e.g., surveys sent through opt-in email listservs can achieve significantly higher response rates since the survey comes from a trusted source). Average response rates seen on random sampling survey research range around 1-2% in recent years (CSU Institute for Social Research).

The community outreach campaign preceding the survey's launch, leveraging multiple communication channels and modes, likely contributed to the DRS response rates achieved (2.9% overall), that were near double current average response rates seen on mail-based randomly sampled surveys. Continuing this community outreach will remain critical to future survey efforts in this region.

Nevertheless, we still saw lower response rates from traditionally harder to reach demographics (i.e. younger age, people of color, multilingual households). This emphasizes the importance of needing more and stronger partnerships with trusted community groups working within those communities. We recommend future research efforts dedicate increased time to tailoring outreach to reach underrepresented communities, potentially through alternative data collection modes that may be more trusted or approachable in these communities (e.g. interviews, focus groups, community group observation).

Finally, weighting the survey data is an important step in overcoming practical limitations that remain in survey research, including high nonresponse rates, sampling under-coverage, and hard-to-reach populations that result in response bias correlating with demographic characteristics. Weighting survey data improves the external validity of results by enhancing the representation of respondents and producing unbiased estimates of population parameters. Working with Sacramento State University's ISR was critical to being able to undertake sophisticated data weighting procedures for such a complex geographic region.

Recommendations:

In conclusion, the DRS shows the opportunities and learnings that can be gained by better understanding Delta residents' experiences, opinions and preferences. There is a strong need across the estuary to continue investing in understanding the human dimensions of the geographically, demographically, and sociologically diverse region. Future environmental management efforts should always start by engaging community members and social scientists to identify the key human and social drivers that influence environmental outcomes of concern and ask relevant decision-makers what they need and want to know about the communities they serve to inform their decisions. The 2023 DRS results offer us initial insight to build on; we recommend the following:

1. Learn from the DRS results and find pathways to integrate Delta residents' perspectives into Delta decision-making. The primary recommendation emerging from the DRS work is for agencies working across the Delta to consider where and how they may be able to integrate data on Delta residents' perspectives into their work. DRS results illuminate what different communities living in the Delta care significantly about, what their primary concerns are, where they engage and who they trust, and how they relate to and view the region. These understandings can inform tailored communication and outreach messages and approaches that are more likely to reach and resonate with specific communities.

For example, for agencies working on climate adaptation and bolstering climate preparedness, DRS results suggest that communicating the ways in which climate change is likely to impact recreation and scenic beauty of the region will resonate highly with residents, who across the board value these aspects of the Delta. For rural communities specifically, communicating how climate change is likely to change the quiet way of life and threaten existing infrastructure emphasizes aspects of the region these residents are concerned about. DRS data can also inform agency processes for improving public engagement in decision-making. For controversial decisions or decisions where local buy-in is critical to achieving on-the-ground progress, involving entities that residents place higher trust in—including scientists, community advisory groups, and local resident representatives—may result in higher community trust. Furthermore, working with and through organizations that have higher community membership, such as religious organizations, volunteer and service organizations, and neighborhood associations provides opportunity to have deeper reach into the communities affected by resource management decisions in the Delta, who may not typically engage or be aware of Delta issues.

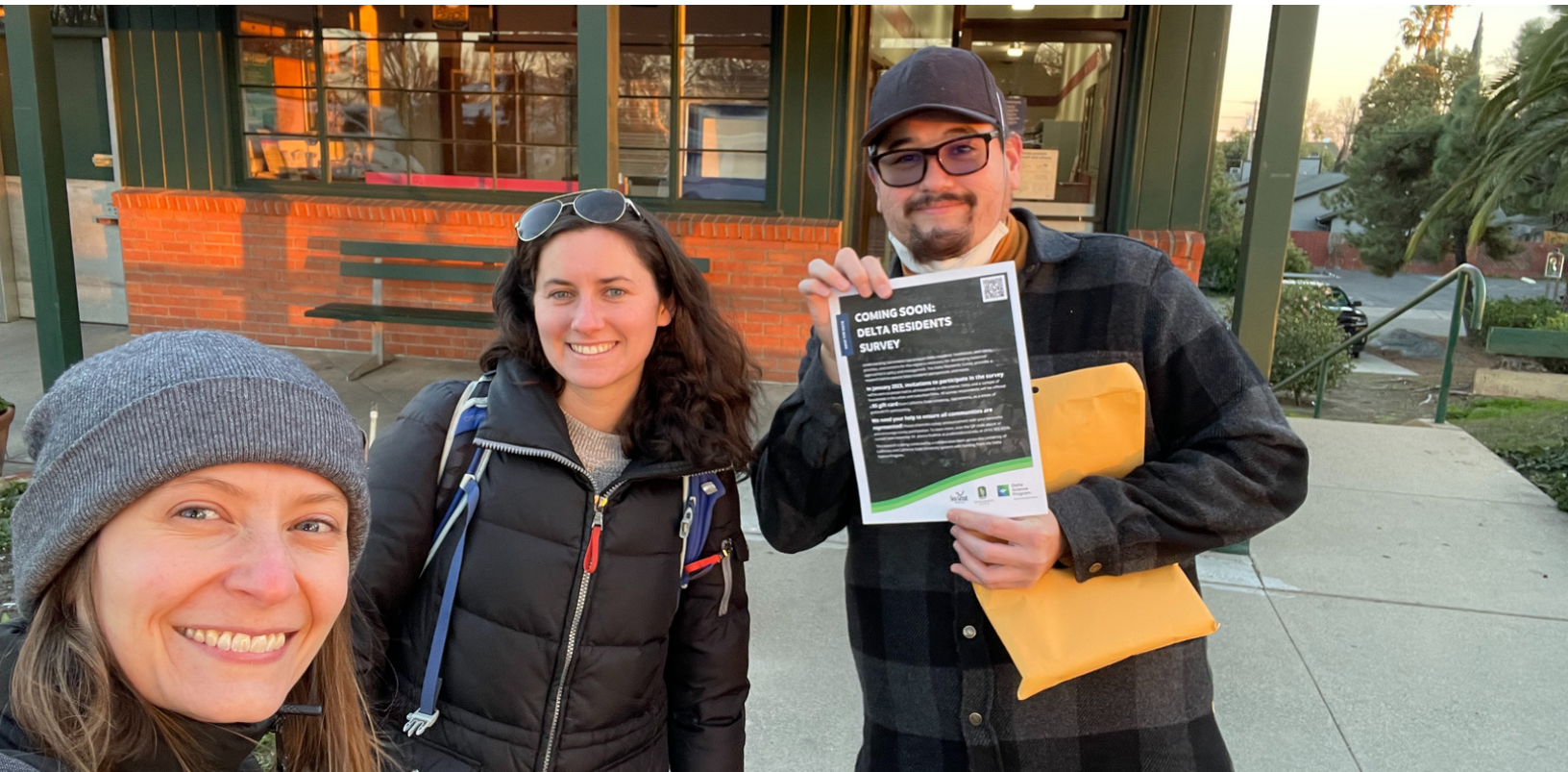
Finally, DRS data illuminates some of inequality in access to resources and overall differences in quality of life of residents across the Delta. For public agencies seeking to improve upon past decisions that have created present-day environmental injustices or to factor environmental justice considerations in as a priority when making decisions, DRS data can be used alongside other available public datasets (e.g. U.S. Census data, CalEnviroScreen cumulative pollution burden data), to identify the specific sub-regions, demographic groups, and socio-behavioral characteristics of residents that may increase their vulnerability to specific environmental harms or management changes; stronger protections and application of the precautionary principle should be followed to reduce likelihood of further inequitable impacts.

2. Develop collaborative approach to long-term social well-being monitoring across the estuary. As interest expands for monitoring human well-being and integrating data on human and ecological health for more holistic monitoring of social-ecological systems, there will be increased need to hone in on the most critical variables to measure consistently over time, and establish shared methods for data collection, such that data can be compiled and synthesized across different sub-regions, programs and times. The approaches and specific survey questions selected to measure concepts of interest on the DRS were not necessarily all encompassing; rather the 2023 survey instrument aimed to cover a range of topics of interest to multiple parties and research partners and replicate questions that had been previously field-tested and for which comparative data existed, while minimizing overall length of the survey for reduced respondent burden. As future survey efforts and follow-up measurements are considered, it will be important to gather additional input to collaboratively agree upon key social indicators of interest and carefully re-evaluate the survey instrument to improve construct measurement and cultural competency of questions. One specific example for reexamination are the Section I sense of place questions, given that 2023 results show that many of the place characteristics asked about had low resonance among many community members; adding or editing response items should be considered in future surveys. However, we recommend careful consideration of all edits to balance question continuity over time which is necessary for longitudinal analyses, with the need to evolve and learn from earlier surveys and emerging research needs. Learning from other large social-ecological systems around the U.S., we believe that repeating survey-based social health monitoring every 3-4 years would be an appropriate time interval for follow up measurement (Puget Sound Partnership).

In future research efforts, we encourage continuation of and even further investment in mixed-methods approaches that pair quantitative and qualitative data collection in order to achieve both broad and deep understanding of social dimensions. This will be important both for data interpretation and expanding research coverage to address known gaps and limitations of the 2023 DRS survey methods. Specifically, the 2023 DRS effort was not tailored to, and thus was not effective in, reaching specific communities known to be disproportionately vulnerable to environmental changes, such as Tribes with cultural or land ties to the Delta, transient labor and farm worker communities in the Delta, or unhoused communities living across the Delta. Developing research partnerships and improving research methods to ensure inclusion of these and other community members that were underrepresented in the survey data collection approach will be essential to establishing comprehensive pictures of human well-being in the Delta.

Finally, we emphasize the importance of continuing to develop partnerships with other regions across the country who are also embarking on efforts to establish holistic approaches to monitoring well-being in complex social-ecological systems. Learning and collaborating with other regions (e.g. Puget Sound, Chesapeake Bay, Tampa Bay, Great Lakes) provided extremely valuable lessons learned and comparative data that greatly informed and shaped the 2023 DRS effort. Continuing to learn, evolve and build holistic monitoring programs in collaboration with others will be important for contextualizing data and evaluating patterns in change across regions and over time.

Outreach for Delta Residents Survey, January 2023 (Photo credit: J.Rudnick)



Bibliography

Ardoin, Nicole, et al. "Scale and sense of place among urban dwellers." ECOSPHERE (2019).

Avancena, Isa, et al. The Livability Poll: An Annual Wellness Check of the Sacramento Region. Valley Vision. Sacramento, CA, 2022. <https://www.valleyvision.org/resources/the livability-poll-2022/>.

Baldassare, Mark, et al. California Voter and Partie Profiles. Fact Sheet. Public Policy Institute of California. Oakland: Public Policy Institute of California, 2023 <https://www.ppic.org/publication/california-voter-and-party-profiles/>.

—. PPIC Statewide Survey: Californians and the Environment. Statewide Survey Report. Oakland: Public Policy Institute of California, 2022 <https://www.ppic.org/publication/ppic-statewide-survey-californians-and-the-environment-july-2022/#questions-and-responses>.

Becker, Rachel. California water agency under investigation for discriminating against tribes, people of color. 9 August 2023. 2023 <https://calmatters.org/environment/water/2023/08/california-water-agency-investigation-discrimination/>.

Bidenweg, K., Sanchirico, J., Doremus, H., Johnston, R., Medillin-Azuara, J., and C. Weible. "A Social Science Strategy for the Sacramento San Joaquin Delta." 2020 <https://deltacouncil.ca.gov/pdf/science-program/delta-social-science-task-force/2020-04-07-task-force-final-report.pdf>.

California Department of Water Resources. California Water Watch. n.d. 2023 <https://cww.water.ca.gov/>.

—. Delta Conveyance: Environmental Justice. 2022. 2023. <https://water.ca.gov/Programs/State-Water-Project/Delta-Conveyance/Environmental-Justice>.

CSU Institute for Social Research. CALSPEAKS SSRIC Data sets. n.d. 2023. <https://calspeaks-dspace.calstate.edu/handle/10211.3/208096/discover filtertype=subject&filter_relational_operator=equals&filter=Public+opinion+polls>.

Delta Conveyance Project. Ed. Chris Austin. 7 February 2021. 2023 <https://mavensnotebook.com/delta-conveyance-project/>.

Delta Independent Science Board. Monitoring Enterprise Review. Report to the Delta Stewardship Council. Sacramento, CA, 2022<https://deltacouncil.ca.gov/pdf/isb/products/2022-03-22-isb-monitoring-enterprise-review.pdf>.

—. Review of Research on the Sacraemnto-San Joaquin Delta as an Evolving Place. Report to the Delta Stewardship Council. Sacramento, CA, 2017<https://deltacouncil.ca.gov/pdf/isb/products/2017-05-18-isb-delta-as-a-place.pdf>.

DeltaScienceProgram. "2022-2026 Science Action Agenda." Delta Stewardship Council, n.d <https://scienceactionagenda.deltacouncil.ca.gov/pdf/2022-2026-science-action-agenda.pdf>.

Fairbank, Maslin, Maullin, Metz & Associates (FM3). Key Findings from Recent Survey on Water Issues. Report for Natural Resources Defense Council. Santa Monica, CA: Faribank, Maslin, Maullin, Metz & Associates (FM3), 2014. 2023<https://www.nrdc.org/sites/default/files/wat_14022501a.pdf>.

Helliwell, John, et al. "Gallup World Poll: World Happiness Report." United Nations Sustainable Develop Goals Network. 2022. 2023.

Marlon, Jennifer, et al. Yale Climate Opinon Maps 2021. 23 February 2022. 2023 <https://climatecommunication.yale.edu/visualizations-data/ycom-us/>.

Mercer, Andrew and Arnold Lau. Comparing two types of online survey samples: Assessing the accuracy of estimates for U.S. adults. 7 September 2023. 2023 <https://www.pewresearch.org/methods/2023/09/07/assessing-the-accuracy-of-estimates-for-u-s-adults/>.

Puget Sound Partnership. Vibrant Human Quality of Life. 2023. 2023. <https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignGoal/Detail/2>.

Roos-Collins, Richard, et al. CA Water Law Symposium: Volutnary Agreements. Ed. Chris Austin. 27 April 2022. 2023. <https://mavensnotebook.com/2022/04/27/ca-water-law-symposium-voluntary-agreements-are-the-promises-enough-or-is-it-just-another-delay tactic/>.

Sandstrom, Aleksandra and Becka Alper. Americans with higher education and income are more likley to be involved in community groups. 2019. 2023. <https://www.pewresearch.org/short-reads/2019/02/22/americans-with-higher-education-and-income-are-more-likely-to-be-involved-in-community-groups/>.

U.S. Census Bureau. "Nonresponse Bias Analysis for the 2020 National Survey of Children's Health." 2020. 2023. <https://www2.census.gov/programs-surveys/nsch/technical-documentation/nonresponse/2020-NSCH-Nonresponse-Bias-Analysis.pdf>.

Analytical tools:

Lumley T (2023). "survey: analysis of complex survey samples." R package version 4.2.

Ou. J. 2021. "colorBlindnessGuide". https://cran.r-project.org/web/packages/colorBlindness/vignettes/colorBlindness.html

Rudis, B., Ross, N., and S. Garnier. "Introduction to the viridis color maps". R package. https://cran.r-project.org/web/packages/viridis/vignettes/intro-to-viridis.html

Appendices

Appendix A. Full Survey Instrument for 2023 Delta Residents Survey
Appendix B. Detailed Methodology
Appendix C. Survey Weighting Report
Appendix. D. Select Results across Geography & Demographic Groups

Appendix A: Full Survey Instrument for 2023 Delta Residents Survey

DELTA RESIDENTS SURVEY

Help represent your community!

Your personal invitation code: **D249682**

Your address has been randomly selected to represent your community by participating in the Delta Residents Survey. Understanding Sacramento-San Joaquin Delta residents' priorities and concerns on key social and environmental issues in the region is necessary for developing balanced approaches to policy and management.

This is a research study conducted cooperatively by *University of California's Sea Grant Program* and *Sacramento State's Institute for Social Research (ISR)*, with funding from the *Delta Science Program*. It is not a political poll and it is not related to any specific Delta policy or project. The information will be used to better understand Delta communities' well-being, quality of life, and key priorities and concerns, which will be used to develop recommendations for policymakers on how to better serve Delta communities.

Your input is extremely valuable. One adult from your household (age 18 or older) is eligible to take the survey. Your participation is voluntary and confidential. Survey respondents will **receive a $5 e-gift card for completing the survey by March 12th, 2023**.

There are multiple ways you can access the survey:

- **Visit:** www.tinyurl.com/DeltaSurvey2023
- **On your phone:**
  - **Scan** the QR code above
  - **Text** "DELTA" to 833-301-2784
- **To request a paper survey in the mail:**
  - **Call** (916) 278-4522
  - **Email** deltasurvey@csus.edu

Hay varias formas de acceder a la encuesta:

- **Visite:** www.tinyurl.com/DeltaSurvey2023
- **En su teléfono:**
  - **Escanea** el código QR de arriba
  - **Envíe** "DELTA" al 833-301-2784
- **Para solicitar una encuesta en papel por correo:**
  - **Llamar** (916) 278-4522
  - **Correo electrónico** deltasurvey@csus.edu

Su hogar ha sido seleccionado al azar para representar a su comunidad a través de su participación en la Encuesta de Residentes de Delta. Comprendiendo las prioridades y preocupaciones de los residentes del Delta Sacramento-San Joaquín sobre cuestiones sociales y ambientales principales en la región es necesario para desarrollar enfoques equilibrados de políticas y administración.

La investigación está siendo realizada por una asociación de colaboración entre *California Sea Grant, El Instituto de Investigación Social del la Universidad Estatal de Sacramento (ISR),* y el *Programa de Ciencias de Delta.* No es una encuesta política y no está relacionada con ninguna política o proyecto específico de Delta. La información se utilizará para comprender mejor el bienestar, la calidad de vida y las prioridades y preocupaciones principales de las comunidades del Delta, que se utilizarán para desarrollar recomendaciones para los legisladores sobre cómo servir mejor a las comunidades del Delta.

Su aporte es extremadamente valioso. Un adulto de su hogar (18 años o más) es elegible para responder a la encuesta. Su participación es voluntaria y confidencial. Los participantes elegibles **recibirán $5 por completar la encuesta antes del 12 de Marzo del 2023.**

The Delta Residents Survey is administered by the Institute for Social Research on behalf of the California Sea Grant and Delta Stewardship Council.

For questions about the survey or for technical assistance:
Project Lead at California Sea Grant, Dr. Jessica Rudnick
916-902-6596 | jrudnick@ucsd.edu
Project Coordinator at Sacramento State, Robert Rodriguez
916-278-4522 | deltasurvey@csus.edu

SACRAMENTO STATE
Institute for Social Research

Invitation Code:

Delta Residents Survey

Your address has been selected to participate in an important survey about the Sacramento-San Joaquin Delta because you live in the region. This survey aims to better understand residents' opinions and experiences with social and environmental issues in the Delta. This is a research study being conducted cooperatively by University of California's Sea Grant Program and Sacramento State's Institute for Social Research, with funding from the Delta Science Program.

This survey is not a partisan nor political poll, and it is not related to any specific Delta policy or project. The information will be used to better understand the quality of life of Delta communities, and will be shared with decision-makers in hopes of informing balanced approaches to policy and management that account for residents' opinions, values, and needs.

Your participation in this survey is voluntary. The survey should take approximately 20 minutes of your time, and you will receive $5 electronic gift card after completing the survey as a thank-you for your participation. You must complete most of the survey to be eligible for the $5 gift card. Individual responses are kept strictly confidential and data will only be reported together as a group so your individual answers cannot be linked back to you. This study has been reviewed and approved by the University of California San Diego Institutional Review Board. Questions can be directed to: IRB@ucsd.edu or (858)-246-4777.

The results of this study will be summarized in a report that will be available at https://deltacouncil.ca.gov/social-science by Summer 2023.

If you have any questions about the survey, please contact Project Lead at California Sea Grant Dr. Jessica Rudnick (jrudnick@ucsd.edu or 916-902-6596). For technical assistance with the survey, please contact Project Coordinator at Sacramento State, Robert Rodriguez (deltasurvey@csus.edu or 916-278-4522).

Your choosing **"I agree" below indicates that you have read and understood the information** attached and that you agree to participate.

☐ **I agree** to participate in this survey.

☐ **I decline** to participate in this survey.

Our first questions are to help us better understand your relationship to the Delta.

The Sacramento-San Joaquin Delta region is shown in the shaded area labeled "Delta" to the left. The map depicts larger cities, bodies of water, and topography. The Delta is a region east of the San Francisco Bay formed by the meeting of the Sacramento River and San Joaquin River, as well as three smaller rivers: the Mokelumne, Cosumnes and Calaveras. The region stretches from Sacramento and West Sacramento in the north, down to Tracy in the south, and from Stockton in the east, to Antioch in the west.

1. Please tell us which of the following apply to you. **Do you currently…**

Select all that apply

- ☐ Live in or near the Delta region
- ☐ Work in the Delta
- ☐ Visit the Delta for fun or recreation
- ☐ Farm in the Delta
- ☐ Commute through the Delta
- ☐ None of these

ANSWER IF YOU CHOSE '*LIVE IN OR NEAR THE DELTA REGION*' AT PREVIOUS QUESTION #1

1a. How long have you **personally** lived in or near the Delta region?

Please provide the length of time in years. If you have lived in or near the Delta for less than one year, please round up to 1.

- ☐ Years lived in or near Delta: _____
- ☐ Decline to answer

2. Which best describes the **area where you live?**

☐ Urban ☐ Suburban ☐ Historic or Delta "legacy" town ☐ Rural (outside of town) ☐ I don't know

3. Which of the following statements **describe YOUR relationship to the Delta?**

Select all that apply	
☐ I am **proud** to live in the Delta.	☐ I enjoy doing **outdoor recreational activities** in the Delta.
☐ I **feel** attached to the **natural environment** of the Delta.	☐ I have **familial, cultural, or historical ties** to the Delta.
☐ I **depend** on the Delta for my **job or livelihood**.	☐ My family has lived in the Delta for **more than one generation.**
☐ I **depend** on fishing or gathering in the Delta as a **source of food**.	☐ None of the above
☐ I have a **sense of responsibility** toward the Delta.	

4. Which of the following statements **describe why YOU feel the Delta is important**?

Select all that apply	
☐ The Delta is an important ecosystem.	☐ The Delta is important as California's water hub.
☐ The Delta is a good region for outdoor recreation.	☐ I don't know why the Delta is important.
☐ The Delta is a place of cultural and historical importance.	☐ The Delta is not important to me.
☐ The Delta is an important agricultural region for the state.	

5. In one or two short sentences, please describe the Delta Region as you would to someone **who is not familiar with it.**

_____

_____

_____

_____

The next set of questions ask about your well-being and quality of life in the Delta.

6. **The following are some factors that people value about living near the Delta.** Which factors, if any, you **personally value most** about living in the Delta area.

Select up to three

- ☐ Access to outdoor recreation opportunities
- ☐ Access to waterways and waterfronts
- ☐ Agricultural region
- ☐ Close proximity between urban and rural areas
- ☐ Historic and culturally significant areas
- ☐ Quiet and solitude
- ☐ Scenic beauty
- ☐ Sense of community
- ☐ Other. Please specify: _____ _____
- ☐ None of these are things I value about living near the Delta

7. **The following are some factors that present potential challenges to the well-being of Delta residents.** Please select which factors, if any, present the **largest challenges to your personal well-being as a Delta resident.**

Select up to three

- ☐ Affordability of basic needs (e.g., housing, food, healthcare)
- ☐ Access to highspeed internet
- ☐ Aging infrastructure (e.g., roads, levees, bridges)
- ☐ Climate change/Global warming
- ☐ Delta Conveyance/Delta Tunnel projects
- ☐ Environmental decline
- ☐ Lack of job or education opportunities
- ☐ Threats to public safety (e.g., first responders, trespassing, vandalism, illegal dumping)
- ☐ Social inequality
- ☐ Traffic congestion/Limited transportation options
- ☐ Urban/Suburban development
- ☐ Other. Please specify: _____ _____
- ☐ None of these are challenging for my personal well-being

8. Do you engage in any of the following activities in the Delta?

Select all that apply

- ☐ Wildlife viewing/Birding
- ☐ Attend/Visit cultural events, festivals, or historical places
- ☐ Fishing or hunting
- ☐ Spiritual or religious practices or rituals related to the environment
- ☐ Water activities (e.g., boat, kayak/ canoe, swim)
- ☐ None of these
- ☐ Land-based activities (e.g., walk, hike, bicycle, camp, picnic)

9. Who do you feel best advocates for your interests in the Delta? (For example, this could be a community organization or group, a public official, a government entity, a local leader, etc.)

- ☐ Please specify individual or organization name: _____
- ☐ No one advocates for my interests in the Delta
- ☐ I don't know

10. Please rate your overall level of satisfaction with your **quality of life** in the Delta.

☐ Very satisfied ☐ Satisfied ☐ Neutral ☐ Dissatisfied ☐ Very dissatisfied

11. When you imagine life in the Delta **one generation from now** (approximately 25 years), what do you hope it looks like? Please provide 1-2 short sentences.

_____

_____

_____

_____

The next few questions ask about your experiences with environmental change in the Delta.

12. Have you or anyone in your home **experienced** any of the following impacts while **living in the Delta**?

Select all that apply

- ☐ Flooded property (e.g., home, farm, roadway)
- ☐ Excessive heat
- ☐ Well failure or contamination
- ☐ Worsening air quality
- ☐ Natural disaster (e.g., flood, wildfire, earthquake, drought, etc.)
- ☐ Worsening water quality
- ☐ Moved/Relocated due to disaster
- ☐ None of the above

13. **How concerned are you about each of the following environmental changes affecting the Delta <u>over the next 25 years</u>?**

Select a response for each item	Very concerned	Moderately concerned	Somewhat concerned	Not at all concerned	Unsure
a. Rising **sea levels**	☐	☐	☐	☐	☐
b. More frequent/severe **heat waves**	☐	☐	☐	☐	☐
c. More frequent/severe **droughts**	☐	☐	☐	☐	☐
d. More frequent/severe **floods**	☐	☐	☐	☐	☐
e. More frequent/severe **wildfires and smoke**	☐	☐	☐	☐	☐
f. Worsening **air quality**	☐	☐	☐	☐	☐
g. Worsening **water quality**	☐	☐	☐	☐	☐

14. Are there any **other environmental changes** not mentioned above that you are concerned about affecting the Delta?

☐ No ☐ Yes. Please specify: _____

15. How much do you think the environmental changes mentioned above (e.g. rising sea levels, heat waves, droughts, floods, wildfires, worsening air and water quality, etc.) **are a result of climate change?**

☐ Entirely due to climate change ☐ Mostly due to climate change ☐ Mostly due to other factors ☐ Not all due to climate change ☐ I don't know

16. Do you believe **climate change** is caused…

☐ mostly by human activities ☐ mostly by natural changes in the environment ☐ by both human activities and natural changes in the environment ☐ None of the above because climate change isn't happening ☐ I don't know

17. To prepare for possible environmental and climate change impacts to the Delta, would you support policies that led to any of the following actions?

Select all that apply

- ☐ You pay an annual fee for local levee improvements to reduce flood risk
- ☐ You pay an annual fee to fund a local district to be responsible for climate risk reduction (for example, the Delta Region Geological Hazard Abatement District in Isleton)
- ☐ State government dedicates more land to restoring wildlife habitat
- ☐ State or local government increases public access to parks, trails, or open spaces
- ☐ State government dedicates more funding for sustainable agriculture
- ☐ State government mandates decreases in farmland during drought years to save water (i.e. fallow farm land)
- ☐ State government dedicates more water to agriculture
- ☐ State government dedicates more water to the environment
- ☐ State government dedicates more water to cities and communities
- ☐ None of these

18. Are there any other actions (not listed above) that you would like to see taken to prepare the Delta for possible environmental and climate change impacts?

☐ No ☐ Yes. Please specify: _____

The following questions ask you about California's current water situation.

19. **Please rate your level of agreement with the following statements:**

Select a response for each item

	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	I don't know
a. California is currently in a severe drought.	☐	☐	☐	☐	☐
b. California should be preparing for more severe droughts in the future.	☐	☐	☐	☐	☐

20. Have you personally experienced **drought impacts directly? If so, how?**

- ☐ Yes, I have personally experienced drought impacts.
  Please specify: _____
- ☐ No, I have not personally experienced drought impacts
- ☐ I don't know

21. In response to the current drought in California, would you say **state and local governments** are...

☐ Not doing enough ☐ Doing the right amount ☐ Doing too much ☐ I don't know

22. In response to the current drought in California, would you say **other people living in the Delta** are...

☐ Not doing enough ☐ Doing the right amount ☐ Doing too much ☐ I don't know

23. In response to the current drought in California, would you say **other Californians living OUTSIDE of the Delta** are...

☐ Not doing enough ☐ Doing the right amount ☐ Doing too much ☐ I don't know

24. Which of the following resources do you currently have access to?

Select all that apply
☐ Air conditioning or climate-controlled environment
☐ Air filters
☐ Backup power supply/Generator
☐ Personal computer with internet connection
☐ Mobile device with internet connection
☐ Domestic well for drinking water
☐ Sewage system
☐ Homeowner's or renter's insurance
☐ Flood insurance
☐ Earthquake insurance
☐ Health insurance
☐ Personal motorized vehicle such as a car, truck, motorbike, etc.
☐ Public transportation such as bus or train route
☐ Emergency financial resources (e.g., savings, credit, loans)
☐ Family, friends or supportive community you could stay with in the case of an emergency event evacuation
☐ None of the above

25. If you have any additional thoughts on **community and environmental wellbeing** in the Delta, please write them here:

_____

_____

_____

The final section of the survey asks some demographic questions that allow us to ensure our results represent the population in the Delta region. As a reminder, all of your responses will be kept strictly confidential, and data is never reported individually.

26. What is **your gender?**

☐ Woman ☐ Man ☐ Transgender ☐ Non-binary/Non-conforming ☐ Decline to answer

27. Which of the following age groups do you belong to?

☐ 18 - 24 ☐ 25 - 34 ☐ 35 - 44 ☐ 45 - 54 ☐ 55 - 64 ☐ 65 or older ☐ Decline to answer

28. Which of the following best describes **your race/ethnicity?**

Select all that apply

☐ Asian or Asian American	☐ Native Hawaiian or Other Pacific Islander
☐ Black or African American	☐ White
☐ Hispanic or Latino/a	☐ Other. Please specify: _____
☐ Native American or Native Alaskan	☐ Decline to answer

29. What is the **highest level of education** you have completed?

☐ No high school degree or GED	☐ Bachelor's degree
☐ High school degree or GED	☐ Graduate or professional degree
☐ Some college, no degree	☐ Decline to answer
☐ Associate degree	

30. What was **your household income from all sources in 2022?**

- ☐ Less than $10,000
- ☐ $10,000-$24,999
- ☐ $25,000-$49,999
- ☐ $50,000-$74,999
- ☐ $75,000-$99,999
- ☐ $100,000-$149,000
- ☐ $150,000-$200,000
- ☐ Greater than $200,000
- ☐ Decline to answer

31. Is **YOUR** residence…

- ☐ Owned by you or someone else living there
- ☐ Rented
- ☐ Occupied without payment of rent
- ☐ Decline to answer

32. Which languages are **spoken in your home?**

Select all that apply

- ☐ Arabic
- ☐ Cambodian
- ☐ Chinese
- ☐ English
- ☐ Hmong
- ☐ Lao
- ☐ Russian
- ☐ Spanish
- ☐ Tagalog
- ☐ Vietnamese
- ☐ Other. Please specify: _____
- ☐ Decline to answer

33. Including yourself and any children, **how many people currently live or stay at this address** most or all of the time.

- ☐ Number of people: _____
- ☐ Decline to answer

34. Which best describes **your political views?**

Select ONLY one

- ☐ Very conservative
- ☐ Conservative
- ☐ Moderate
- ☐ Liberal
- ☐ Very Liberal
- ☐ None of the above
- ☐ Decline to answer

The following questions are not related to the purpose of this study, but allow us to ensure our results represent the population in the Delta region.

35. Approximately, how many **hours of television** do you watch on an average day?

ONLY provide a whole number

☐ Please provide your best estimate in **hours**: _____

☐ Decline to answer

36. In a typical week, about how many **hours do you spend on the internet** for personal use?

ONLY provide a whole number

☐ Please provide your best estimate in **hours**: _____

☐ Decline to answer

37. How often do you **try new products** before other people do?

☐ Never ☐ Sometimes ☐ Often ☐ Always ☐ Decline to answer

38. **Thank you for your responses! Would you be interested in being contacted by the survey sponsor to talk more about issues facing the Delta region? Again, any information you provide will be strictly confidential.**

☐ Yes ☐ No, thank you

ANSWER IF YOU CHOSE '*YES*' AT PREVIOUS QUESTION #38

38a. Please provide your **contact information**, specifically your **first name only** AND phone number **OR** email:

a. First name **only**: _____

b. Phone number: _____

c. Email: _____

Thank you for completing this survey!

Before you go, we are testing out a few more questions to use on future surveys. We would appreciate if you could please take some time to answer a few more quick questions. These additional questions will take less than 5 minutes.

39. Are you involved with any of the following **groups or communities** in the Delta?

Select all that apply

☐ Agricultural group (e.g., farm bureau, commodity association, water agency)	☐ Neighborhood/Homeowners association
☐ Reclamation district	☐ Volunteer-based or service organization
☐ Religious group	☐ Social justice or social welfare organization
☐ School-based group (e.g., parent association, student group, college or university)	☐ Tribe (federally recognized or not) or Native American group
☐ Recreation or sports group (e.g., hunting club, sports team)	☐ Political group
☐ Marina or boating club	☐ Ethnic, nationality or civil rights group
☐ Professional society	☐ Historical society or arts-based organization
☐ Labor union	☐ Other. Please specify: _____
☐ Town council/Local government advisory group	☐ None of the above

40. **Please rate the following entities on how much you trust them to act in the best interests of the Delta.**

Select a response for each item

	Trust completely	Trust somewhat	Trust only a little	Somewhat distrust	Strongly distrust
a. Federal policy makers	☐	☐	☐	☐	☐
b. State policy makers	☐	☐	☐	☐	☐
c. Local policy makers	☐	☐	☐	☐	☐
d. Scientific experts	☐	☐	☐	☐	☐
e. Community advisory groups	☐	☐	☐	☐	☐
f. Local residents	☐	☐	☐	☐	☐

41. **How likely are you to get involved in any of the following ways for a Delta issue that is important to you?**

Select a response for each item	Very likely	Somewhat likely	Somewhat unlikely	Very unlikely	Unsure
a. Attending/Participating in a hearing or public meeting	☐	☐	☐	☐	☐
b. Attending/Participating in a demonstration	☐	☐	☐	☐	☐
c. Volunteering with an advocacy group	☐	☐	☐	☐	☐
d. Writing a blog or letter to a newspaper	☐	☐	☐	☐	☐
e. Calling or writing a letter to an elected official or public agency	☐	☐	☐	☐	☐
f. Signing a petition	☐	☐	☐	☐	☐
g. Voting in an election	☐	☐	☐	☐	☐
h. Taking a job that allows me to work on the issue	☐	☐	☐	☐	☐

42. Is there another way that was not listed above that you would be likely to get involved in the Delta for an issue that mattered to you?

☐ No ☐ Yes. Please specify: _____

43. Are any of the following factors **barriers to engaging** with issues facing the Delta?

Select all that apply

☐ I am unfamiliar with the issues

☐ I am too busy with other obligations and priorities

☐ I feel like my perspective is not represented

☐ My preferred language is not available (e.g., no translation or interpretation is available)

☐ I feel like my input will not affect decision-making

☐ COVID-related impacts (e.g., health, time, financial resources or obligations)

☐ I don't know how or when to engage

☐ I am not interested in the issues

☐ I am unable to get to meetings (e.g., transportation; location or time are inconvenient)

☐ Other barrier. Please specify: _____
_____

☐ I do not have internet or technology access to attend virtual meetings

☐ None of the above

As mentioned before, you can receive $5 as a thank-you**. If you would like to receive the $5**, please provide your mailing address to receive cash via mail or your email address to receive an electronic gift card. **You may also choose to donate your $5.** Your donation will help us learn more about the opinions and experiences of other Delta area residents, by allowing more people to participate. Please make the appropriate selection:

☐ **Email: _____**

☐ **Street Address:_____**
(For Example: 123 Main Street Apt. 2)

☐ **Donate**

Thanks again for taking the time to participate in the Delta Residents Survey!
Your feedback is extremely important!

If you have any questions about the survey, please contact:

Project Lead at California Sea Grant Dr. Jessica Rudnick
jrudnick@ucsd.edu | 916-902-6596

Project Coordinator at Sacramento State Robert Rodriguez
deltasurvey@csus.edu | 916-278-4522

Please use the enclosed pre-paid envelope and mail to return your completed survey by:

Thursday March 31st, 2023

Sea Grant California

SACRAMENTO STATE

Delta Science Program
DELTA STEWARDSHIP COUNCIL

Appendix B: Detailed Methodology

This Appendix includes detailed documentation on the following steps to developing, creating, implementing and analyzing the 2023 Delta Residents Survey:

1. **Survey instrument development**
2. **Survey advisory group**
3. **Survey beta test**
4. **Community outreach campaign**
5. **Sampling frame**
6. **Survey distribution**
7. **Survey analysis**

This Appendix includes detailed documentation on the following steps to developing, creating, implementing and analyzing the 2023 Delta Residents Survey:

1. Survey instrument development

To inform development of the 2023 DRS instrument, the research team participated in and supported qualitative data collection efforts and conducted extensive reviews of available literature and previously collected data. Qualitative data collection efforts included interview-based research that Shalita Brydie conducted in 2021-22 for her capstone project to fulfill her degree requirements for her Professional Master's in Environmental Science from Oregon State University. Six in-depth interviews were conducted which informed the research team's understanding of sense of place connections of Delta residents and allowed for field testing of multiple sense of place and well-being survey topics. Project PI Rudnick and co-PI Biedenweg provided mentorship and supervision of Ms. Brydie's research throughout her capstone and degree. Additionally, the research team and multiple members from the survey advisory group designed, facilitated, and/or participated in 12 complementary focus groups conducted throughout 2021-22, sponsored by the Delta Stewardship Council and focused on the agency's efforts to plan for climate change impacts and necessary adaptation.

These focus groups provided important insight into different Delta interest group's concerns, priorities, and experiences with environmental and climate change across the estuary.

Beyond the qualitative data collection efforts, the research team reviewed as many surveys as they could find that had been fielded in the Delta in the past. The team identified 19 surveys fielded to Delta communities over the past 25 years (1997-2022). Reviewing past surveys helped to identify where baseline or comparative data may exist and also revealed important gaps in what topics and target populations have been subjects of past surveys. Notably, the team found there had only been one other representative survey effort conducted at the full Delta regional scale (a survey on perceptions of Carbon Capture and Sequestration conducted by Lawrence Livermore National Labs in 2020). Most survey efforts targeted specific user groups (e.g. people who fish, boaters, hunters) or were focused on a very specific issue (e.g. Department of Water Resources' Environmental Justice Survey conducted in 2019 on the Delta Conveyance Project).

After reviewing available data in the Delta, the research team developed a survey question bank that compiled relevant survey questions from other survey research efforts around the country. This question bank provided questions that had been field tested in other regions and that would have comparative data to evaluate from other regions. Notable other surveys that were reviewed included the Puget Sound Human Well-being Vital Signs, the Chesapeake Bay Stewardship Indicators, the Yale Climate Change Communication Program surveys, Public Policy Institute of California surveys on drought and environmental opinions, Natural Resource Defense Council survey on drought in California, and the U.S. General Social Survey.

2. Survey advisory group

A Survey Advisory Group (SAG) was established with approximately 20 members from various organizations involved in and around the Delta, relevant academic and research social scientists, and local consultants and community groups. Organizations represented on the SAG included the Delta Protection Commission, the Sacramento-San Joaquin Delta Conservancy, the Delta Watermaster's Office, San Francisco Estuary Institute, San Francisco Estuary Partnership, NOAA Southwest Fisheries Office, Valley Vision, UC Davis, UC Merced, Tufts University, UC Santa Barbara and Sacramento State University.

The SAG met 3 times on Zoom to provide input on the scope of the survey, review an extensive list of potential survey questions, and review the draft and near final survey instruments. The SAG met a final time after survey data had been collected and results compiled, to provide feedback on a draft version of this summary report. In addition to the SAG, the Delta Stewardship Council staff provided input on the survey instrument design and development at two Social Science Integration Team meetings, one Delta Adapts team meeting, and one Executive Team meeting. The SAG, SAG members' organizations, and the Delta Stewardship Council were essential partners in the community outreach campaign (see Section 4 below) and getting the word out about the DRS release. Partners leveraged their newsletters, email listservs, social media platforms, and personal networks to communicate support for the DRS and encourage Delta residents to participate if they received an invitation to the survey.

3. Survey beta test

A draft survey instrument was beta tested with Delta community members in fall 2022 to ensure survey questions were easily readable, culturally competent and locally tailored. Beta testers were recruited over email by reaching out to local community groups, the Delta Leaders network, the Delta Protection Advisory Committee, and other groups actively involved with the three Delta State agencies. Volunteers offering to serve as beta testers were asked to fill out a brief questionnaire that provided basic information on their demographics, where in the Delta they live, and what, if any, community groups they participate in. The research team purposefully sampled from the volunteer list to try and achieve a diverse sample of beta testers from different geographies, demographic groups, and representing different key community and interest groups in the Delta.

In November 2022, 42 volunteers who had signed up to beta test the survey were selected and mailed an invitation letter. We received 21 responses back total for a 50% response rate (3 people responded by mail, 18 responded online). Beta testers were asked to take the full survey and then respond to an additional questionnaire about their experience with the survey and any feedback they had on question design, question wording, or topics on the survey. Beta testers were compensated with $50 gift cards for their time and expertise and response data was shared back with them in summary report format. Input from the beta test was used to revise the survey instrument in preparation for the full survey launch.

4. Community outreach campaign

In advance of launching the survey, the research team led an extensive outreach campaign to raise awareness of the survey effort and ask for support from community groups with connections and communication channels direct to Delta residents. Lead PI Rudnick and DSC staff member Annie Merrit sent two rounds of outreach emails to approximately 100 email contacts, including community groups, active community members, local governments, and other state agencies with active newsletters and email lists reaching Delta communities (e.g. Delta Protection Commission, Delta Watermaster's Office Delta Water Rights Holders listserv, Department of Water Resources list). The Delta Stewardship Council communications team added information about the survey on the Council's website, launched two email listserv notices, and posted multiple times on social media.

The research team provided outreach presentations to multiple community groups throughout 2021 and 2022: Walnut Grove Rotary Club, Clarksburg Volunteer Fire District, Isleton City Council, South Stockton Shibley Community Center, Antioch Mobility LABs; presentations were also provided to the Delta Protection Advisory Committee and the Delta Stewardship Council's Environmental Justice Expert Group multiple times throughout the survey development process. Finally, posters providing information on the survey effort were posted at all post offices throughout the rural Delta and public libraries in the suburban/ urban Delta.

5. Sampling Frame

Sacramento State University Institute for Social Research (ISR) and Marketing Systems Group (MSG) led the development and execution of survey sampling, following the desired structure given by project PI Rudnick. MSG carried out all spatial analyses to develop the sampling frame, purchased residential address databases from the U.S. Postal Service based on defined sampling boundaries, and determined which household addresses fell within each survey zone.

The survey was distributed following a stratified random sampling approach. We developed 3 strata (or" zones"), based off of the legal boundaries of the Delta:

- Zone 1: ("Delta Primary Zone", including Rio Vista): Rural area in the heart of the Delta, shown in Map 1 below by the red area.
- Zone 2: ("Delta Secondary Zone"): Adjacent to the primary zone, includes the surrounding suburban/ urban areas of the Delta; shown in Map 2 below in blue area.
- Zone 3: Comprised of two areas, one in south Sacramento and one in south Stockton, outside of the defined Secondary Zone, that bring in communities known to bear disproportionate environmental harm burden. These areas are defined by California's Community Air Protection Program1 (CAPP; responsive to 2017 Assembly Bill 617), which defined boundaries at a very local level for communities highly impacted by environmental harms. The program includes communities in South Stockton & South Sacramento/ Florin, which the research team adopted for the 2023 DRS for the purpose of reaching Delta adjacent, highly impacted and socially vulnerable communities.

Residential address sampling is done using the U.S. Census geographies, specifically using 2020 Census Block Groups (CBGs), the finest scale spatial unit available. Sampling by CBG geography allows for more accurate comparison to full population characteristics (e.g. demographics) to assess the survey respondents for representativeness and weight the data appropriately. CBG boundaries do not perfectly overlap with Delta legal boundaries or the CAPP legal boundaries. Discrepancies between CBG boundaries and the zone boundaries are reconciled in the following ways:

- If part of a CBG is inside a zone and part is outside of all zones, include the full CBG in the zone.
- If a CBG falls into both zones 1 and 2, assign the CBG to whichever of the two zones has the largest population.
- If a CBG falls into both Zone 2 and Zone 3 (which only occurs in Stockton where these two zones overlap), those CBGs go with Zone 2.

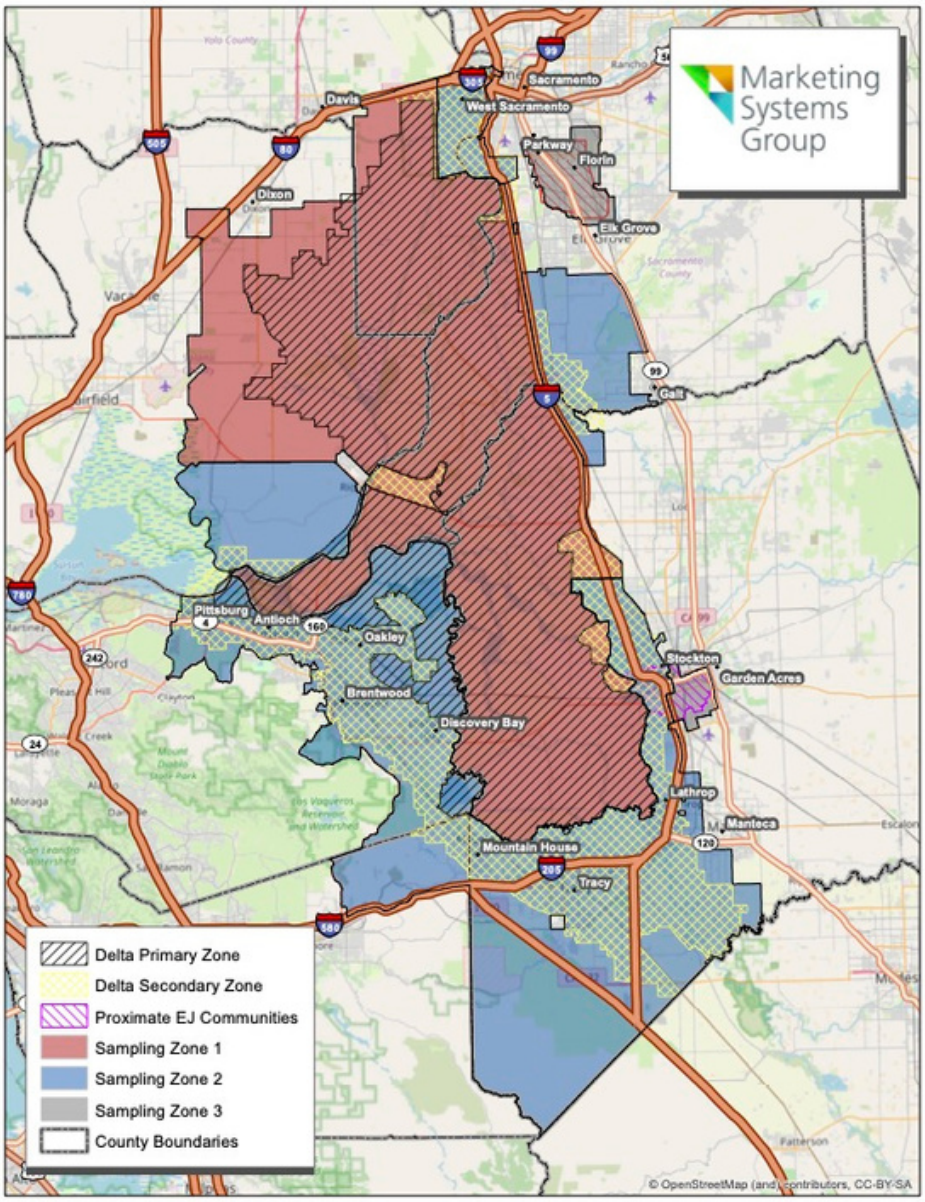
See Table 1 for total population, household and sampling numbers by zone. See Map 1 below for comparison of sampling zones to legal zone boundaries.

Table 1: 2023 DRS Sampling Numbers

Zone	Population count	Count of Households	% Households to sample	# Households invited to participate
Zone 1 (Delta Primary Zone)*	**11,727**	4,372	100	4,372
Zone 2 (Delta Secondary Zone)	**540,340**	236,699	25	59,175
Zone 3 (Delta adjacent CAPP communities)	**166,085**	67,758	25	16,940
TOTAL	**718,152**	**308,829**	-	**80,487**

*Note, in addition to physical residential addresses, after the first mailing it was discovered that there are an additional 1,670 Post Office boxes in Zone 1 designated as "traditional PO boxes", meaning that they are paid for by the user who technically can receive mail at their street address, but likely don't reliably receive mail at their street addresses. These PO boxes were included in the second mail-out list.

Map B.1: Delta legal zones denoted in cross-hatched patterns, which overlay sampling zones established for 2023 DRS, which are denoted by colors.



6. Survey Distribution

Survey distribution followed a modified Dillman Tailored Design Method2 for a mail-to-web based approach. Mail-to-web based approaches send physical mail invitations to sampled addresses, and provide directions on how to access the survey online. In this case, options to access the survey online included scanning a QR code, texting a phone number to receive the survey link via SMS, typing in a tinyURL into an internet browser, or for an offline version, calling a phone number or emailing to request a survey be sent in print to the mailing address.

On February 3rd, 2023, 80,487 invitation letters were sent out via USPS mail to residential addresses across all three zones. The invitation letter explained the purpose of the survey, who was conducting the research, and provided different options for accessing the survey. The invitation letter also had instructions in Spanish. Each invitation letter included a personalized invitation code that provided a key linking the respondent's answers to their residential address.

On March 6th, 2023, a second round of invitation letters was sent out via USPS mail to residential addresses who had not yet responded from Zone 1 and Zone 3. Zone 2 response rates had met expectations already, so follow up invitations were not sent to this zone. In addition, the ~1,600 traditional PO boxes in Zone 1 were also sent invitation letters. Invitations sent to the PO boxes required that respondents fill in their residential address in order to verify no duplicate responses.

7. Survey analysis

Survey response rates were calculated following the American Association for Public Opinion Research response rate calculators3.

Survey respondent characteristics (e.g. demographic frequencies) are based on raw data. All other analyses in this report use the weighted data (see Appendix C for details on weighting methodology).

All descriptive analyses were completed in R, using Thomas Lumley's {survey} package V4.2-1 for complex survey samples. Weighted means, frequencies, minimums/ maximums, and standard deviations were all calculated using the Survey package summary functions. Means difference testing to determine significant differences in survey question responses between respondents across zones and demographics groups were conducted by running Pearson's chi-square tests with Rao-Scott corrections necessary for weighted samples4. Significant differences at $p<0.05$ are reported.

Index scores for select survey batteries (i.e. sense of place, environmental impacts experienced, level of climate concern, adaptive capacity, group membership, civic engagement) were developed as a mean score of the multiple survey items within each designated survey question for each respondent, and then weighted mean(s) of the index variable across respondents or sub-groups of respondents were calculated.

The only index that combined more than one survey question was the sense of place index, combining items from Q1 and Q3 for an overall score out of 12. Index scores were averaged across all respondents within a census tract to develop the maps showing how scores varied across the Delta geography. Because complex survey samples break the assumptions of traditional ANOVA/F-test and Student's t-test approaches for testing distributions of a continuous variable across categorical variables, means difference testing of the index scores across demographic groups was done by running Generalized Linear Model regressions with a single co-variate at a time (the demographic factor of interest) using 'svyglm' function in the Lumley {survey}5 package, followed by Wald-tests to determine significant differences in the effect of each demographic variable coefficient6. Bonferroni corrections were applied to account for multiple comparison testing. Significant differences reported are at a $p<0.05$ level.

References

1. California Air Resources Board, Community Air Protection Program: https://ww2.arb.ca.gov/capp

2. Dillman, Don A., Smyth, Jolene D., Christian, Leah Melani. 2014. Internet, Phone, Mail and Mixed-Mode Surveys: The Tailored Design Method, 4th edition. John Wiley: Hoboken, NJ

3. American Association for Public Opinion Research Response Rate Calculator v 4.1. https://aapor.org/response-rates/

4. Scott, Alastair. N.d. "Rao-Scott corrections and their impact". Section on Survey Research methods. Auckland, New Zealand, 1011. http://www.asasrms.org/Proceedings/y2007/Files/JSM2007-000874.pdf

5. Lumley, Thomas. "Analysis of Complex Survey Samples" Package. Version 4.2-1. Updated May 3, 2023. https://cran.r-project.org/web//packages/survey/survey.pdf

6. Heeringa, Steven G., Brady T. West, and Patricia A. Berglund. Applied survey data analysis. CRC press, 2017.

Appendix C: Survey Weighting Report

WEIGHTING METHODOLOGY
California Delta Residents' Survey 2023

This survey has secured a total of 2,208 adult respondents residing in three zones of California using Address-Based Sampling for administration of a probability-based sample survey. The following table provides a summary of respondents by zone.

Table 1. Respondent Distribution by County

Zone	Respondents	
1	326	14.8%
2	1,363	61.7%
3	519	23.5%
Total	**2,208**	**100.0%**

All survey data must be weighted before they can be used to produce unbiased estimates of population parameters. By compensating for practical limitations of sample surveys, such as differential nonresponse and undercoverage, weighting improves the external validity of survey data by enhancing the representation of respondents.

Weights for this survey were computed using the *WgtAdjust* procedure of SUDAAN, which relies on a constrained logistic model to predict the likelihood of response as a function of a set of explanatory variables[1]. These variables, which represent the geodemographic characteristics of adults residing in the three zones, are summarized in the following tables. Because of the special shape of the survey geography, the needed population benchmarks for weighting were secured from the latest estimates produce by Claritas (https://claritas.com).

It should be noted that in order to improve the stability of the resulting survey estimates, extreme weights were identified and trimmed at both ends of the weight distribution. This important gain in precision, however, is achieved at the expense of introducing some minor diversions between weighted totals and their corresponding population benchmarks. In the final step, analysis weights were rescaled to sum to the total number of respondents for this survey (2,208).

Table 2. Population and Respondent Distributions by Gender and Zone

Gender	Zone 1				Zone 2				Zone 3			
	Population		Respondents		Population		Respondents		Population		Respondents	
Male	6,174	52.6%	143	43.9%	264,581	49.0%	646	47.4%	80,974	48.8%	175	33.7%
Female	5,553	47.4%	183	56.1%	275,759	51.0%	717	52.6%	85,111	51.2%	344	66.3%
Total	**11,727**	**100.0%**	**326**	**100.0%**	**540,340**	**100.0%**	**1,363**	**100.0%**	**166,085**	**100.0%**	**519**	**100.0%**

[1] RTI International (2012). *SUDAAN Language Manual, Release 11.0.* RTI International.

Table 3. Population and Respondent Distributions by Age and Zone

Age	Zone 1				Zone 2				Zone 3			
	Population		Respondents		Population		Respondents		Population		Respondents	
18 - 24	1,076	9.2%	12	3.7%	67,422	12.5%	73	5.4%	21,553	13.0%	84	16.2%
25 - 34	1,815	15.5%	26	8.0%	96,857	17.9%	168	12.3%	34,124	20.5%	87	16.8%
35 - 44	1,584	13.5%	39	12.0%	100,096	18.5%	266	19.5%	33,254	20.0%	96	18.5%
45 - 54	1,458	12.4%	43	13.2%	90,312	16.7%	206	15.1%	25,993	15.7%	63	12.1%
55 - 64	2,061	17.6%	84	25.8%	82,921	15.3%	262	19.2%	22,991	13.8%	91	17.5%
65+	3,733	31.8%	122	37.4%	102,732	19.0%	388	28.5%	28,170	17.0%	98	18.9%
Total	**11,727**	**100.0%**	**326**	**100.0%**	**540,340**	**100.0%**	**1,363**	**100.0%**	**166,085**	**100.0%**	**519**	**100.0%**

Table 4. Population and Respondent Distributions by Ethnicity and Zone

Ethnicity	Zone 1				Zone 2				Zone 3			
	Population		Respondents		Population		Respondents		Population		Respondents	
Hispanic	4,677	39.9%	56	17.2%	178,078	33.0%	286	21.0%	58,977	35.5%	153	29.5%
Other	7,050	60.1%	270	82.8%	362,262	67.0%	1,077	79.0%	107,108	64.5%	366	70.5%
Total	**11,727**	**100.0%**	**326**	**100.0%**	**540,340**	**100.0%**	**1,363**	**100.0%**	**166,085**	**100.0%**	**519**	**100.0%**

Table 5. Population and Respondent Distributions by Race and Zone

Race	Zone 1				Zone 2				Zone 3			
	Population		Respondents		Population		Respondents		Population		Respondents	
White	6,081	51.9%	237	72.7%	194,449	36.0%	737	54.1%	30,919	18.6%	161	31.0%
Black	291	2.5%	11	3.4%	62,173	11.5%	86	6.3%	22,686	13.7%	80	15.4%
Asian & PI	716	6.1%	14	4.3%	112,960	20.9%	245	18.0%	54,634	32.9%	113	21.8%
Other	4,639	39.6%	64	19.6%	170,758	31.6%	295	21.6%	57,846	34.8%	165	31.8%
Total	**11,727**	**100.0%**	**326**	**100.0%**	**540,340**	**100.0%**	**1,363**	**100.0%**	**166,085**	**100.0%**	**519**	**100.0%**

Table 6. Population and Respondent Distributions by Education and Zone

Education[2]	Zone 1				Zone 2				Zone 3			
	Population		Respondents		Population		Respondents		Population		Respondents	
18 - 24	1,076	9.2%	12	3.7%	67,422	12.5%	73	5.4%	21,553	13.0%	84	16.2%
Up to HS	4,427	37.8%	28	8.6%	194,928	36.1%	94	6.9%	79,605	47.9%	55	10.6%
SC	2,573	21.9%	75	23.0%	116,018	21.5%	246	18.0%	32,352	19.5%	106	20.4%
As	904	7.7%	32	9.8%	44,930	8.3%	141	10.3%	11,569	7.0%	72	13.9%
BS	1,710	14.6%	87	26.7%	80,217	14.8%	436	32.0%	15,975	9.6%	130	25.0%
MS+	1,037	8.8%	92	28.2%	36,825	6.8%	373	27.4%	5,031	3.0%	72	13.9%
Total	**11,727**	**100.0%**	**326**	**100.0%**	**540,340**	**100.0%**	**1,363**	**100.0%**	**166,085**	**100.0%**	**519**	**100.0%**

Table 7. Population and Respondent Distributions by Income and Zone

Income	Zone 1				Zone 2				Zone 3			
	Population		Respondents		Population		Respondents		Population		Respondents	
$0K<$25K	1,556	13.3%	29	8.9%	63,698	11.8%	109	8.0%	34,354	20.7%	107	20.6%
$25K<$50K	2,376	20.3%	52	16.0%	75,672	14.0%	150	11.0%	39,955	24.1%	118	22.7%
$50K<$75K	2,147	18.3%	42	12.9%	77,851	14.4%	225	16.5%	28,323	17.1%	104	20.0%
$75K<$100K	1,387	11.8%	49	15.0%	70,709	13.1%	191	14.0%	19,967	12.0%	74	14.3%
$100K<$150K	1,756	15.0%	63	19.3%	108,571	20.1%	313	23.0%	25,202	15.2%	76	14.6%
$150K<$200K	954	8.1%	37	11.3%	60,396	11.2%	191	14.0%	9,418	5.7%	24	4.6%
$200K+	1,551	13.2%	54	16.6%	83,443	15.4%	184	13.5%	8,866	5.3%	16	3.1%
Total	**11,727**	**100.0%**	**326**	**100.0%**	**540,340**	**100.0%**	**1,363**	**100.0%**	**166,085**	**100.0%**	**519**	**100.0%**

Variance Estimation for Weighted Data:

Survey estimates can only be interpreted properly in light of their associated sampling errors. Since weighting often increases variance of estimates, use of standard variance calculation formulae with weighted data can result in misleading statistical inferences. With weighted data,

[2] Claritas does not produce estimates of educational attainments for individuals less than 25 years of age.

two general approaches for variance estimation can be distinguished. One is *Taylor Series Linearization*, while the second method of variance estimation is *Replication*.

Also, an approximation method can be used for variance estimation when the above tools are not available. With W_i representing the final weight of the $i^{\underline{th}}$ respondent, the inflation due to weighting, which is commonly referred to as *Design Effect*, can be approximated by:

$$\delta = 1 + \frac{\sum_{i=1}^{n} \frac{\left(W_i - \bar{W}\right)^2}{n-1}}{\bar{W}^2}$$

For calculation of confidence intervals for an estimated percentage, $\hat{p}$, one can obtain the conventional variance of the given percentage, multiply it by the resulting design effect, δ, and use the resulting quantity as adjusted variance. That is, the adjusted variance would be given by:

$$\hat{S}^2(\hat{p}) \approx S^2\left(\hat{p}\right)(\hat{p}) \times \delta = \frac{\hat{p} \times \left(1 - \hat{p}\right)}{n-1}\left(\frac{N-n}{N}\right) \times \delta$$

Subsequently, the (100-α) percent confidence interval for P would be given by:

$$\hat{p} - z_{\alpha/2}\sqrt{\frac{\hat{p} \times (1-\hat{p})}{n-1}\left(\frac{N-n}{N}\right) \times \delta} \leq P \leq \hat{p} + z_{\alpha/2}\sqrt{\frac{\hat{p} \times (1-\hat{p})}{n-1}\left(\frac{N-n}{N}\right) \times \delta}$$

Appendix D: Select Results across Geography & Demographic Groups

APPENDIX D. SELECT RESULTS ACROSS GEOGRAPHY AND DEMOGRAPHIC GROUPS

Demographic	Demographic Group	Average Index Score					
		Sense of Place	Environmental Impacts Experienced	Overall Level of Climate Concern	Adaptive Capacity	Community group membership	Civic Engagement
	INDEX RANGE	0-12	0-7	0-4	0-15	0-16	0-4
Gender	Female	3.10	1.53	2.23	8.07	0.74	2.46
	Male	3.70	1.46	1.99	8.53	0.97	2.53
	Other/ non-binary	4.21	2.03	2.51	9.45	0.29	2.15
Age	18-24	2.90	1.67	2.22	7.18	0.38	2.38
	25-34	3.47	1.45	2.03	7.82	0.66	2.44
	35-44	3.17	1.51	2.06	7.51	0.81	2.47
	45-54	3.51	1.49	2.11	8.57	0.77	2.48
	55-64	3.77	1.44	2.13	8.80	1.11	2.50
	65+	3.59	1.46	2.18	9.44	1.05	2.61
Ethnicity	Hispanic/ Latino	3.46	1.41	2.10	7.43	0.76	2.47
	Not Hispanic/ Latino	3.33	1.53	2.13	8.81	0.85	2.50
Race	Other & mixed	3.28	1.35	2.10	7.33	0.63	2.52
	White	3.81	1.55	2.10	9.53	1.02	2.47
	Black	2.86	1.59	2.21	7.63	0.93	2.31
	AAPI	3.16	1.52	2.16	8.49	0.63	2.57
	Native American	2.91	1.59	1.78	6.91	0.81	2.52
Education	Up to HS Diploma/ GED	3.07	1.39	2.08	7.31	0.57	2.70
	Some College, no degree	3.48	1.51	2.08	8.81	0.86	2.38
	AA/AS	4.00	1.66	2.13	8.57	1.08	2.37
	BA/BS	3.58	1.52	2.21	8.96	0.95	2.40
	Grad/ Professional Degree	3.83	1.74	2.20	9.60	1.34	2.33
	<10K	3.18	1.83	2.39	4.19	0.87	2.43
	10K - <25K	2.86	1.48	2.14	5.56	0.61	2.68

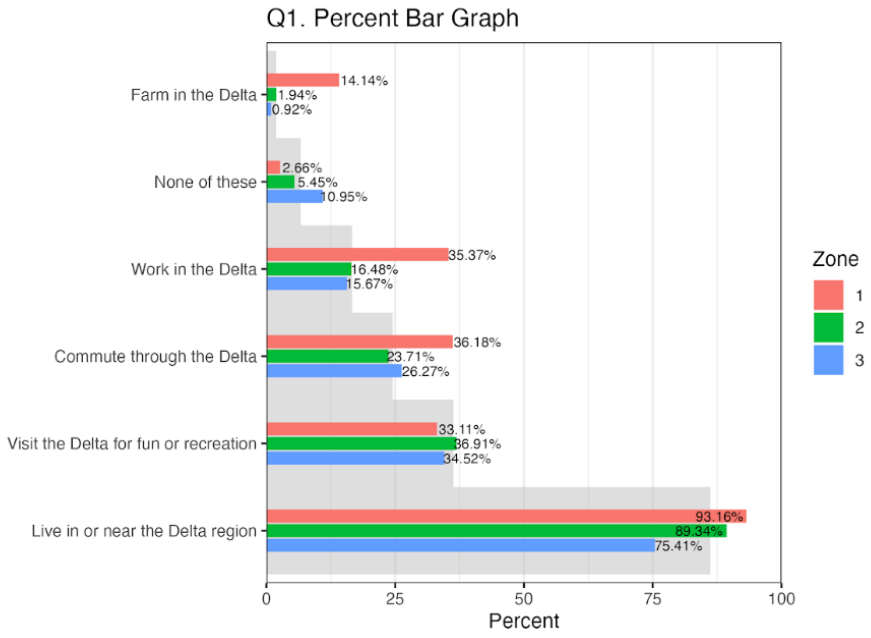
2022 Household Income	**25K - <50K**	2.84	1.38	2.17	7.01	0.39	2.60
	50K - <75K	3.47	1.59	2.05	8.57	0.75	2.56
	75K - <100K	3.81	1.48	2.08	9.28	1.04	2.41
	100K - <150K	3.82	1.43	2.15	9.82	1.00	2.41
	150K - 200K	3.66	1.49	1.97	10.00	1.04	2.49
	>200K	3.72	1.44	1.98	9.80	1.03	2.35
Language spoken at home	**Other language**	3.28	1.50	2.16	7.69	0.75	2.49
	English only	3.45	1.53	2.10	8.48	0.88	2.48
Home Ownership	**Rented/ Other**	3.00	1.56	2.19	6.96	0.72	2.53
	Owned by you	3.63	1.49	2.08	9.13	0.90	2.46

SURVEY RESULTS SUMMARIZED BY ZONE:

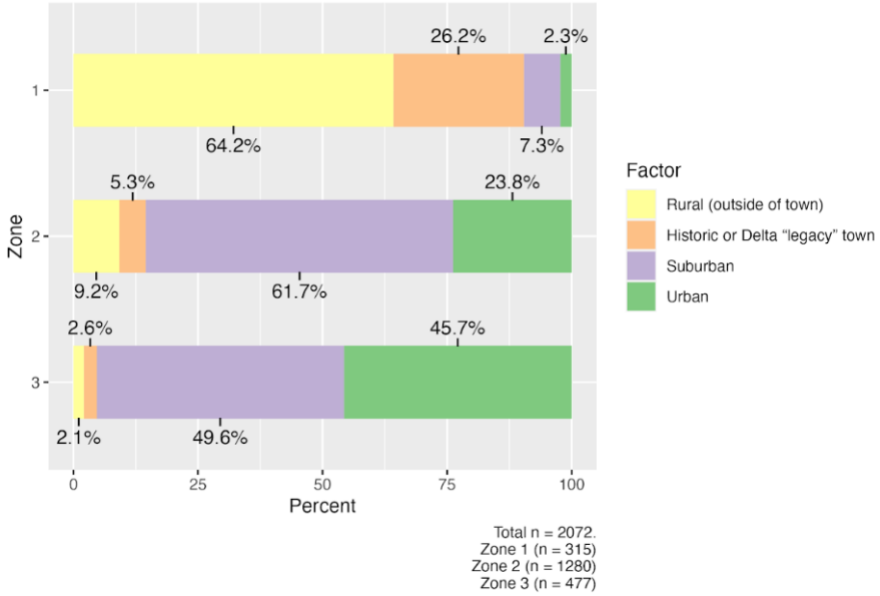
All frequencies and distributions reported use weighted data. N=2208, unless otherwise noted on figure.

SECTION I: SENSE OF PLACE

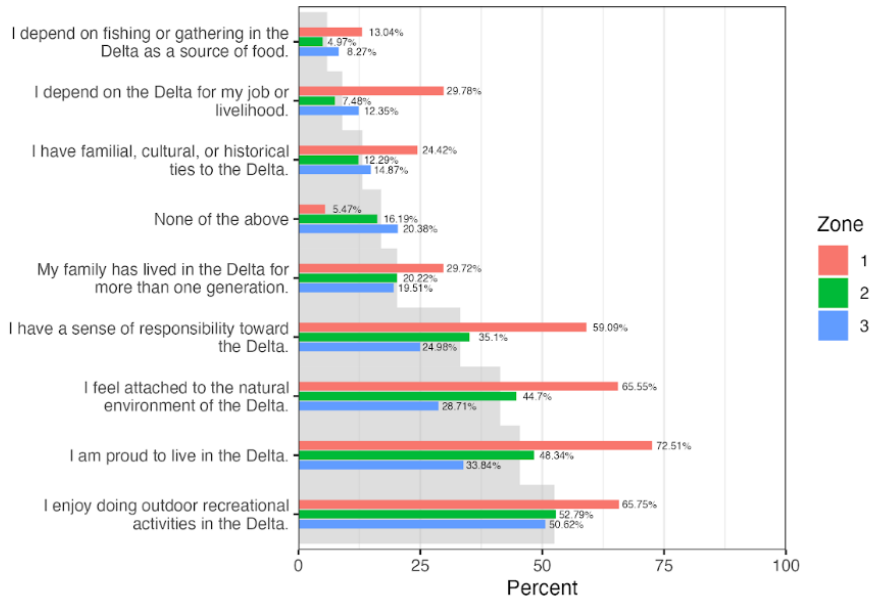
Q1: PLEASE TELL US WHICH OF THE FOLLOWING APPLY TO YOU. DO YOU CURRENTLY… **(SELECT ALL THAT APPLY)**



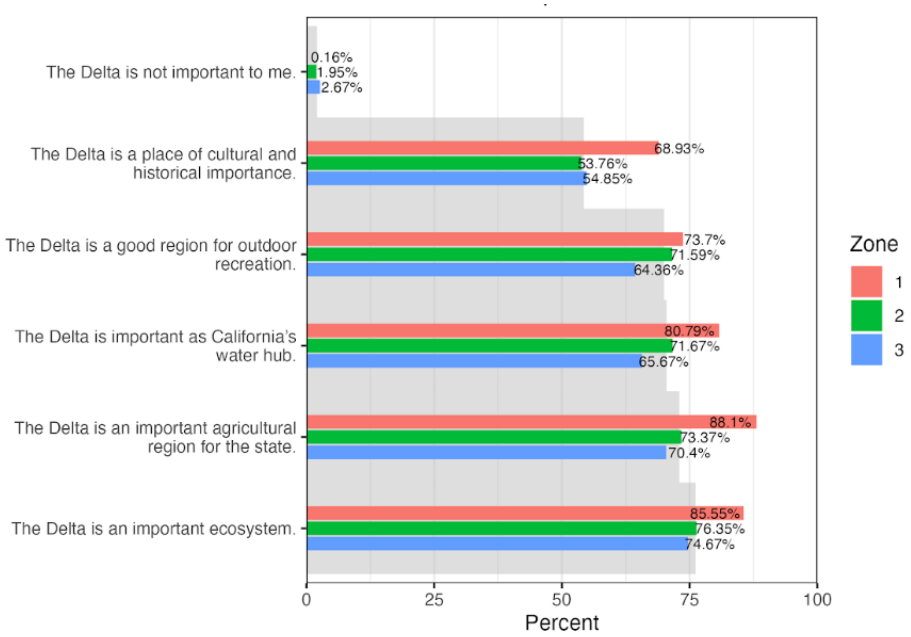
Q2: WHICH BEST DESCRIBES THE AREA WHERE YOU LIVE?



Q3: WHICH OF THE FOLLOWING STATEMENTS DESCRIBE YOUR RELATIONSHIP TO THE DELTA? **(SELECT ALL THAT APPLY)**



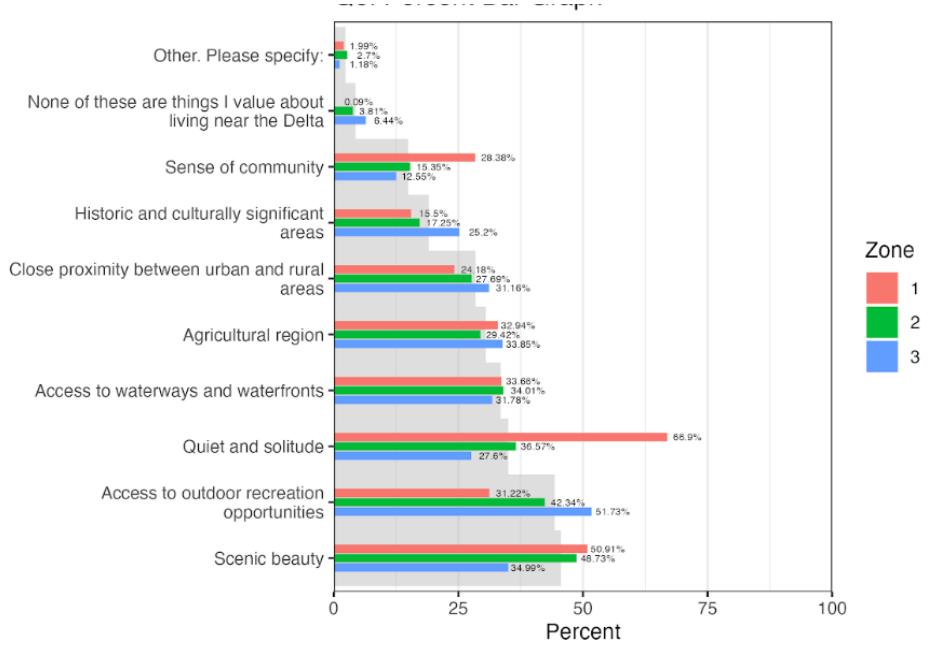
Q4: WHICH OF THE FOLLOWING STATEMENTS DESCRIBE WHY YOU FEEL THE DELTA IS IMPORTANT? **(SELECT ALL THAT APPLY)**



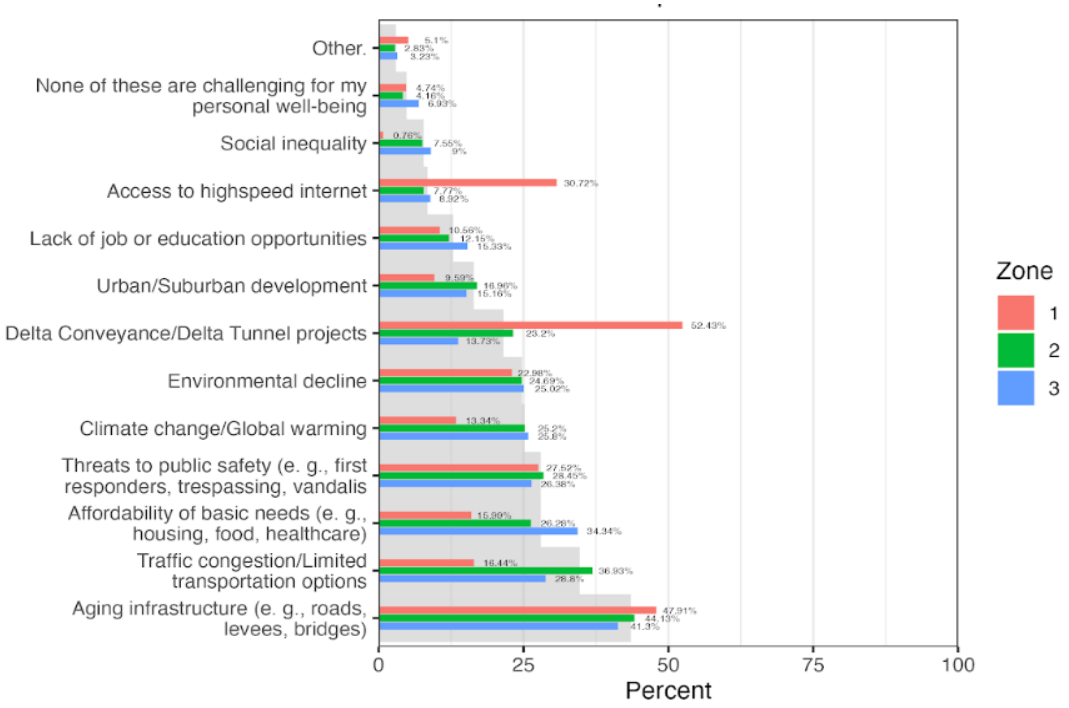
[Q5 SHORT RESPONSE QUESTION- NOT SUMMARIZED HERE]

SECTION II: QUALITY OF LIFE IN THE DELTA

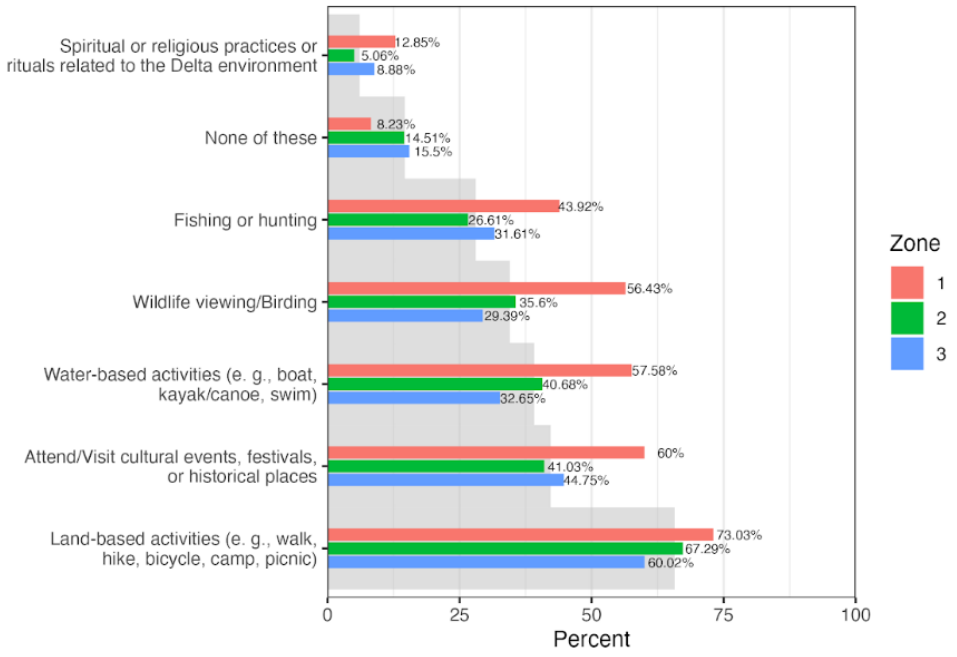
Q6: WHICH OF THE FOLLOWING FACTORS, IF ANY, DO YOU PERSONALLY VALUE MOST ABOUT LIVING IN THE DELTA AREA? **(SELECT UP TO 3)**



Q7: WHICH OF THE FOLLOWING FACTORS, IF ANY, ARE THE LARGEST CHALLENGES TO YOUR PERSONAL WELL-BEING AS A DELTA RESIDENT? **(SELECT UP TO 3)**

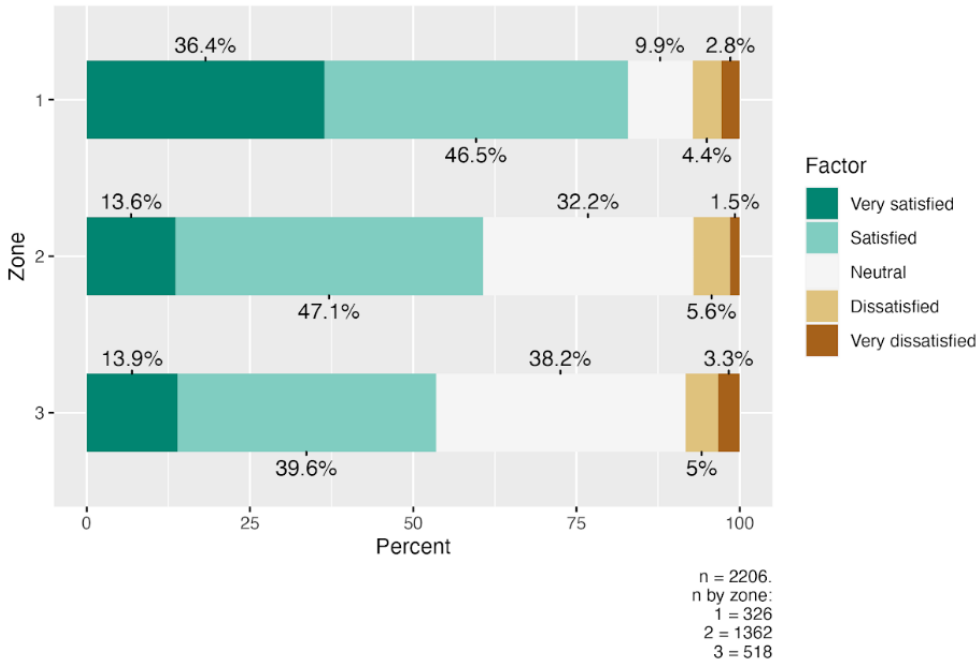


Q8: DO YOU ENGAGE IN ANY OF THE FOLLOWING ACTIVITIES IN THE DELTA? **(SELECT ALL THAT APPLY)**



[Q9 SHORT RESPONSE QUESTION- NOT SUMMARIZED HERE]

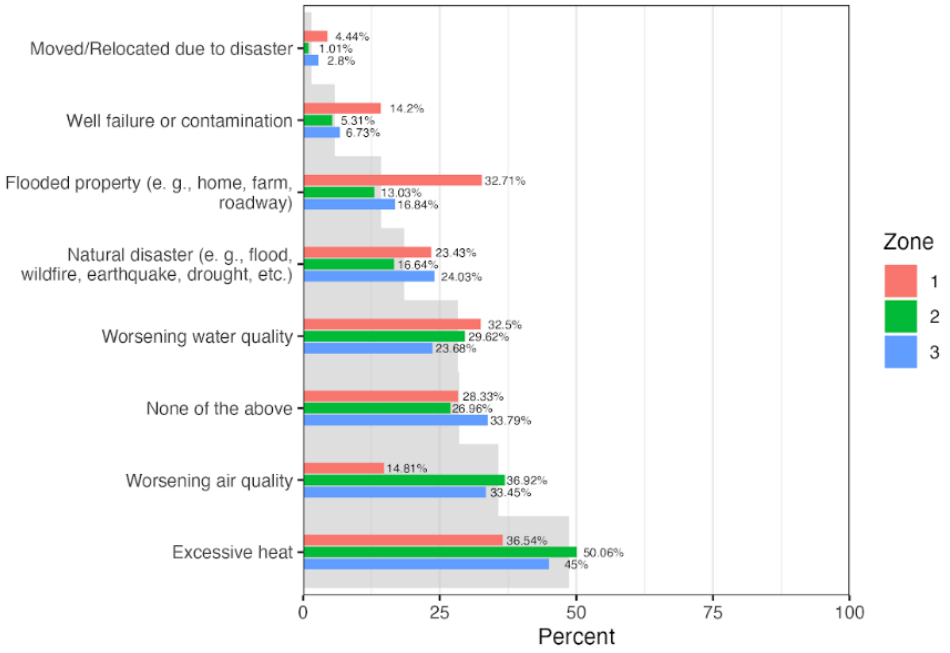
Q10: PLEASE RATE YOUR OVERALL LEVEL OF SATISFACTION WITH YOUR QUALITY OF LIFE IN THE DELTA.



[Q11 SHORT RESPONSE QUESTION- NOT SUMMARIZED HERE]

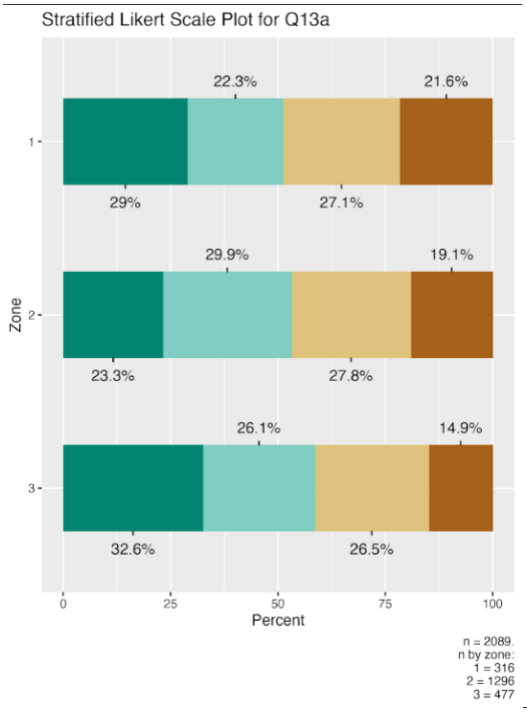
SECTION III: RISK AND RESILIENCE TO CLIMATE CHANGE

Q12: HAVE YOU OR ANYONE IN YOUR HOME EXPERIENCED ANY OF THE FOLLOWING IMPACTS WHILE LIVING IN THE DELTA? **(SELECT ALL THAT APPLY)**

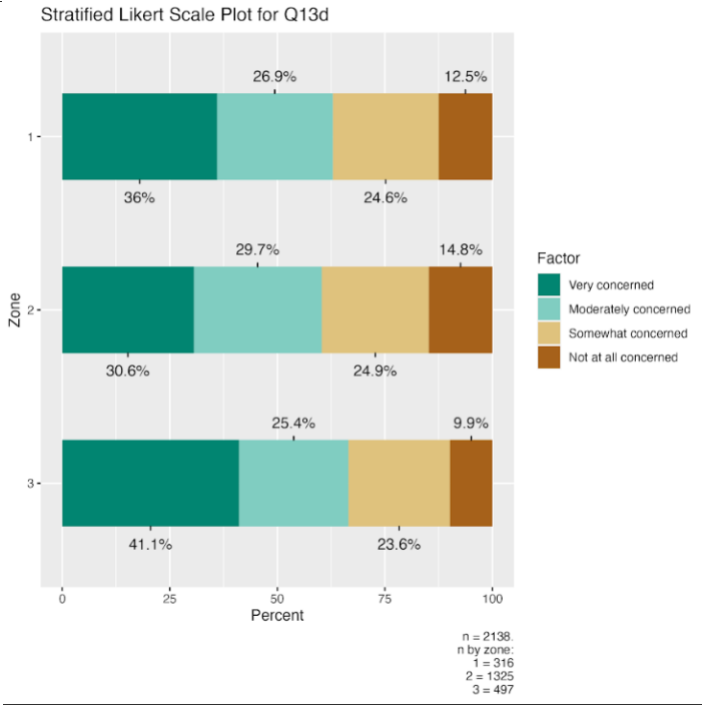


Q13: HOW CONCERNED ARE YOU ABOUT EACH OF THE FOLLOWING ENVIRONMENTAL CHANGES AFFECTING THE DELTA OVER THE NEXT 25 YEARS?

a. Sea Level Rise



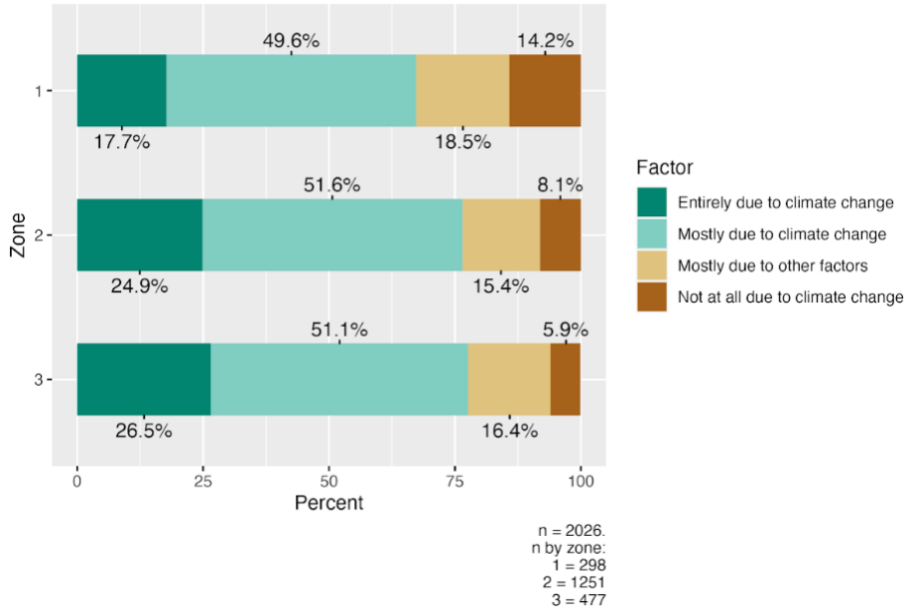
d. More frequent/ severe floods



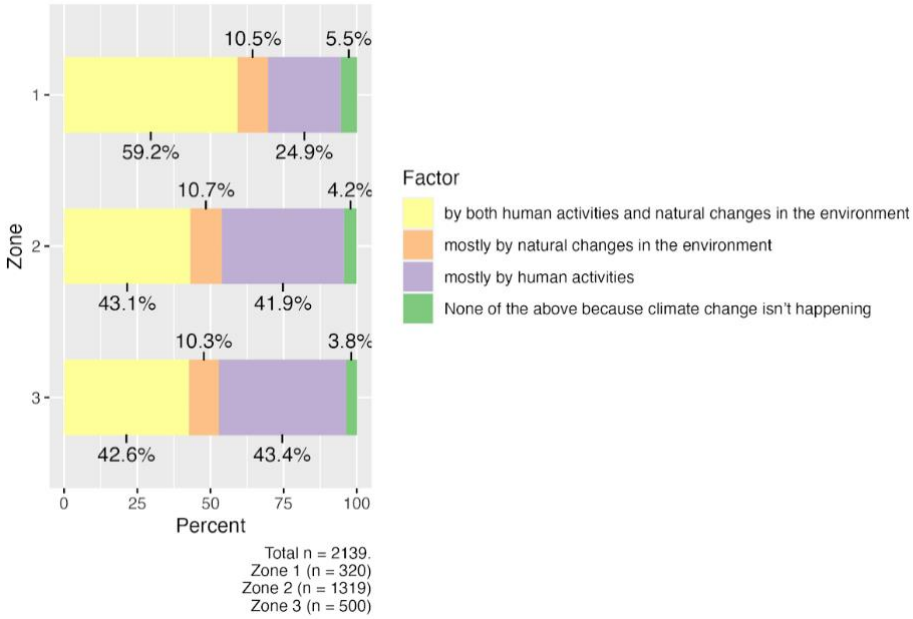
(not all climate threats from Q13 graphed by zone included here)

[Q14 SHORT RESPONSE QUESTION- NOT SUMMARIZED HERE]

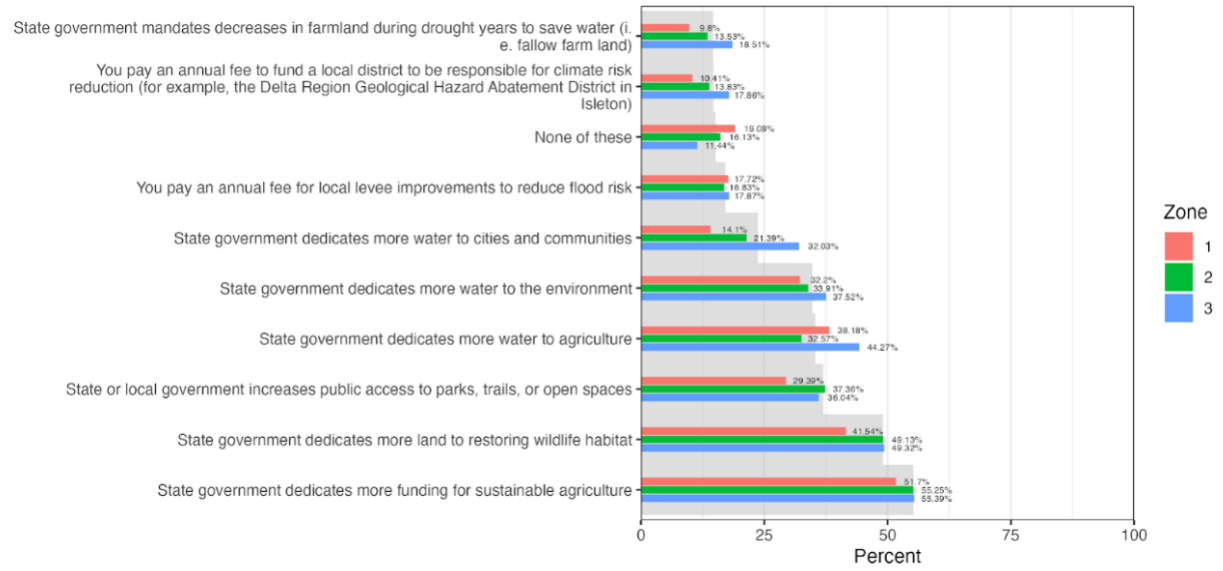
Q15: HOW MUCH DO YOU THNK THE ENVIRONMENTAL CHANGES MENTIONED ABOVE ARE A RESULT OF CLIMATE CHANGE?



Q16: DO YOU BELIEVE CLIMATE CHANGE IS CAUSED BY...

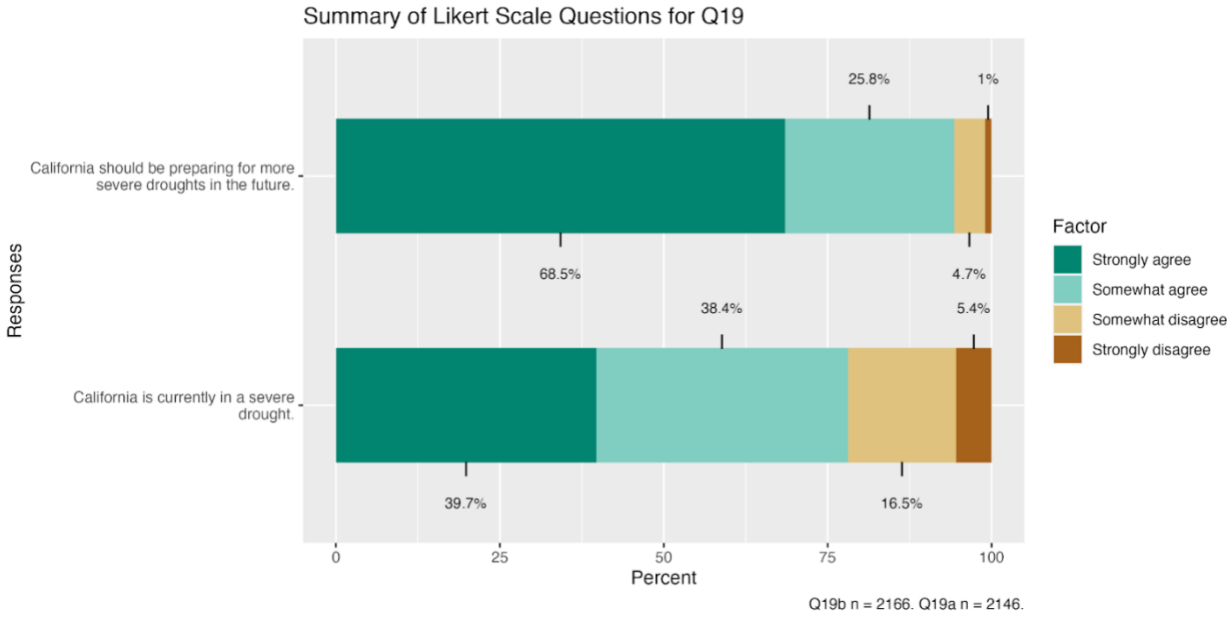


Q17: TO PREPARE FOR POSSIBLE ENVIRONMENTAL AND CLIAMTE CHANGE MPACTS TO THE DELTA, WOULD YOU SUPPORT POLICIES THAT LED TO ANY OF THE FOLLOWING ACTIONS? (**SELECT ALL THAT APPLY).**



[Q18 SHORT RESPONSE QUESTION- NOT SUMMARIZED HERE]

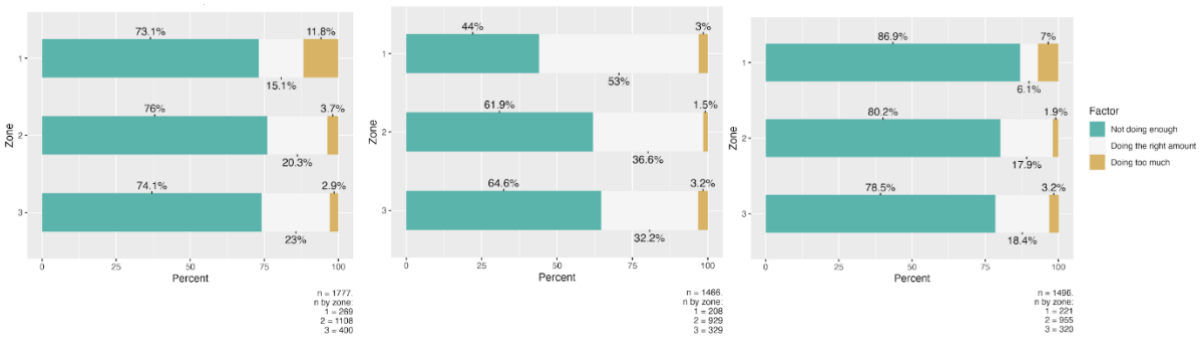
Q19: TO WHAT EXTENT DO YOU AGREE WITH THE FOLLOWING STATEMENTS?



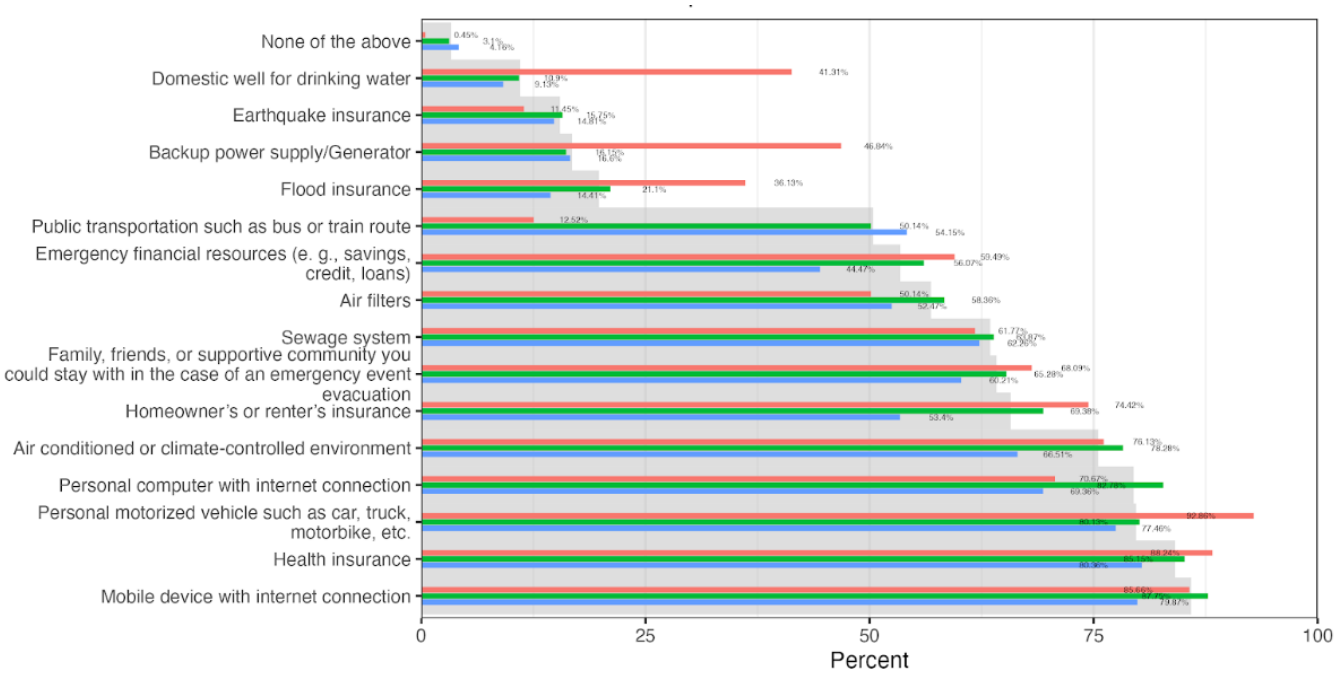
[Q20 SHORT RESPONSE QUESTION- NOT SUMMARIZED HERE]

Q21-23: IN RESPONSE TO THE CURRENT DROUGHT, WHAT DO YOU THINK OF THE FOLLOWING ENTITIES ACTIONS?

State and local governments | Other people living in the Delta | People living outside the Delta

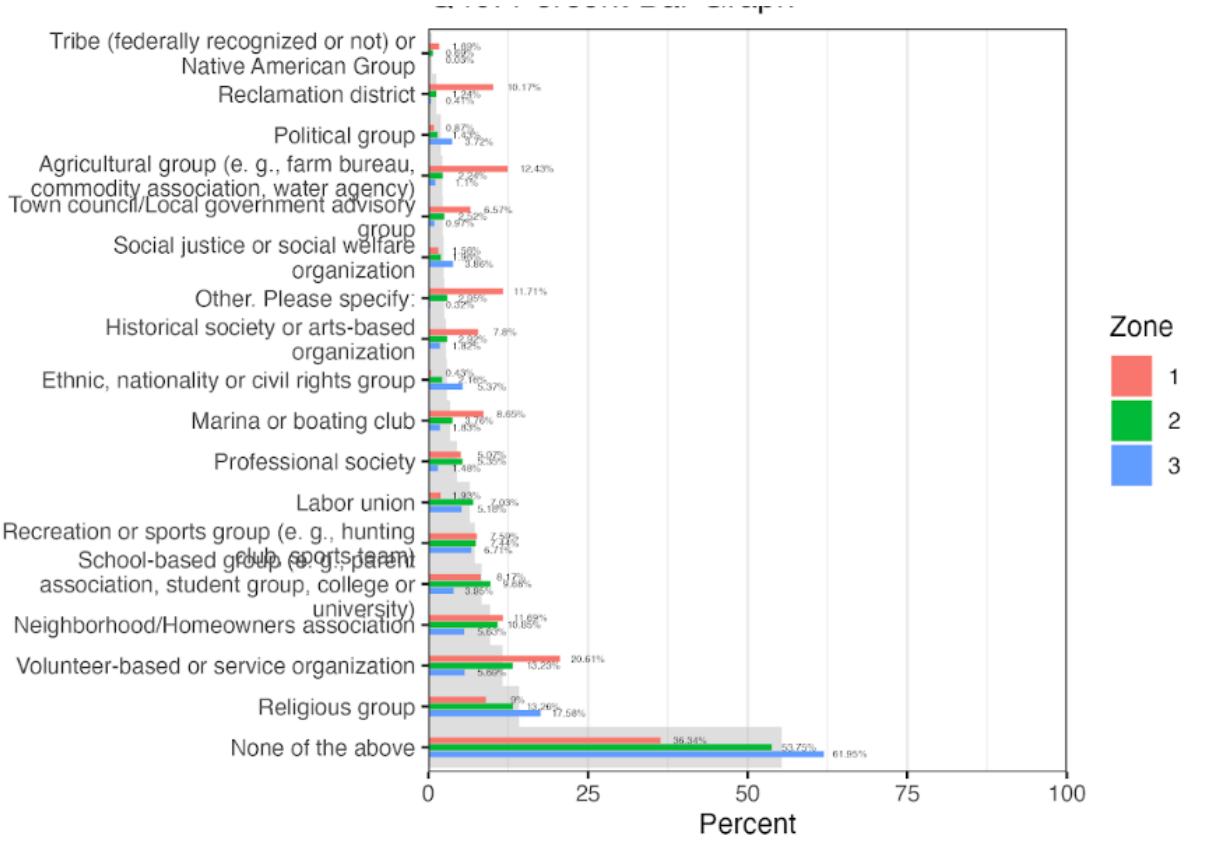


Q24: WHICH OF THE FOLLOWING RESOURCES DO YOU CURRENTLY HAVE ACCESS TO? **(SELECT ALL THAT APPLY)**



SECTION IV: CIVIC ENGAGEMENT & GOOD GOVERNANCE

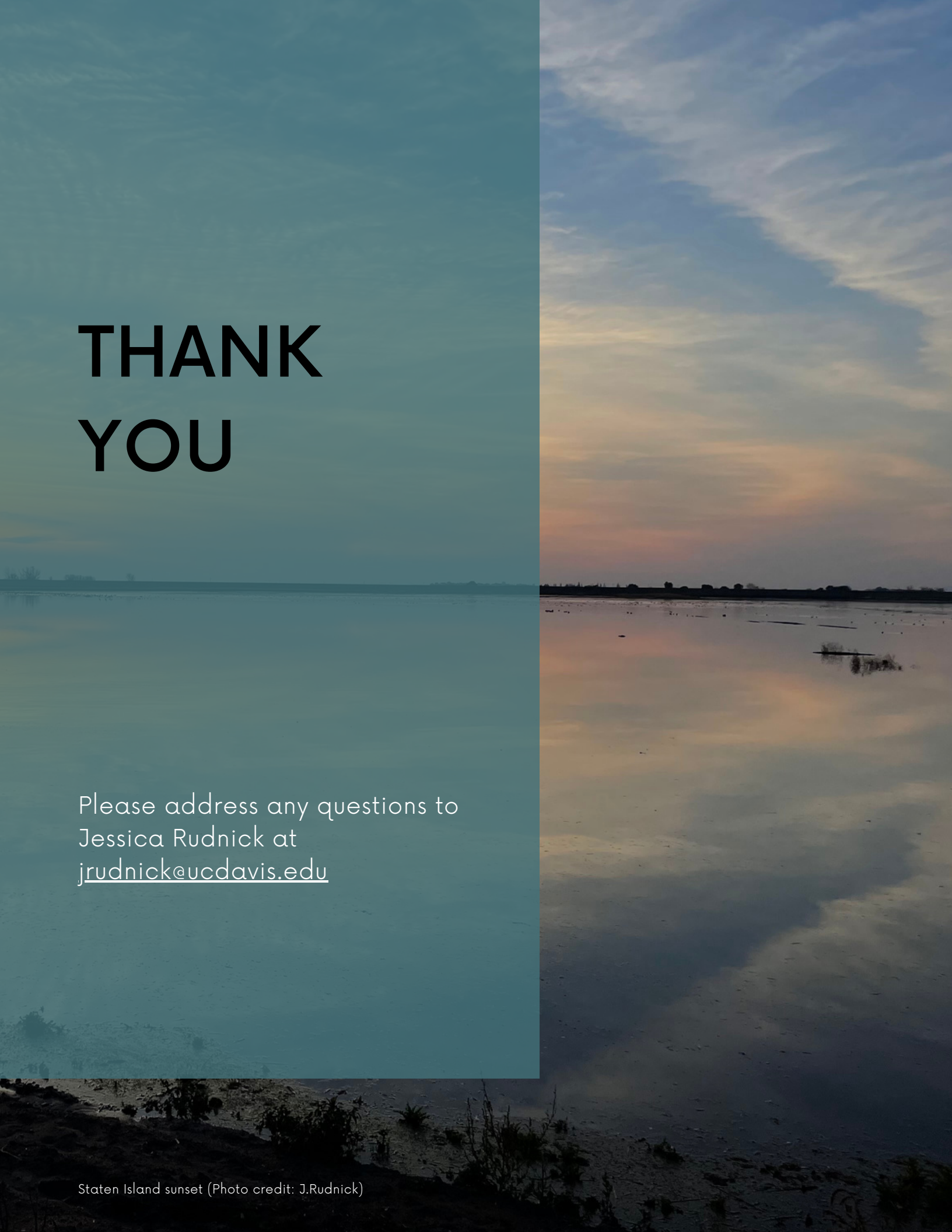
Q40: ARE YOU INVOLVED IN ANYOF THE FOLLOWING COMMUNITIES IN THE DELTA? **(SELECT ALL THAT APPLY)**



Q41 AND Q42: ALL INDIVIDUAL ITEMS NOT GRAPHED FOR EACH ZONE SEPARATELY

THANK YOU

Please address any questions to Jessica Rudnick at jrudnick@ucdavis.edu



Staten Island sunset (Photo credit: J.Rudnick)