42 N. Sutter Street, Suite 506
Stockton, CA 95202
(209) 475-9550
www.restorethedelta.org

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via email to: deltaplanPEIR@deltacouncil.ca.gov

Delta Stewardship Council
980 9th Street, Suite 1500
Sacramento, CA 95814

Subject: Delta Plan Amendments EIR

To whom it concerns:

Restore the Delta advocates for local Delta stakeholders to ensure that they have a direct impact on water management decisions affecting the water quality and well-being of their communities, and water sustainability policies for all Californians. We work through public education and outreach so that all Californians recognize the Sacramento-San Joaquin Delta as part of California's natural heritage, deserving of protection and restoration. We fight for a Delta whose waters are fishable, swimmable, drinkable, and farmable, supporting the health of the San Francisco Bay-Delta Estuary, and the ocean beyond. Our coalition envisions the Sacramento-San Joaquin Delta as a place where a vibrant local economy, tourism, recreation, farming, wildlife, and fisheries thrive as a result of resident efforts to protect our waterway commons.

We thank the Delta Stewardship Council (DSC) for the opportunity to comment on the Draft Program Environmental Impact Report (DPEIR) on Delta Plan Amendments (DPAs). Our comments primarily address statewide environmental justice planning requirements, the project description, alternative descriptions, and hydrology and water quality impacts of the project.

We understand the project description as being organized around three sets of DPAs addressing Delta levee investment priorities (DLI); conveyance, storage, and operations priorities (CSO); and performance measures (PM). We understand too that the DPEIR considers three main alternatives to the proposed amendments and the no project alternative: a reduced reliance on the Delta emphasis; a Delta wetland restoration emphasis; and a through-Delta conveyance emphasis. The longest impact chapter of the DPEIR addresses hydrology and water quality (Section 5.11), and our comments in this letter focus for the most part on this chapter too. Our comments also address a

major omission concerning public health and environmental justice, particularly as they pertain to the CSO amendments.

General Comments

The DPEIR Executive Summary indicates a total of 74 identified impacts, and for each set of DPAs there are 64 or 65 impacts termed "significant and unavoidable." This is alarming to say the least for a PEIR. This is justified in part by the DSC's impotence in regulatory and enforcement matters, despite the Delta Reform Act's (Act or DRA) mandate that the Delta Plan be enforceable. (DPEIR, p. ES-22:30-42, ES-23:1-16; see page 14 of this letter below.) Such a finding, especially for the CSO amendments would likely be accurate since the most likely covered action proposal to reach the attention of the DSC once these amendments are adopted is the California WaterFix proposal. The comprehensive scope of significant and unavoidable impacts of the CSO portion of the project description makes the DPEIR's assessment of impacts largely one with which we would agree (however, for different reasons than those offered by the DSC).

The proposed DPAs fail to properly accord the central role of the mandate to reduce Delta reliance for meeting California's future water needs that the DRA requires. This state policy mandate is relevant to the CSO and PM amendments, but is largely ignored. The DPEIR's statement of Project Objectives fails to acknowledge this policy, focusing instead on the coequal goals of water supply reliability and ecosystem restoration and recovery. (DPEIR, p. 3-2 to 3-6.) The mandate of reduced Delta reliance for meeting California's future water needs logically is paramount to the two coequal goals because of the manner in which it is included as "Delta policy" (as compared with the coequal goals' more definitional placement in the Delta Reform Act). Accordingly, its paramount status is reflected in the Legislature's inclusion of reduced Delta reliance as state policy, an interpretation that makes the most sense. It also provides clear and direct legislative guidance to the DPEIR's statement that "To achieve the coequal goals, there is a need to change the way water is managed and water systems are operated in the Delta." (DPEIR, p. 3-3:3-4.) The DSC should do so by first reducing reliance on the Delta for meeting California's future water needs—so stated the Legislature in the DRA. (Water Code section 85021.)

In conclusion, the DSC, which lacks enforcement authority over other state and federal agencies, is a bureaucratic redundancy lacking meaningful authority to benefit either the people of the Delta or of the state of California. The DSC should be abolished and its useful functions, such as the Delta Independent Science Board, relocated to another more appropriate state agency.

Furthermore, we find that in the Draft Plan EIR for the amendments that:

- The Council's proposed Delta Plan amendments are planning activities, yet they take no account of State of California environmental justice, human right to water, and anti-discrimination policy requirements.

- The proposed Delta Plan amendments fail to set measurable standards for reducing reliance on the Delta and for making conservation a way of life in California.

- The proposed Delta Plan amendments fail to address in a meaningful way the significant and unavoidable impacts resulting from construction and operation of new conveyance. Instead, the DSC so to speak passes the administrative buck back to other state agencies.

Again, we appreciate the opportunity to comment on the DSC's DPEIR on these DPAs. If you have questions concerning our comments, do not hesitate to contact us.

Sincerely,

Barbara Barrigan-Parrilla Executive Director barbara@restorethedelta.org	Tim Stroshane Policy Analyst tim@restorethedelta.org

Attachments

1. State and Federal Environmental Justice, Human Right to Water, and Anti-Discrimination Policies

2. American Community Survey Data on Delta Region Environmental Justice Populations

3. Delta Region Distressed Community Index Scores and Narrative

4. Delta Region Food Deserts Narrative and Maps

5. Stockton Retail Water Sources and Related Drinking Water Quality Description

6. State Water Resources Control Board Fact Sheet, April 7, 2017.

7. "Making Conservation a California Way of Life," April 2017.

8. Restore the Delta Part 2 Exhibit Index, California WaterFix Change Petition Proceeding.

9. Delta Regional Opportunity Analysis.

cc: Jessica Pearson, Executive Director, Delta Stewardship Council
Randy Fiorini, Chair, Delta Stewardship Council
Susan Tatayon, Vice-Chair, Delta Stewardship Council (DSC)
Frank C. Damrell, Jr., Member, DSC

Mike Gatto, Member, DSC
Patrick Johnston, Member, DSC
Skip Thomson, Member, DSC
Ken Weinberg, Member, DSC
Mayor Michael Tubbs, City of Stockton
Kurt O. Wilson, City Manager, City of Stockton
Robert Granberg City of Stockton Municipal Utilities Department
John Luebberke, City Attorney, City of Stockton
Kelley Taber, Somach, Simmons & Dunn
Michelle Ghafar, Earthjustice
E. Robert Wright, Senior Counsel, Friends of the River
Osha Meserve, Soluri Meserve
Thomas H. Keeling, Freeman Firm
Doug Obegi, Natural Resources Defense Council
Gary Bobker, The Bay Institute
Jon Rosenfield, The Bay Institute
Gary Mulcahy, Winnemem Wintu Tribe
Carolee Krieger, California Water Impact Network
Michael B. Jackson, California Water Impact Network
Bill Jennings, California Sportfishing Protection Alliance
Barbara Vlamis, AquAlliance
Kathryn Phillips, Sierra Club California
Kyle Jones, Sierra Club California
Jonas Minton, Planning and Conservation League
Conner Everts, Environmental Water Caucus
Jeff Miller, Center for Biological Diversity
John Buse, Center for Biological Diversity
Adam Keats, Center for Food Safety
Michael A. Brodsky, Save the California Delta Alliance
John Herrick, South Delta Water Agency
Dante Nomellini, Central Delta Water Agency
Noah Oppenheim, PCFFA and Institute for Fisheries Resources
John McManus, Golden Gate Salmon Association
Melinda Terry, North Delta Water Agency

Comments on Appendix C:

1. The Council's proposed Delta Plan amendments are planning activities, yet they take no account of State of California environmental justice, human right to water, and anti-discrimination policy requirements.

State of California environmental justice, human right to water, and anti-discrimination policy requirements apply to planning activities and decisions by all state agencies. We searched planning and scientific documents prepared by the Delta Stewardship Council (DSC) concerning Delta Plan amendments (DPAs) for performance measures and conveyance, storage and operations.[1] We used the terms "environmental justice", "human right to water", and various permutations of "anti-discrimination". None of these terms are found in the DSC planning and scientific documents reviewed for this letter.

The DSC has to date failed to address these concerns in each of these proposed DPAs. The DSC should bridge this gap immediately, starting with outreach to and education efforts about its proposed Delta Plan amendments in Delta environmental justice communities.

We searched the draft Program Environmental Impact Report (PEIR) for references to environmental justice and found no results in Appendix C. There was just one search result in Section 5.18 (page 11) that only places environmental justice within the purview of the State Water Resources Control Board (SWRCB) and the regional water boards; and 80 pages in Appendix A—references all derived from two letters to the DSC: mostly due to the header of the joint Restore the Delta/Environmental Justice Coalition for Water (RTD/EJCW) letter and other references to an environmental water coalition letter that included references to both RTD and EJCW. Environmental justice references in the PEIR then appear to result entirely from authors other than the DSC, despite the DSC's obligation to acknowledge and follow state environmental justice policies.

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[1] Delta Stewardship Council documents (besides this PEIR) reviewed for this letter include:

- Agenda Item 12, February 23-24, 2017:
  - ✓ Staff Report: "Consideration of Draft Delta Plan Amendment for Water Conveyance, System Storage, and the Operation of Both."
  - ✓ "19 Principles of Water Conveyance in the Delta, Storage Systems, and for the Operation of Both to Achieve the Coequal Goals."
  - ✓ "Delta Plan Summary and New Scientific Findings for Delta Plan Update Concerning storage, Conveyance, and Operation
  - ✓ "Updated Scientific Findings for Delta Plan Amendment Concerning Storage, Conveyance, and Operation."
- Delta Plan Performance Measures Amendment Workshop
  - ✓ Staff Report, December 18, 2014: "Delta Plan Performance Measures"
  - ✓ Staff Presentation, March 9, 2016: "Delta Plan Performance Measures Public Workshop."
  - ✓ Appendix E: Performance Measures for the Delta Plan," approved by DSC, February 2016.
  - ✓ Matrix of Proposed Changes to Delta Plan Performance Measures, redline version, March 7, 2017.
- Delta Levee Investment Priorities amendment documents at the DSC web site, including two memoranda by Arcadis addressing ability to pay and comparing DRMS and DLIS levee needs.

See Attachment 1 to this letter for additional detail on environmental justice, human right to water, and anti-discrimination policies.

In addition, many Delta residents are people of color; low-income and impoverished (among all races and ethnicities); and may face isolating language barriers. Recent American Community Survey data from the U.S. Census Bureau summarize and quantify these populations cited in Attachment 2 to this letter.

Delta region environmental justice communities face economic and social distress, contributing to their vulnerability to disproportionate environmental risks and injustices they face concerning Delta water supply and water quality. Using the Distressed Community Index, Economic Innovations Group found that Stockton is the sixth-most distressed large city in the United States, and the most distressed large California city. Attachment 3 to this letter details seven different recent indicators of economic and social distress in the Delta region.

An additional indicator of distress in the Delta region is the presence of sizable food deserts. We provide in Attachment 4 to this letter maps and data obtained from the U.S. Department of Agriculture's Economic Research Service in 2016 illustrating different geographies of food insecurity in the Delta region.

While the detailed attachments relate explicitly to the California WaterFix project, they are relevant to the DSC's consideration of its conveyance language, and its lack of merit in light of environmental justice principles. The DSC rather cravenly accepts the seeming-mandate to "promote" conveyance options. The treatment of the city of Stockton, its municipal water supplies, and its environmental justice communities provide additional case study insights into the serious, and as yet unaddressed, effects of California WaterFix on Delta environmental justice communities. This treatment, and potential environmental justice and environmental effects of California WaterFix on Stockton communities, is described in Attachment 5 to this letter. The DSC ought to consider the ***merits*** of promoting conveyance (or storage, or operational) options, not simply take options as given and place them unexamined into the Delta Plan.

2. Comments on proposed Delta Plan Amendments (DPAs) concerning conveyance, storage, and operation of both.

As the DSC knows, the Delta Plan is currently in litigation over the efficacy of its current formulation of implementing policies and performance measures for this legislative mandate. Beginning in July 2015, the DSC and staff developed, a lengthy list of "principles" by which new Delta Plan policies concerning "conveyance and storage"—more commonly known as "canals" (or tunnels and pipelines) and "reservoirs"—would be developed. As we have indicated in part 1 of this letter, the documents comprising the Delta Plan amendment process and substance for surface storage, conveyance, and operational concerns failed to address any potential environmental justice concerns. We have other comments on the amendment proposal, summarized here.

The 19 principles approved by DSC fail to assess and balance the mandate to "promote options" for improved conveyance and storage with the other provisions of the Delta Reform Act (DRA).

When it comes to conveyance and storage, the adopted 2013 Delta Plan stated just four policies of its own concerning improved conveyance and storage:

- "Complete Bay Delta Conservation Plan." (Policy WR P12, p. 106.)
- Complete water surface storage studies.
- Identify near-term opportunities for storage, use and water transfer projects.
- Improve water transfer procedures.

Current Delta Plan conveyance and storage policies are thus no match for evaluating the Tunnels Project as a covered action. A holistic reading of the DRA by the DSC would ensure that key DRA and state water policies would govern the DSC's approach to regulating conveyance and storage covered actions.

3. Proposed Delta Levee Amendments

The DSC's approach to Delta levees has improved in recent years. It had been our perception that the DSC's Delta Levee Investment Strategy initiative was striving to rid the Delta of seeming low-value islands and encourage a lot of ecosystem restoration actions through attrition of human island usage in the wake of potential flood damage.

We find much in the DSC's Delta levees DPA to support and appreciate. We understand it is necessary to prioritize levee investments in light of constrained funding sources from all levels of government and the private sector. Overall, we support the DSC's strong statements supporting the California Department of Water Resources (DWR) continuing its Delta levee maintenance subvention program. As DSC states, "The record of declining flooding damage and testimony to the Council reflect these programs' value. These programs should be continued with adequate funding to provide State matching funds for addressing Delta flood risk."[2] We also concur with the DSC's proposal that the 75 percent state cost share be extended indefinitely. Adjustment of the Delta Levees Maintenance Subventions Program deductible to account for inflation seems reasonable to us as well. This would help the levee maintenance keep pace with the cost of materials and labor over time, ensuring flood protection and risk reduction for the long haul.[3]

However, the DSC's analysis of the ability to pay of reclamation districts to pay for their fair share of levee maintenance (as part of participation in the DWR subvention program) should be rethought. The Arcadis study of ability to pay fails to indicate just

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[2] Delta Levee DPA, Agenda Item 10, Attachment 1, p. 52:29-31. **FIND AN APPENDIX C CITATION?**

[3] *Ibid.*, p. 54:2-10. **FIND AN APPENDIX C CITATION?**

how few reclamation districts show a "very low" ability to pay.[4] This study sorts the dataset of reclamation districts into quartiles rather arbitrarily, rather than developing and applying criteria quantifying low compared with high ability to pay (ATP) for levee maintenance expenses. This approach to sorting the data masks the findings that of the 14 districts with "very low" ability to pay, 9 have an ATP exceeding 50 percent of their income, while 6 of them have an ATP exceeding 70 percent. This means that fully 47 of the 55 districts in the Arcadis study have an ability to pay of over 70 percent, and of these 47, 41 of them have an ability to pay that exceeds 88 percent of income. This means that the vast majority of Delta reclamation districts, by Arcadis' analysis, has a strong ability to continue paying their share of levee maintenance costs under the subvention program.

The DSC goes on to suggest, however, a "simplified approach to the consideration of a local levee agency's ability to pay for the cost of levee maintenance or improvement… so that reclamation districts with little ability to pay receive the full 75 percent State cost share recommended above, with reduced State cost shares for reclamation districts that are able to pay more to maintain and improve their levees."[5] Actually, the suggested approach is more complicated than the present levee subvention program approach. Instead, it is a misguided attempt to help the State shirk its commitment to the Delta levee maintenance subvention program. This proposal ignores the DSC's other policy proposal of having a "beneficiary pays" approach to supplement the Delta levee maintenance subvention program. It will be analytically very difficult to determine with precision what, say, the Tulare Lake Water Storage District's fee for Delta levee maintenance should be based on its receipt of south-of-Delta water exports via the State Water Project.

Politically it will be very difficult to get beneficiaries like water contractors to accept application of a beneficiary pays principle to the long-term protection of Delta levees. This makes the idea more difficult and complex, not less.

It should be obvious that it is already a simplified approach to have DWR conduct a levee maintenance subvention program wherein each reclamation district receives 75 percent payment of its levee maintenance costs from the state. These state funds are paid for by all California taxpayers, and the program thus recognizes the state's interest in benefits that all Californians realize from protection and maintenance of Delta levees. ***We urge the DSC to eliminate subsection C from RR R3.***

There are other things to like in the Delta Levees DPA. In particular, we agree that CalTrans should be given authority by the Legislature to enter into agreements with local levee districts to fund improvement and maintenance of levees adjoining interstates and highways "when that is the least cost approach to reducing flood risks to those roads." This last clause seems to make a distinction without a difference: when

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[4] Memo from George F. McMahon, P.E., PhD., Arcadis, to Dan Ray, Delta Stewardship Council, January 27, 2017 (Revised), "Ability to Pay (ATP) Analysis, Delta levees Investment Strategy," 9 pages.

[5] *Ibid.*, p. 54:14-19.

levees adjacent to highways protect the highways from flooding, why wouldn't maintaining or improving the levee be the least cost alternative? If the DSC must keep that clause, we think it doesn't add or subtract much.

RR R13 requiring "an adequate level of flood insurance" strikes us in two ways: First, what is "adequate"? Second, this section's problem statement alludes to a DWR 2005 paper that advocated that the state "reduce its liability by requiring that all homes and businesses in areas at risk of flooding, regardless of the level of protection, have some form of flood insurance similar to the National Flood Insurance Program, yet more comprehensive." The idea here is to engage all property owners and residents who would pay for insurance (even as renters) to buy into the reality of flooding potential and invest in protecting themselves from injury, death, damage and loss due to flooding. This is actually a good idea, but the DSC's RR R13 fails to take up this task, and it consequently languishes, implying that anyone who cannot afford flood insurance in the Delta should strongly consider relocating if the State will not be the safety net. Such an implication of this Delta Plan recommendation would have undue environmental justice impacts on minority and poor residents, as well as those facing language barriers who may struggle to understand the risk, liability, and flooding issues involved.

Environmental Justice Analysis Needed

This leads us to insist that the major gap with the DSC's Delta Levees DPA is the lack of consideration and analysis of environmental justice issues pertaining to flooding potential, shouldering of disproportionate risks from flood hazards and levee protection and maintenance costs. One analytic task that should be performed is to overlay the DLIS priorities map (e.g., p. 48 of the Delta Levees DPA, or Figure 2 of the NOP), and the reclamation district ability to pay map (e.g., Figure 1 of the Arcadis ATP study) with various maps generated for the legal Delta by the University of California at Davis's Center for Regional Change study of Delta regional opportunities.[6] The latter's maps show opportunities for a number of social and economic indicators, including education, employment and income, housing, civic life, and health/environment. The maps of the Economic Innovations Group's Distressed Communities Index for Delta region zip codes (cited in Attachment 3 to this letter) should also be compared with levee-related maps to ensure that the social and economic needs of the Delta region's most vulnerable environmental justice populations are accounted for in the DSC's Delta levee priorities amendments to the Delta Plan.

4. DPA Performance Measures Comments

The Delta Plan was litigated almost immediately upon its adoption by the DSC in May 2013. Superior Court Judge Michael Kenny ruled in 2016 that the Delta Plan failed to put forward legally enforceable and quantified performance measures. The measures that he found lacked "quantified or otherwise measurable targets" included:

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[6] Chris Benner, *Delta Regional Opportunity Analysis*, UC Davis, Center for Regional Change, with Cassie Hartzog and Sara Watterson. See Attachment 9 to this letter.

- Reduced reliance on the Delta for California's future water supply needs.
- Reduced risk of take and harm from nonnative invasive species.
- Restoration of more natural flow into and through the Delta.
- Increased water supply reliability.
- Promotion of options for new and improved infrastructure relating to water conveyance in the Delta to achieve the coequal goals.

Under Judge Kenny's decision, the Delta Plan is vacated until such time as these performance measures are brought into compliance with the DRA requirement that the Plan be enforceable. We understand that the case is presently on appeal.

Our comments concerning performance measures center on outcome-related performance measures proposed by the DSC in its "Delta Plan Performance Measures" matrix, dated March 7, 2017.

Measurable reduction in reliance on the Delta in each hydrologic region.

This proposed outcome performance measure attempts to implement the statewide policy of Water Code Section 85021. It fails, however. While the matrix identifies what may be an appropriate baseline for determining reductions of the "average of 1998-2010 Delta water supplies" and the average volume of total water use met by water originating in the Delta watershed by hydrologic region over the same period, the performance measure proposed is highly incremental, the tiniest of steps in the direction of reducing reliance on the Delta by other regions for California's future water needs: all of a whopping one percent (1%): "1% reduction in average volume of total water supply met by water originating in the Delta watershed, by hydrologic region" by 2020. For the five hydrologic regions established in the baselines as subject to this performance measure (San Francisco Bay, Central Coast, South Coast, Tulare Lake, and South Lahontan), this one percent reduction would result in a whopping savings of 72,000 acre-feet by 2020.

Its alternative ("or") target is expressed as "Reduction in average percent of total water supply met by water originating in the Delta watershed, by hydrologic region, equal to at least the reduction that would be achieved through SB X7-7 goals and holding baseline supplies and imports constant." This performance measure is impossible to understand for lay readers not familiar with this terminology. What *are* the relevant SB X7-7 goals and why are they suddenly relevant to reduced Delta reliance as a performance measure? If this is referring to the 20 percent conservation goals by 2020, why not so state it? The language of this draft target is opaque, unnecessarily so. It should either be related back to the baseline measures suggested in the draft performance measure in as clear a manner as possible—or dropped with no further consideration. It would be far simpler for the public to grasp to state percentage reductions targeted for specific points in time.

But the larger problem with this proposed "reduced Delta reliance" measure is that it is bereft of the larger context that led to so much Delta deterioration in recent years: the special legislative session at the end of the 2007-2009 drought period that led to passage of the Delta Reform Act; the finding in the Act that the Delta is in crisis; the Act's policies that so clearly aim to improve Delta ecosystems while stabilizing water supply reliability; and the Act's "early actions" that required, among other things, that the State Water Board develop, and the DSC apply in its Delta Plan work, information on Delta flows that would protect public trust resources. The draft Ref. 3.4 performance measure has no analytic basis in these historical and ecological realities that it desperately needs. It appears as a number pulled from the air by DSC staff and put forward as ostensibly a politically safe number that will not anger water contractors and the Department of Water Resources because it is likely to be ineffectual.

The Environmental Water Caucus, and more recently Restore the Delta, has argued since the time of the drafting of the Delta Plan that a safer and more reliable level of exports from the Delta is for an average of about 3 million acre-feet annually. However, this may be perceived as an arbitrary number like the present 1 percent suggested by the DSC for Delta export reductions.

To save this performance measure from being found arbitrary and/or capricious, an analysis should be performed by DSC that relates the findings of the Delta Flow Criteria report (authorized by the DRA in Section 85086 and approved by the State Water Board in 2010) since it identifies flows that would be protective of fish to regional self-sufficiency targets for each hydrologic region based on the categories of supply alternatives described in the second sentence of Water Code Section 85021. They address the means by which reduced reliance on the Delta is to be translated as a matter of state policy into local self-sufficiency and reliance—and hence, greater local water supply reliability. This way, responsibility for water supply reliability is spread throughout the six Delta-dependent regions[7] and can become priorities for local water infrastructure investments. And, as we discussed earlier in this letter, local water conservation efforts and behaviors by all Californians must also be factored into the real need for reliance on the Delta, and a more realistic potential for reduced Delta reliance is likely to be emerge from such an analysis. This analysis resolves to being the same type of needs assessment that should be performed on conveyance and storage options of the conveyance, storage, and operations DPA, and should be standard DSC professional methodology.

Making conservation a California way of life has to become part of the definition, analysis, and implementation of the reduced Delta reliance policy by the DSC. So far, the DSC avoids the analytical hoist for taking account of Delta flow needs, effective citizen conservation behavior, technological potential for non-Delta and local self-reliant water supply methods, to arrive at both what local self-sufficiency targets and reduced

[7] The SWP and CVP service areas of the South Bay Aqueduct, San Felipe Project, Delta-Mendota Canal, California Aqueduct, San Luis Canal, and Friant and Madera canals; as well as Contra Costa Water District, East Bay Municipal Utilities District, and San Francisco Public Utilities Commission.

Delta reliance targets could be. By doing such analysis, the DSC will make these performance measures in the Delta Plan enforceable because they will demonstrate the legal and practical nexus between the policy to be achieved and the target derived to enforce the policy in the Plan. And it will avoid the problem of being arbitrary and capricious—of attempting to apply to reduced Delta reliance and increased local self-sufficiency numbers that are pulled from the air. Most of all, it will make the DSC a highly relevant state agency in Delta and statewide water policy.

Responsible State and local agencies complete the mandates of the 2014 Sustainable Groundwater Management Act.

This outcome performance measure is likely quite appropriate for the DSC to incorporate, but to become "enforceable" it must break out exactly what those SGMA mandates are and specify them as targets to be met. The California Department of Water Resources has provided a timeline for Key SGMA Milestones in its Groundwater Sustainability Draft Strategic Plan.[8]

Certain SGMA mandates are likely to be more relevant to DSC policy goals like water supply reliability and ecosystem restoration than are others. For instance, increased water supply reliability as an outcome of state water policy is met most directly by Groundwater Sustainability Agencies completing and adopting legally adequate Groundwater Sustainability Plans that do not require intervention by the State Water Resources Control Board in the 2020s. The DSC should be primarily concerned with mandates in SGMA that directly relate to SGMA "desired outcomes" because these will improve and increase overall water supply reliability for local self-sufficiency. And this can readily feed back into the analysis of reduced Delta reliance and local self-sufficiency as well, discussed in our comments on reduced Delta reliance above.

Decrease in Delta exports during critically dry years and an increase in Delta exports during wet years—this performance measure should be immediately withdrawn.

This is the standard talking point of the Department of Water Resources in which they propose that the way to increase reliability and new supplies is to skim more of the flood flows in wet years so the state and federal water projects may take less water (with presumably less pain to their water contractors) during critically dry years. Trouble is, this strategy incorrectly and unwisely assumes that reservoir storage gained by the "big gulp" during wet years will be managed wisely—that supplies during non-crisis drought years will be harbored in such a way that long-term drought experiences will result in larger carryover.

Recent experiences in 2008, 2014, and 2015 all attest to the crucial storage assumption behind this so-called strategy. In those years, the Department of Water Resources and

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[8] California Department of Water Resources, 2015. *Groundwater Sustainability Program Draft Strategic Plan*. March 9, pp. 22-23, accessible at http://www.water.ca.gov/groundwater/sgm/pdfs/DWR_GSP_DraftStrategicPlanMarch2015.pdf.

the Bureau of Reclamation came before the State Water Board to seek "temporary urgency changes" to their water rights that would release them from specific water quality objective compliance in the Delta so that they could harbor meager stored water supplies that remained. Prior to submitting the TUCPs, the Department and the Bureau had drawn down their supplies for their customers leaving less for carryover storage into the next, possibly drier or critically dry year to come, and too little with which they could also meet Delta water quality standards.

The big gulp strategy suggested for this performance measure does not improve on this recent reality. Moreover, it implies the presence and operation of the Tunnels Project of California WaterFix as the site and vehicle of the "big gulp." Its presence as a performance measure is nowhere supported by other Delta Plan policies, certainly not those in place as of May 2013. This performance measure assumes what has yet to be demonstrated after nearly 11 years of conveyance planning in the Delta: not only that the big-gulp strategy would improve on recent practice, but that it will not have serious hydrologic, water quality, and ecosystem consequences for fish, planktonic species and food webs, and Delta region environmental justice communities.

Consider too that this strategy is naive about the future. If, under expected climate change scenarios of more frequent and longer dry periods and less frequent but more extreme wet periods, would this strategy even be able to boost water supply reliability? The DSC fails to justify why this performance measure is included. As we have urged, it should be withdrawn.

It is because of proposals like this one that we urge the DSC to face squarely and honestly the various meanings of "water supply reliability." Without engaging the various meanings of this phrase, genuine progress by the DSC toward real supply reliability (as it concerns the Delta) that achieves the coequal goals and reduces reliance by other hydrologic regions on Delta exports will remain elusive and controversial.

At a minimum, "water supply reliability" represents a statistical probability, a likelihood of attaining a certain level of supply consistently a large percentage of the time. Under assumption of stationarity[9], probability of exceedance curves are a useful tool for grasping such a reliability concept. But the term "reliability" in this phrase also connotes a relationship of supply to demand: Demand is what populations who need water do when they use water. If demand can be reduced over the long term, then water supplies can be stretched farther for the same population, or even for a growing population using more water in ways that are increasingly efficient. In economic terms, the productivity of water usage can increase, without overall supplies necessarily having to increase.

Similarly, the sources of supply can be diversified to reduce reliance on supplies that may be vulnerable to drought. Delta exports dependent on conveyance projects like California WaterFix do not ready meet this criterion.

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[9] Stationarity—the idea that future conditions will be similar to those of the known past—is problematic, since climate change undermines the relationship between the past and the future.

But the DSC's incorporation of this outcome performance measure signifies that the DSC has not done the necessary analysis to figure out how to increase water supply reliability by reducing Delta reliance and increasing local self-reliance, as we stated earlier. The DSC's inattention to this is hydrologic malpractice, and, again, we urge the DSC to withdraw this outcome performance measure, and address water supply reliability through a forthright and comprehensive needs assessment, from which a more suitable measure could emerge.

5. Comments Specific to the Draft PEIR

Significant and Unavoidable Impacts

The DSC acknowledges its PEIR that many impacts of its DPAs are significant and unavoidable even after mitigations int he PEIR and existing Delta Plan are applied. The DSC's reasoning calls into question the need for the DSC.

> In many cases, adoption of 2013 PEIR Mitigation Measures, or equally effective measures, as part of covered actions would reduce impacts in this PEIR to a less-than-significant level. However, the specific locations, scale, and timing of possible future facilities are not known at this time, and the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning and Extended Planning Areas cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities and the facility itself. Therefore, it is not possible to conclude that significant adverse effects would be avoided or reduced to a less-than-significant level. Furthermore, implementation and enforcement of 2013 PEIR Mitigation Measures, or equally effective measures would be within the responsibility and jurisdiction of public agencies other than the Council. Therefore, many of the significant impacts would remain significant and unavoidable.
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> For non-covered actions that are constructed in response to the proposed amendments in the Primary and Extended Planning Areas, implementation of 2013 PEIR Mitigation Measures by other public agencies is recommended to reduce potentially significant impacts. However, the Council lacks authority to require other agencies to adopt or enforce mitigation measures for projects that are not covered actions.[ ] Accordingly, for non-covered actions, this PEIR assumes, as CEQA requires, that potentially significant environmental impacts would be significant and unavoidable, even if feasible mitigation measures are available, because they would be within the responsibility and jurisdiction of an agency other than the Council.
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> For many impacts, this conclusion is very conservative. Agencies that might propose actions or activities that the proposed Delta Plan amendments seek to influence have a legal duty under CEQA to mitigate impacts to the extent feasible. In addition, many of the mitigation measures identified in this PEIR are standard types of mitigation, are considered to be generally feasible for most

> projects, and would reduce impacts to less-than-significant levels in many cases. Nevertheless, the Council cannot guarantee that the mitigation measures will be adopted by the lead agencies for non-covered actions.
>
> (Draft PEIR, p. ES-22:30-42, p. ES-23:1-16.)

We conclude from this discussion that the DSC is a bureaucratic redundancy lacking meaningful authority to benefit either the people of the Delta or of the state of California. The DSC should be abolished and its useful functions, such as the Delta Independent Science Board, relocated to another more appropriate state agency.

<u>Project Objectives—Conveyance, Storage, and Operations of Both</u>

The problem with "promoting conveyance-related infrastructure"

First, we note that a citation to Water Code Section 86304 is in error; the correct section of the code is 85304. (Draft PEIR, p. 3-3:9.)

Next, we point out that the objective to "contribute to achieving improved water quality both in the Delta and for water quality delivered to the end users of the conveyance system" represents DSC engaging in magical thinking: it ignores the zero-sum character of Delta inflows, tidal flows, exports, and Delta outflows. Quite simply, whenever there is less inflow, there is more salinity and poorer water quality in the Delta. Higher exports typically mean less outflow past Chipps Island—an opportunity for tidal flows to increase in the interior Delta. ***This statement is true regardless of whether the exports are taken in the north Delta, the south Delta, or from both locations simultaneously. Please strike this as a criterion for evaluating "new or improved Delta conveyance infrastructure."***

Because the DSC typically avoids reading its enabling legislation (the DRA) holistically, policy criteria establishing the findings and justification for "improved conveyance" in the Delta need to be established through amendment of the Delta Plan. The amendment before the DSC would establish some criteria by which any conveyance covered action proposal should be evaluated.

The new Delta Plan amendment for conveyance, storage and operation seeks narrowly to fulfill Water Code Section 85304.[10] Like other California water agencies, the DSC prefers as narrow as possible a path to complying with this DRA provision, to the point of not placing this directive in the context of other key policies that make up the California water policy framework.

The Delta Reform Act contains relevant policies that:

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[10] Water Code Section 85304 states, "The Delta Plan shall promote options for new and improved infrastructure relating to conveyance in the Delta, storage systems, and for the operation of both to achieve the coequal goals."

- Reduce reliance on the Delta for California's future water supply needs. (Water Code Section 85021.)
- Define the coequal goals as combining a more reliable water supply for California with "protecting, restoring, and enhancing the Delta ecosystem." (Water Code Section 85054.)
- Call for improving "the water conveyance system and expand statewide water storage." (Water Code Section 85020(f))
- Reaffirm the Public Trust Doctrine and reasonable use of water as forming "the foundation of California's water management policy and are particularly applicable to the Delta." (Water Code Section 85023.)
- Reaffirm area of origin water rights in state law (Water Code Section 85031).

There is one passage our organizations support. The public trust doctrine is applied (echoing Water Code Section 85320(a)(2)(A), without calling it such) on page 6 of the DPA in I.B.1.a, where the DPA calls for identifying what flows fish need "and other operational requirements and flows necessary for recovering the Delta ecosystem and restoring fisheries under a reasonable range of hydrologic conditions…" before saying "which will identify the remaining water available for export and other beneficial uses." (This is apparently transferred over from the old BDCP requirements for incorporation into the DP pre-WaterFix.) Without the DSC's stated, explicit commitment to balancing the various components of California's water policy framework, this laudable passage remains a slim reed on which to rest our trust in DSC's good faith.

But by its silence in the proposed Delta Plan amendment "promoting" conveyance and storage options, the DSC condones passive acceptance of the California WaterFix's presentation and poor justification of "need" for the project. Approval by the DSC of this DPA would be prejudicial to WaterFix consideration by the DSC when WaterFix arrives as a proposed covered action.

The verb "promote" in this section of the DRA is thus problematic. The DSC failed to grapple with its meaning in relation to broader goals and objectives of the Act. "To promote" is to "further the progress of something (especially a a cause, venture or aim); to support or actively encourage."

What does it mean on one hand to "promote" options for improved conveyance when such options may come before the DSC as covered actions asserting conformance with the Delta Plan? This is the essence of a looming conflict of interest for the DSC, in our view. The DSC neither recognizes nor confronts this conflict of interest embedded in its legislative charge. The DSC should confront the concept of "promotion" of these options by drafting a policy in the DPA that limits the notion of "promotion" to one of recognition of potential options while distinguishing recognition of options from consideration of covered actions. Rather than promoting conveyance options, the DSC should instead draft criteria for evaluating proposals

intending to "improve conveyance" in the Delta. The criteria in the DRA intended for BDCP could be readily adapted and applied through the Delta Plan for evaluating conveyance proposals, such as California WaterFix.[11]

The DSC should distance itself from encouraging or promoting any particular option so as to preserve its impartiality when considering conveyance- or storage-related covered actions. Its statutory mandates to use best available science, reduce Delta reliance, and achieve the coequal goals, among others, must still be applied to the review and evaluation of such covered actions under the DRA. These mandates conflict with and should therefore constrain and limit the statutory language of promoting storage and conveyance options.

The DSC is charged ultimately with solving water reliability and environmental problems in the Delta and its watershed. But with this present DPA, treatment of specific conveyance proposals like California WaterFix in light of the problematic concept of "promotion" is detrimental to the public interest and contrary to the framework of California and Delta water policy in the DRA. To continue down this path will undermine DSC authority for balanced consideration of the proposed project when it arrives before the DSC as a covered action.

Assess Need for Conveyance and Storage Projects Honestly and Transparently

Besides the DRA BDCP criteria we suggested be applied to California WaterFix in the Delta Plan, the need for such projects must be assessed in covered action review by the DSC.

There still has been no genuine needs assessment and economic water supply justification for new conveyance and new storage, let alone whether such new conveyance and storage systems would represent "improvement." The lack of such needs assessments (like benefit-cost analysis taking account of ecosystem services and non-market contingent economic values in society) contribute to the longevity if not the merits of California WaterFix and most of the CalFED Surface Storage proposals, and their egregious environmental justice effects. The DSC is uniquely positioned to undertake and implement results of such a study.

In recent environmental documents for California WaterFix the alleged "need" is simply restated as meeting contractual entitlements and increase storage and conveyance capacity across the Delta to do so. This does not qualify as a needs assessment for improved conveyance—it essentially justifies need for the California WaterFix project as "because we've always done it this way"—a tautology. The 19 principles follow in these footsteps, not those of DRA policies. ***Contracts may be solemn documents, but they are never immutable. When it comes to conveyance and storage proposals there***

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[11] The portions of the Delta Reform Act that call for "promotion" of conveyance or infrastructure options are anomalous with respect to the rest of the Act's regulatory provisions, and could be struck down without doing violence to the overall mission, goals, and objectives of the Act and of the Delta Stewardship Council.

should be no assumption by any party that water service contracts served by new conveyance and storage facilities would be left unchanged. Indeed, until it was suspended early in 2015, DWR and the state water contractors had briefly embarked on a publicly accessible contract negotiation process to arrive at financing structure acceptable to all parties for the tunnels facilities in Conservation Measure 1 of the Bay Delta Conservation Plan—before the project became California WaterFix.

The alleged "need" for "improved conveyance" in the Delta must confront and account for the reality that Californians have responded to a fifth year of drought by surpassing water conservation goals established by Governor Brown. On April 4th this year, the State Water Resources Control Board (SWRCB) announced that urban Californians' monthly water conservation was 25.1 percent in February, more than double the 11.9 percent savings in February 2016, when state-mandated conservation targets were in place. Cumulative statewide savings from June 2015 through February 2017 was 22.5 percent compared with the same months in 2013. Since June 2015, the SWRCB reported that 2.6 million acre-feet of water was saved by Californians heeding the call for conservation. This was "enough water to supply more than 13 million people—exceeding a third of the state's population—for a year," the Board stated.[12]

Moreover, statewide residential gallons per capita per day (R-GPCD) for February 2017 was 57.5. Among regions dependent on the Delta, the Sacramento River (63.9 R-GPCD) and San Joaquin River (60.4 R-GPCD) hydrologic regions exceeded this statewide average only somewhat, while the San Francisco Bay (50.0), Central Coast (48.6), and South Coast (56.1) hydrologic regions outperformed the statewide average for residential water consumption. These are but beginning building blocks for constructing an assessment of true need for "improved conveyance" and increased storage in California. These outcomes are summarized in Attachment 6.

Making water conservation a way of life will be increasingly important as drought recurs throughout California under rising greenhouse gas emissions and climate change conditions. The permanence of water conservation measures was addressed in a 2017 multi-agency report from the Brown Administration (see Attachment 7). None of this is disclosed or analyzed in determining the need for the Tunnels Project, and the Delta Stewardship Council's DPA activity fails to define a policy process that will address permanent water conservation and conveyance and storage needs in that light.

DSC should strengthen its Delta Plan policies and regulations to implement Water Code Section 85021, actually reducing reliance on Delta imports by south of Delta water project customers. It can only do this by, for example, identifying reduction targets timed to match SGMA Groundwater Sustainability Plan timelines and taking a leadership role in promoting options for adapting California's water needs and demands to the new Delta and groundwater policy realities.

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[12] State Water Resources Control Board Media Release, "Statewide Water Savings Exceed 25 Percent in February: Conservation to Remain a California Way of Life," April 4, 2017. Accessible at http://www.swrcb.ca.gov/water_issues/programs/conservation_portal/docs/2017apr/pr040417_february_conservation.pdf.

Other criteria from state policy for evaluating conveyance and storage: Environmental Justice

The DSC should address some related considerations concerning conveyance promotion:

- Exactly how does DSC promotion of more exports via California WaterFix represent consistency with environmental justice and anti-discrimination policies? The principles embodied in the DPA need to be addressed consistent with these statewide policies.

- The DSC appears to have largely ignored the Human Right to Water policy as well, which all state agencies are supposed to consider when they do planning, which this DPA is an example of. The DPA must also address the relationship of the storage, conveyance and operating principles to the state's "human right to water" planning requirements, including identifying populations where the human right to water must be protected in DSC's jurisdiction.

- California's overall water policy framework should explicitly shape this DPA. (i.e., reasonable use; prohibition on waste, unreasonable use, and method of diversion; public trust resource protection; area of origin water rights priorities, including the Delta Protection Act of 1959; state and federal clean water acts; and endangered species acts.) The criteria DSC deploys in this DPA are almost entirely matters of engineering new conveyance, new storage, and new operations. The DSC improperly fails to balance the wide range of DRA policy concerns in the service of flagrantly "promoting" options.

The format of the DPA does not disclose whether its conveyance, storage and operations options are to be treated as policies or recommendations in the Delta Plan. This is inconsistent with how the DSC formulated and framed policies and recommendations in the Delta Plan as adopted in May 2013. Neither the proposed amendment nor the supporting staff report nor scientific attachments the DSC used last spring clarify this. Exactly what is the status of this language in the DPA? Without answers to such basic questions, the purpose and use of the DPA is opaque to the public, not transparent.

The DPA is also plagued by agent-less language. Nowhere does it say anything about who does what except under Part I.A.1 (where it is DWR and USBR doing the Tunnels project, DPA pages 5-6). All the other DPA sections get highly speculative as to who does what with DSC's "promotion" of options. This goes back partly to the status of these proposed amendments: If they are policies, to whom will they be applied by the DSC? If recommendations, to which other state agencies and potential applicants will the DSC give them?

The DPA blithely narrates these promoted options despite the fact that a ***massive*** EIR/EIS has been reviewed by the public on California WaterFix and many months' testimony and evidence taken by SWRCB concerning the California WaterFix water

rights change petition. This body of evidence clearly shows that the Tunnels spell doom for achieving coequal goals in the Delta. The tunnels would privilege water supply reliability over ecosystem restoration (let alone fish species' recovery). Given this preponderance of evidence of harm and significant unavoidable impacts accepted into the Board's record on the change petition for California WaterFix, why would the DSC merely "promote" this conveyance option? Is the DSC not paying attention?

Outcome performance measures continue to have no numeric targets by which the DSC can meaningfully assess performance toward meeting coequal goals that would be made by contributions from this DPA. (While RTD is a litigant against the Delta Plan, we look for more of the same unless DSC acts to apply numeric targets for reduced Delta reliance, decreased Delta exports and measured increases in natural functional flows, etc. called for in Attachment A.)

Nearly all of these proposed performance measures contained in the conveyance DPA fail to provide meaningful targets to perform to, which is the point of performance measures. The one exception is PM 4.6 (Appendix C, PDF pages 417, 418, and 453) stating that one measure of success toward the coequal goals would be to achieve the salmon doubling goal under state and federal law, as measured in data from state and federal fishery agencies. Our organizations support adoption and implementation of this performance measure as a meaningful outcome measure, *post haste*.

The DPA's new Figure 3.1 map (DPEIR Appendix C, Attachment C-3, p. 40) presents data on "soil agricultural groundwater banking index identifying potential areas for banking on ag lands." This is a curious attachment. DPA page 11 states in II.C.2 (DPEIR, Appendix C, Attachment C-3, p. 34) that DWR should develop a model ordinance for groundwater recharge that urges cities and counties to incorporate groundwater recharge and storage into land-use planning and zoning, and to protect areas with the highest potential for groundwater recharge from incompatible uses. This is a good policy. It's just that in the new Figure 3.1 map, it does not appear to offer a lot of areas where soils are good enough for such water spreading to work well on agricultural land. We urge that the DSC work closely with the map's authors to devise a more fine-grained mapping system to help implement such a policy, and collaborate with DWR SGMA staff and the California Water Commission toward that end.

There are many areas of the Central Valley where the new Figure 3.1 map shows poor or very poor soil conditions for surface recharge. If this is indeed the case, why is so much attention given to conjunctive use as a "system storage" strategy? Neither the scientific attachments nor the staff report during DSC's spring adoption process of these DPAs address this. No attempt was made in the PEIR to quantify or locate potential for conjunctive use subsurface storage. The only substantive mentions of "conjunctive use" occur in Section 5.11 of the PEIR (Section 5.11, PDF pages 835, 849, 851, 861, 867, 869, and 878). It appears to us to undermine or at least overstate the utility of conjunctive use as a storage solution in the Central Valley. We urge the DSC to address this problem before it embarks on a storage policy that may not meet California's future water supply needs. The DPA should at a minimum recommend additional study by the

Delta Independent Science Board of the feasibility and reliability of conjunctive use as a meaningful strategy contributing to greater water storage in California's Central Valley.

Our organizations recommend a new Delta Plan policy that ***no conveyance or storage alternative or option may be presented to the DSC as a certifiable covered action without first having obtained water rights permits and a 401 certification from the State Water Board, and applicable 404 permits from the U.S. Army Corps of Engineers.*** In the case of new hydroelectric dam projects, they would also need a FERC license prior to the entity seeking a covered action certification from the DSC.

We also recommend that the DSC should establish as criteria of consistency with the Delta Plan that any conveyance or storage project ***must*** have project bonding that guarantees all necessary maintenance and mitigation activities be documented and funded before any covered action certification be approved by the DSC. The California Coastal Commission has required bonding of permittees for sea walls and other coastal protective structures to ensure compliance with terms of coastal permit approval, and to ensure that projects actually have the funding they need to complete construction. Presently, we note, the California WaterFix project, after ten and a half years of planning, still has no financing plan on which such bonding could rely.

The DSC should expand the DPA's discussion of where the respective sets of known conveyance and storage projects (i.e., WaterFix and CalFED storage projects) are in their respective processes as of some date certain like a month before the Council adopts the DPA. To "promote options" in the absence of describing what options are actually out there under consideration (including storage projects before the California Water Commission or conveyance proposals under consideration among south of Delta water agencies) is non-transparent. The Delta Plan is supposed to be updated every five years, and none of these California WaterFix or CalFED storage projects have funding, authorization, permits and so on. The DSC should name, not hide, what's under consideration among these options so that the Delta Plan may be a more or less transparent and relevant document that is useful to the public.

Scientific Findings

Attachment 4 of the DPA materials from February 22-23 include "updated scientific findings for DPA concerning storage, conveyance, and operation." This attachment is an annotated bibliography of articles from various scientific and engineering journals. However, the annotations do not tie back into exactly how the updated science relates to Delta Plan Amendment policies or recommendations. Mostly, they appear just to reproduce research paper abstracts as annotations. Specific connections of scientific findings to proposed policies and recommendations (however flawed and such as they are) are missing.

Consequently, we urge DSC members not to construe the scientific findings attachment as scientific justification for the proposed DPA on storage, conveyance, and operations.

Conclusions on the Conveyance, Storage, and Operations DPA: Require Needs Assessments for Covered Actions

In sum, the DSC should reject environmental review and adoption of the present conveyance, storage, and operational options for promotion now before it. Instead, the DSC should develop criteria and required covered action conditions derived from Water Code Sections 85021, 85320, and from environmental justice, human right to water, and anti-discrimination policies, and use them systematically to require each conveyance covered action undergo a comprehensive and quantified needs assessment. The needs assessment should take into account project feasibility, economics, ecosystem services protected or the cost of restoring them elsewhere if the covered action is approved, and water supply and demand, and the reliability of each. An improved Delta Plan amendment addressing conveyance, storage, and operations should meet findings that derive from the criteria that would be placed by the DSC into the Delta Plan. At present, the DSC has no such proposal before it.

Environmentally Superior Alternative

In our April 17, 2017, comments on the Notice of Preparation we stated: “Regarding alternatives to be considered in the program environmental impact report, we urge the DSC to include a reduced exports alternative that reflects the mandate to reduce reliance on the Delta for California’s future water needs and which would build on a strong funding and institutional commitment to strong regional/local water self-sufficiency programs as suggested in the Delta Reform Act (e.g., Water Code Sections 85021 and 85004(b). In relation to Delta conveyance, there should be a “no isolated conveyance” alternative in which through-Delta conveyance in open Delta channels is continued into the foreseeable future.”

We appreciate the DSC including a “Reduced Reliance on the Delta Emphasis” alternative in the PEIR. However, we think it is mistreated due to the flawed interpretation the DSC gives to reduced Delta reliance in the formulation of its project objectives. See our discussion immediately above concerning project objectives.

The DSC’s PEIR identifies the environmentally superior alternative as a “Delta Wetland Restoration Emphasis” alternative that “would promote construction of new isolated, below ground conveyance facilities to help manage water flow conditions in the Delta for fisheries.” (PEIR, p. 9-30:26-28; p. 9-42:18-19.) The PEIR states that Alternative 2 would be the environmental superior alternative and it would also achieve most of the basic project objectives.

In order to arrive at this conclusion, the DSC has cherry-picked portions of the DRA and the Delta Plan for front-loading project objectives that are conveyance-friendly. As mentioned already, the DSC has narrowed its obligations relating to conveyance to that of Water Code section 85304, calling for promotion of conveyance options, at the expense of a holistic interpretation of DRA and statewide policies that mandate reduced Delta reliance, protection of the public trust, reasonable use of water, reasonable methods of diversion, and maintenance and enhancement of water quality. This is an

improper abuse of discretion by DSC in the formulation of these Delta Plan amendments and in the processing of the PEIR on them.

To drive home this abuse of discretion, we point out that, since it is a mandate from the State Legislature to reduce reliance on the Delta and increase regional self-reliance and -sufficiency in the importer service areas of the Delta watershed, it makes no legal sense for DSC to state in Chapter 9 of the PEIR:

> …because Alternative 1 would reduce reliance on the Delta and promote regional self-reliance, it is possible that, in order to realize the same benefits as the Proposed Project, Alternative 1 could result in construction of additional projects in the Extended Planning Area (Delta export area). The construction of new or expanded water storage facilities could occur in the portion of the Delta watershed that receives exported Delta water supplies and in areas outside the Delta watershed that receive exported Delta water supplies that could increase construction and operation impacts when compared to the Proposed Project.

(PEIR, p. 9-28:11-18.)

Reduced Delta reliance is deemed by the Legislature as an essential policy concerning how California meets its future water needs. Additional language in Water Code section 85021 gives ready examples of the types of investments that importers of Delta water should undertake to meet the mandate of this policy. The policy includes explicit recognition that local new supplies and coordination of regional supply efforts are important to implementing the reduced Delta reliance policy. (Water Code section 85021.) The DSC defines its project objectives for the CSO amendments in such fashion as to undercut the mandate of reduced Delta reliance which includes making such investments that the DSC finds sufficiently environmentally damaging that Alternative 1 is not accepted as an environmentally superior alternative.

Section 85021 states in full:

> The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.

"Not all of the project objectives would be achieved under Alternative 1," states the PEIR (p. 9-29:14). This is because the project objectives have been improperly formulated and fail to comply with the reduced Delta reliance policy cited here. Reduced Delta reliance *means* reducing exports to service areas within the State Water Project and the Central Valley Project that are outside the legal Delta. This is state policy. If this alternative fails to comply with project objectives, the fault lies with the formulation of the project objectives, not the State Legislature's having adopted the policy mandate.

It is arbitrary and capricious for DSC to strip this policy mandate of its meaning and authority in the formulation of project objectives for the CSO amendments. In doing so, the DSC makes a travesty of CEQA alternatives analysis requirements.

Environmental Justice and Public Health

In our joint RTD/EJCW letter of April 17, 2017, we wrote: "Regarding the scope of potential effects of the proposed Delta Plan amendments, we urge that the DSC include in the EIR contents chapters that deal with environmental justice and public health. The environmental justice chapter should connect the disproportionate burdens that may be placed on these communities by provisions of the Delta Plan amendments under consideration with hydrology/water quality, air quality, climate change and sea level rise, land use and planning, noise, public health, growth inducement, recreation, population/housing/employment, transportation, utilities and public services, and cultural resources. Accordingly, we also recommend a separate public health chapter that addresses the potential for conveyance alternatives to contribute to flow stagnation, increased residence time of water, and the potential for increased deposition of chemical contaminants like selenium and mercury and increase of harmful algal blooms during summer and early fall seasons. Both environmental justice and public health chapters were included in the Bay Delta Conservation Plan/California WaterFix EIR/EIS; such chapters should be included here too." We note for the record that neither the format nor the substance of the PEIR follows this suggestion.

Flows, Water Quality, and Selenium

We agree that construction and dredging activities could re-suspend contaminants including selenium that would become bioavailable to benthic species and would cause a pulse of contamination in Delta benthic communities and among key benthic predators like sturgeon.

The PEIR ignores the role of alterations to flow and water quality from conveyance operations in the Delta that would contribute to selenium contamination in benthic communities. Restore the Delta herein excerpts California WaterFix Change Petition Part 2 Hearing testimony by our policy analyst Tim Stroshane as relevant commentary on CSO amendments analyzed in the PEIR. We further attach an excerpt of our exhibit index and assert that all of his exhibit citations are also incorporated materially into this comment letter. We respectfully request that the DSC download each of Mr. Stroshane's exhibits from the California WaterFix Change Petition hearing website hosted by the State Water Resources Control Board to include them in the administrative record of the PEIR.

OPERATION OF PETITION FACILITIES WOULD INCREASE SAN JOAQUIN RIVER FLOW AS A WATER SOURCE IN THE DELTA, WOULD DEGRADE WATER QUALITY, AND WOULD INCREASE CAPACITY FOR CROSS-DELTA WATER TRANSFERS.

6. Generally, SWRCB acknowledges that water quality of the lower San Joaquin River (SJR) "has decreased markedly in recent decades and has generally coincided with SJR flow reductions, population growth, and expanded agricultural production. There are numerous water quality constituents in the SJR basin which can negatively impact fish and wildlife beneficial uses including: dissolved oxygen, salinity and boron, nutrients, trace metals, and pesticides [citations]." (RTD-104, p. 3-52- to 3-53, Section 3.7.6.) Parts of the San Joaquin Valley are also naturally contaminated with salts, selenium, total dissolved solids, and high levels of other toxic elements like boron, arsenic, and molybdenum. (RTD-171, Figures 5, and 8 through 12.)

7. In my Part 1B testimony for Restore the Delta, I described, using source water fingerprinting model results (from SWRCB 3 and SWRCB-4), how operations of Petition Facilities would increase the presence of Sacramento River water diverted from the North Delta intakes in water pumped at the State Water Project's (SWP) Banks and CVP's Jones pumping plants. This would reduce San Joaquin River as a source of water at Banks and, especially, at Jones pumping plants. Simultaneously, Petition Facilities would increase the presence in much of the rest of the Delta's channels of flows from the San Joaquin River. (RTD-10rev2, pp. 7-8, ¶23 through ¶25; RTD-130, pp. 60-61.) More recent source water fingerprinting model results for both Sacramento and San Joaquin Rivers in the Delta generally confirm these same effects on source waters in various Delta channel locations from operation of Petition Facilities. (SWRCB-102, pp. 8D-315 to 8D-360; summarized in RTD-156.)

8. It is my understanding that residence time of water is an estimate of the length of time that the same water molecules remain in a water body before flow, evaporation, or plant evapotranspiration removes them from that water body. In my Part 1B testimony, I summarized increases in water residence times for five Delta subregions using DSM-2 particle tracking studies. (RTD-10rev2, pp. 37-38, ¶114-115; SWRCB-102, p. 8-198, Table 8-60a; RTD-158, p. 59; RTD-130, p. 73; SWRCB-5, p. 5C.5.4-84, Table 5C.5.4-14.) It is my further understanding that residence time is critical because the longer water containing contaminants or other chemical stressors remains in the same general place, the greater potential there is for physical and hydrodynamic processes to facilitate toxic interactions of those contaminants with organisms in that water.

9. It is also my understanding that increased residence time of water can alter water quality by increasing water temperature, facilitating partitioning and bioavailability of selenium from the water column (allowing selenium to enter benthic food webs), and risking harmful algal blooms that can release cyanotoxins into Delta waters. Beneficial uses that can be impaired from such alterations include water contact recreation; native fish that feed on shellfish and other benthic invertebrates bioaccumulating selenium and other toxins; and commercial, recreational, and tribal and subsistence fishing and hunting uses, especially those that involve fish and wildlife predator species such as sturgeon and a number of diving ducks.

10. Under current hydrologic regimes, residence times of water in the south Delta and the North Bay can last from 16 days to three months during low flow, depending on levels of through-Delta discharge and mixing activity. In Suisun Bay, they may range from half a day in high flow to 35 days in low flow conditions. (RTD-159, p. 17.) Removal of Sacramento River flows from the north Delta will result in less overall fresh

water reaching western and central Delta channels, including through Georgiana Slough or via Delta Cross Channel.

11. In addition to these flow and water quality effects, it is my understanding that, based on evidence I present herein, Petition Facilities' operations would include conveyance of cross-Delta water transfers. Cross-Delta water transfers already occur through use of existing SWP and CVP facilities in the Delta. (SWRCB-4, Appendix 1E, p. 1E-1:33-38.) Water transfers are defined as follows:

> Water transfers involve a change in the place of water use, from the water's historic point of diversion and use, to a new location either within or outside the watershed of origin. Water may be transferred from one user to another for a variety of purposes, including agricultural, municipal and industrial uses. It may also be transferred for environmental purposes such as in-stream flow augmentation and wildlife refuges. Water transfers and exchanges can be temporary—either short-term (up to 1 year) or long-term (more than one year but not permanent) or permanent.

(SWRCB-4, Appendix 1E, p. 1E-1:13-18.)

12. Cross-Delta water transfers (water transfers) are regulated by type of transfer (e.g., reservoir deregulation, groundwater substitution, crop idling, crop shifting, water conservation); by D-1641; by the 2008 delta smelt biological opinion from the U.S. Fish and Wildlife Service (FWS); by the 2009 salmonid biological opinion from the National Marine Fisheries Service (NMFS); and various provisions of the California Water Code. (*Id.*, pp. 1E-2 to 1E-13.) The delta smelt biological opinion limits water transfers to the period July 1 through September 30 as a "window" during which delta smelt are not usually present at the south Delta export pumps.

13. Petitioners state that the maximum daily pumping rate is 6,680 cfs (cubic feet per second) over a three-day average (6,993 cfs as a one-day average) under a combination of a specific U.S. Army Corps of Engineers operating permit (SWRCB-98), D-1641, and the biological opinions. Under the Corps' permit, Petitioners state that Banks pumping plant in the SWP:

> can export an additional 500 cfs between July 1 and September 30, which can be used for the purpose of replacing Project export pumping foregone for the benefit of Delta fish species, making the summer limit effectively 7,180 cfs. The 500 cfs has been used to move a portion of the water provided under the Lower Yuba River Accord…in most years.

(*Id*., p. 1E-12:34:38.)

14. Petitioners have operated water purchase programs, the Environmental Water Account, and Yuba River Accord Transfers for many years now. (*Id.*, pp. 1E-13 to 1E-15.) Between 2008 and 2012, current facilities conveyed over 700 thousand acre-feet (TAF) for the Lower Yuba River Accord program. (SWRCB-4, Appendix 5C, p. 5C-13, Table 5C.-4.) Between 2001 and 2007, the Environmental Water Account Program saw 1,351 TAF of sales and exchange activity. (*Id.*, p. 5C-10, Table 5C-3.) Overall, statewide cross-Delta water transfers totaled 25,842 TAF between 1982 and

2011, of which 15,351 TAF were for short-term flows. (*Id.*, pp. 5C-4 to 5C-5, Table 5C-2.)

15. Water transfers may be "wheeled" at times when one project's pumping capacity is insufficient. "Wheeling" water occurs when one project's water—for example, deliveries to be made by CVP—is actually pumped from the Delta by the Banks pumping plant, then later exchanged through the Intertie back to the Delta-Mendota Canal or credited back to the CVP via storage accounting at San Luis Reservoir (where Petitioners jointly store water south of the Delta).

16. Petition Facilities would increase the capacity for and occurrence of cross-Delta water transfers, continuing, rather than reducing, reliance on the Delta for California's future water supply needs. They would also provide a longer window of time than is currently allowed during which transfers could occur under current biological opinion and water quality restrictions. (SWRCB-3, p. 4.3.1- 9:19-23.) Petitioners' environmental documents also state:

> As a result of avoiding those restrictions, transfer water could be moved at any time of the year that capacity exists in the combined cross-Delta channels, the new cross-Delta facility, and the export pumps, depending on operational and regulatory constraints, including criteria guiding the operation of water conveyance facilities under Alternative 4A.

(*Id.*, p. 4.3.1-9:23-26.) Identical language is provided for the Petition Facilities' other two RDEIR/SDEIS alternatives. (*Id.*, p. 4.4.1-9:12-19; p. 4.5.1-9:12-19.)

17. Petitioners' California WaterFix Final EIR/EIS similarly states:

> Due to the location of the new north Delta facilities, some of the restrictions relating to export of transfer water, including those related to Delta reverse flows or south Delta water levels and potential fisheries impacts (the basis for the current July through September transfer window) would not apply to the new facilities. Thus, transfer water could potentially be moved at any time of the year that capacity exists in the new cross-Delta facility and the export pumps, depending on operational and regulatory constraints. If the new north Delta facilities are not restricted to the current July through September transfer export window, crop idling or crop shifting-based transfers may become a more viable source of transfer water for much of the Sacramento Valley.

(SWRCB-102, p. 30-108:3-11.)

18. BDCP's purpose and need includes increasing the supply reliability of cross-Delta water transfers (i.e., from north of Delta to south of Delta locations) in drier and drought years. This is not disclosed in the Purpose and Need Statement of Chapter 2 in the EIR/EIS, nor in the Change Petition nor its addendum, where an electronic search for "water transfer" found no results for either document. (SWRCB-1; SWRCB-2.) The underlying purpose and need of BDCP and its North Delta Intake diversions is more fully disclosed in modeling results of EIR/EIS Chapter 5, Water Supply, and in accompanying analysis of water transfers in that chapter and related appendices.

19. With Petition Facilities in place, "wheeling" would originate further north along the Sacramento River at the North Delta Intakes, where export water quality would be better. BDCP Chapter 7, Implementation Structure, of the Bay Delta Conservation Plan

stated that "Reclamation will likely enter into an agreement with DWR to 'wheel' CVP water through a new conveyance facility." (SWRCB-5, p. 7-10:11-12.)

20. It is my understanding that Petition Facilities would increase overall capacity in wet or above normal years of contractual deliveries relative to current conditions and relative to the No Action Alternative (the future condition without Petition Facilities in place). In drier years, Petitioners expect there would be extra capacity in North Delta Intakes and Tunnels. (SWRCB-4, Chapter 5, p. 5-29:1-2; Appendix 5D, p. 5D-1:28-31, p. 5D-2:18-23, p. 5D-3:29-33.) In drier years, "contractual" supplies may be much less available. Consequently, contractors would still have what Petitioners refer to as "supplemental demand" for water. Analysis provided in Appendix 5D specifically assumes that "supplemental demand" for water transfers is triggered when SWP allocations go below 50 percent of Table A SWP contract amounts, and below 40 percent of total CVP total contract amounts. This assumption was based on observed correlations of contract allocations for SWP and CVP with water transfer activity:

> Comparing the years when cross-Delta transfer activity picks up with allocations, and considering Delta export constraints on transfers, SWP demand for cross-Delta transfers increases noticeably at allocations below 50 percent and CVP demand for cross-Delta transfers increases below 40 percent.

(SWRCB-4, Appendix 5D, p. 5D-3:29-33 and 5D-6:25-40 through 5D-8:1-11 .)

21. According to the *State Water Project Atlas*, additional pumping capacity is also available at SWP's Banks Pumping Plant in the Delta. "During [Banks'] construction (1963-1969) seven pumps were installed. In 1986, four more were added to divert and pump more water during the wet months to fill offstream storage reservoirs and groundwater basins south of the Delta to improve water supply reliability." (RTD-115, p. 80.) These additional pumps can facilitate more water transfer capacity in the SWP.

22. According to the *Atlas*, the four newer pumps have a combined capacity to pump 4,268 cfs. (*Id.*, p. 80, [indicating four pumps with 1,067 cfs pumping capacity each].) This capacity nearly matches that of the CVP's Jones Pumping Plant owned by Petitioner Bureau of Reclamation, which has a pumping capacity of about 4,600 cfs. At that pumping rate, the four extra pumps alone would provide a pumped export capacity of nearly 780,000 acre-feet during a three-month irrigating season by themselves.

23. Currently, the "Four Pumps Agreement" between Petitioner DWR and the California Department of Fish and Wildlife (CDFW) idles these four Banks Pumping Plant units so that SWP complies with both fishery mitigations for DFW and navigability limits under US Army Corps of Engineers Public Notice 5820A (from October 1981). (SWRCB-98.) This Agreement states that Notice 5820A "limits exports to the amount of water that can be diverted by the existing [seven] pumps, except during winter months when additional amounts can be diverted during high San Joaquin River flow periods." (RTD-1016, p. 4, Recital E.)

24. The EIR/EIS provides a "spreadsheet model" analysis in Appendix 5D identifying two potential water market volumes in periods of "supplemental demand," one of up to 600,000 acre-feet, and the other of up to 1 million acre-feet, each for single-year time spans. (SWRCB-4, Appendix 5D, p. 5D-8 to 5D-16.)

25. The BDCP EIR/EIS states that:

> Alternative 4 provides a separate cross-Delta facility with additional capacity to move transfer water from areas upstream of the Delta to export service areas and provides a longer transfer window than allowed under current regulatory constraints. In addition, the facility provides conveyance that would not be restricted by Delta reverse flow concerns or south Delta water level concerns. As a result of avoiding those restrictions, transfer water could be moved at any time of the year that capacity exists in the combined cross-Delta channels, the new cross-Delta facility and the export pumps, depending on operational regulatory constraints including BDCP permit terms discussed in Alternative 1A.

(*Id.*, p. 5-108:32-39.) The same is true of Alternative 4A (Petition Facilities), which replaced Alternative 4 as Petitioners' preferred alternative. The California Environmental Quality Act (CEQA) conclusion of the Recirculated Draft EIR/Supplemental Draft EIS on California WaterFix (CWF) states:

> Alternative 4A would increase water transfer demand compared to existing conditions. Alternative 4A would increase conveyance capacity, enabling additional cross-Delta water transfers that could lead to increases in Delta exports when compared to existing conditions.

(SWRCB-3, Section 4.3.1, p. 4.3.1-9:34-36.)

THE SAN FRANCISCO REGIONAL WATER QUALITY CONTROL BOARD (SFRWQCB) HAS DECLARED THE NORTHERN SAN FRANCISCO BAY, INCLUDING SUISUN BAY TO THE WESTERN DELTA, AS IMPAIRED FOR SELENIUM, AND CONSIDERS THAT CHANGES TO DELTA FLOW REGIMES WITH CALIFORNIA WATERFIX COULD LEAD TO GREATER SELENIUM LOADING AND BIOACCUMULATION IN IMPAIRED AREAS.

26. It is my testimony that operation of Petition Facilities would alter flows and degrade water quality resulting in unreasonable selenium contamination of beneficial uses estuarine habitat (EST), rare, threatened, or endangered species (RARE), wildlife habitat (WILD), commercial and sport fishing (COMM), and water contact recreation (REC-1). (SWRCB-27, pp, 8-9.)

27. Northern San Francisco Bay is presently impaired for selenium. The basis for impairment initially rested on bioaccumulation of selenium that triggered health advisories to local hunters cautioning against consumption of diving ducks, and elevated selenium concentrations exceeded levels associated with potential reproductive impacts to fish elsewhere. (SWRCB-45, p. 3 [November 18, 2015, report].) With the subsequent arrival to San Francisco Bay all the way to Suisun Bay in 1986 of a nonnative, invasive Asian clam, *P. amurensis*, even greater concern has emerged about selenium. (*Id.*) The SFRWQCB stated in its 2015 selenium total maximum daily load (TMDL) report:

> The introduction of the Asian clam (*Corbula amurensis*)[13] into the Bay in 1986 has exacerbated the bioaccumulation of selenium in benthic fish. This non-native clam is a prodigious filter-feeder, and, by consuming large quantities of selenium-laden particles, this exotic species provides a pathway for biotransformation of a considerable mass of selenium from the benthic food web to diving ducks and large fishes such as white sturgeon. The estimated selenium concentrations found in sturgeon's muscle sporadically exceed the draft United States Environmental Protection Agency…limit of 11.3 µg/g proposed for freshwater fish [citation]. Increased levels of selenium in the Bay-Delta have been suggested as a possible contributing factor to the observed decline of some key species (e.g., white sturgeon, Sacramento splittail, and diving ducks), and therefore these species are the main focus of the analyses in this report.

(*Id.*)

Selenium toxicity, sources, and partitioning

28. It is my understanding that selenium is necessary to the health of most vertebrate species, including humans, in small doses. For example, adequate amounts of selenium are found in a well-balanced human diet. But at just slightly elevated levels, selenium becomes poisonous. As ingested concentrations rise, selenium can cause embryonic defects, reproductive problems, and death in vertebrate animals. (RTD-178.)

29. It is my understanding that selenium can readily substitute for sulfur in salts (such as selenates for sulfates) in certain amino acids, the building blocks of proteins. (E.g., seleno-cysteine and seleno-methionine; *id*., p. 554-555; RTD-159, p. 40.) Selenium's ability to substitute chemically for sulfur clears pathways to toxicity, increased gene mutation, and ecological damage. (RTD-178.)

30. At higher tissue concentrations, proteins in predator species may be altered by excessive exposure to selenium, leading to sterility and suppression of the immune system "at critical development stages when rapid cell reproduction and morphogenic movement are occurring." (*Id.*, p. 555.) Changes in the structure of many antibodies (such as from substitution of selenium for sulfur atoms) can compromise the organism's immune defenses, making it more susceptible to disease. (*Id*.)

31. The western San Joaquin Valley and its Coast Range foothills have naturally high levels of selenium in the rocks and soils. (RTD-169; RTD-170.) Three areas of the western San Joaquin Valley have the highest soil selenium concentrations:

- The alluvial fans near Panoche and Cantua creeks in the central western valley (near Gustine and Firebaugh);
- An area west of the town of Lost Hills; and
- The Buena Vista Lake Bed Area, west of Bakersfield.

(RTD-170, p. 8, Figure 2.)

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[13] The scientific name for this nonnative invasive clam appears in various studies as either "*Potamcorbula*" *or* "*Corbula.*" In either usage, it is the same species. Except where quoted in context as here, my testimony applies "*Potamocorbula*" or "*P. amurensis*"to identify this clam.

32. Irrigation has played a key role in physical processes mobilizing selenium to the San Joaquin River, thence to the Delta:

> Prior to about 1940, groundwater moved toward valley stream channels, and much of the valley was a discharge area. By 1970, pumping for agriculture and other uses had drawn groundwater reservoirs down hundreds of feet. Importation of irrigation water (from rivers or from the [CVP]) together with continued overuse of groundwater means the Central Valley is now primarily a groundwater recharge area, and most groundwater discharge is a result of pumping rather than natural seepage. As a result, salts and selenium accrete in Central Valley soils, poisoning agricultural runoff water.

(RTD-165, p. 43.)

33. Because of the extent of the geologic formations and rocks containing selenium in the western San Joaquin Valley, it is important to recognize that at time scales relevant to society, "there are, for all practical purposes, unlimited reservoirs of selenium and salt stored within the aquifers and soils of the valley and upslope in the Coast Ranges." (RTD-172, p. 2) The selenium reservoir will be with Californians for a very long time to come—by one estimate, 304 to 2,828 years. (RTD-159, Appendix A, p. 111, Table 5.)

34. The National Research Council's 2012 report on Bay-Delta sustainable water management recognized this selenium reservoir as well, stating in part:

> A very large reservoir of selenium exists in the soils of the western San Joaquin Valley associated with the salts that accumulated there during decades of irrigation [citation]. Irrigation drainage, contaminated by selenium from those soils, is also accumulating in western San Joaquin Valley groundwaters. The problem is exacerbated by the recycling of the San Joaquin River when water is exported from the delta. While control of selenium releases has improved, how long those controls will be effective is not clear because of the selenium reservoir in groundwater.
>
> ...Other aspects of water management also could affect selenium contamination. For example, infrastructure changes in the delta such as construction of an isolated facility could result in the export of more Sacramento River water to the south, which would allow more selenium-rich San Joaquin River water to enter the bay. The solutions to selenium contamination must be found within the Central Valley and the risks from selenium to the bay are an important consideration in any infrastructure changes that affect how San Joaquin River water gets to the bay.

(RTD-168, p. 94.)

The invasive clam, *Potamocorbula amurensis*.

35. It is my understanding that the 1986 arrival of *Potamocorbula amurensis* (hereafter *P. amurensis*) has had a remarkable impact on the food webs and ecology of the San Francisco Bay and Delta. *P. amurensis* is a formidable clam. In Asian coastal Pacific waters, it ranges from latitude 53 degrees north to about 22 degrees north, from

cold temperate waters off Korea, Russia, and Japan to tropical waters off southern China. (RTD-173, p. 88.) *P. amurensis* adults tolerate salinity ranges of 2 to 30 parts per thousand. (SWRCB-5, Appendix 5.F, pp. 5.F-112 to 5.F-114.) It issues fertilized gametes in the early fall that are planktonic in open waters for up to three weeks. (RTD-174; SWRCB-5, *id*.)

36. Ranging in size up to about 25 mm (about 1 inch) in length, this clam overnight nearly replaced an established clam community in the Bay and Delta, including *Macoma balthica* and *Mya arenaria* (which dominated in Suisun Bay by the end of the 1976-1977 drought) and other species, some of which were themselves introduced to the estuary as early as the 1870s. (RTD-166, pp. 13-14; RTD-167, pp. 98-99.) Immediately prior to *P. amurensis*'s discovery in Suisun Bay in October 1986, a dry period benthic clam community led by *Macoma* and *Mya* was likely eliminated by high suspended sediment loads, scouring, and transport of bottom sediments from an extreme flood in February 1986.

> Thus, in mid-1986 when [*P. amurensis*] was introduced, presumably via ship ballast water [citation], the Suisun Bay region was inhabited by a depauperate benthic community. It is possible, therefore, that this species was initially successful because it exploited a naturally disturbed, sparsely occupied habitat rather than interjecting itself among and displacing existing species. If this is true. *P. amurensis* was acting, at least initially, as a colonizer rather than an invader [citation].

(RTD-167, p. 100; SWRCB-5, Appendix 5.F, p. 5.F-109.)

37. It is my understanding that in recent years, ecologists studying San Francisco Bay and Delta ecosystems may refer to invasive species like *P. amurensis* as "stressors"; that is, such species "stress" native or long-established Bay and Delta species by creating stiff competition for niches, consumption of food resources, and energy—the bases for reproductive advantage in ecology.[14] *P. amurensis* has had two important "stressor" roles: First, its consumption of plankton outcompetes native open water larval fish. Second, its physiology takes up bioavailable selenium and eliminates it only very slowly. The clam's shallow burial in sediments makes it easy prey, and its predators bioaccumulate the selenium it contains into their tissues. Both of these stressor impacts are directly related to flow and water quality changes that would result from operation of Petition Facilities.

***P. amurensis* grazing activity and its significance**

38. First, *P. amurensis*'s voracious feeding habits in shallow subtidal to open water have reduced planktonic food resources in the vicinity of the Bay-Delta's low salinity zone (LSZ), making it a suspect responsible for declines in planktonic food availability for listed native fish like larval stage delta smelt and longfin smelt. (RTD-183;

[14] For example, the Bay Delta Conservation Plan (BDCP), Appendix 5.F, included among biotic stressors on covered fish invasive vegetation, invasive mollusks (*P. amurensis* and *C. fluminea*), and *Microcystis*, a key cyanobacterium causing harmful algal blooms. (SWRCB-5.)

RTD-184; RTD-185; RTD-186; RTD-193, p. 4.) Its voraciousness and great fecundity generate highly dense colonies in much of Suisun Bay near the LSZ. (RTD-174, p. 1.)

39. The Bay Delta Conservation Plan (BDCP) described physiological tolerances for *P. amurensis*, including a side-by-side comparison with *Corbicula fluminea* (*C. fluminea*), a fresher-water invasive clam that also resides upstream in the Delta. *P. amurensis* tolerates saltier waters than *C. fluminea*, a similar range of temperatures, and hypoxic (i.e., low oxygen) conditions. (SWRCB-5, Appendix 5.F, p. 5.F-113, Table 5.F.7-1.) Salinities fluctuate in the Bay Delta Estuary, and *P. amurensis*'s larvae tolerate a wide salinity range. (*Id*., p. 5.F-112:36-38.) One study found that 2-hour-old embryos can tolerate salinities from 10 to 30 practical salinity units (psu) and by 24 hours they can tolerate the same salinities as can adult *P. amurensis*. (RTD-187, p. 377, 385.)

40. Analysis of California Department of Water Resources (DWR) benthic monitoring data from the Bay-Delta Estuary showed that benthic assemblage composition varied with salinity and hydrology (but was not associated with different substrate types). (RTD-188, p. 13 [Figure 8], p. 17 [Figure 9, showing lower benthic abundance after 1986], and p. 19; SWRCB-5, Appendix 5.F, p. 5.F-112.)

41. The Delta Regional Ecosystem Restoration Implementation Plan (DRERIP) conceptual model for Delta aquatic food webs indicates that salinity's importance to such clams is high, its predictability as an abiotic factor in their abundance and life history is moderately high, and scientists' understanding of these relationships is also moderately high. (RTD-189, Section 2.11.) It further notes that "[b]road shifts in salinity effectively determine the complementary ranges of these two bivalves, with [*P. amurensis*] residing primarily in marine to brackish water and [*C. fluminea*] in fresh water." (*Id.*)

42. It is my understanding that an ecological problem posed by these two nonnative clam species is that they graze the same relatively shallow open water column as larval delta smelt and longfin smelt. (*Id*.; RTD-188, comparing Figures 8 and 9 for comparative bivalve abundance for these two species in Grizzly Bay and Lower Sacramento River assemblages.) At typical North Bay densities, *P. amurensis* tends to occupy benthic sediments in Delta and Suisun Bay waters downstream of X2's position in fresher water areas where it can filter phytoplankton from the entire water column more than once per day in open water Delta channels and almost "13 times per day over shallow areas." *P. amurensis*'s filtration rate enables its consumption to exceed the phytoplankton growth rate in the Delta. (SWRCB-5, Appendix 5.F, p. 5.F-110:7-13; see also RTD-177.) *C. fluminea,* which tends to occupy benthic sediments in Delta and Suisun Bay waters upstream of X2's position[15], is considered to be less efficient than *P. amurensis* at filtering out shallow water bodies like Franks Tract. But *C. fluminea* can still "filter out the entire water column in less than a day." (SWRCB-5, Appendix 5.F, p. 5.F-111:18-25.)

43. It is my further understanding that the invasive clams' relative abundances and location are affected by changes in flow and water quality that affect their respective locations and abundances. BDCP applies this understanding to whether Fall X2 flows

[15] "X2 is defined as the horizontal distance in kilometers up the axis of the estuary from the Golden Gate Bridge to where the tidally averaged near-bottom salinity is 2 practical salinity units (psu). [citation] The position of X2 roughly equates to the center of the low salinity zone…." (SWRCB-25, p. 29.)

are provided as part of Conservation Measure 1 mitigations (the precursor to Petition Facilities):

> If Fall X2 [that is, higher fall Delta outflow to move X2 downstream in autumn months] is implemented...no change in suitable habitat for [*P. amurensis*] from water operations would occur. However, if Fall X2 is not implemented, X2 would occur more easterly than under [the Existing Conditions Scenario with Fall X2 implemented under the Delta smelt biological opinion], and therefore the suitable habitat for [*P. amurensis*] would be expanded in wet and above normal water years. Likewise, increased tidal habitat from restoration of tidal natural communities (CM4) may facilitate recruitment and expansion of [*P. amurensis*] if located in areas with salinity greater than 2 ppt. If this occurs, the foodweb benefits described [elsewhere in BDCP] may be reduced.

(SWRCB-5, Appendix 5.F, p. 5F-v:26-42.)

> [Also] if Fall X2 is not implemented, operations would comply with...Water Right Decision 1641 (D-1641) Delta outflow requirements. In that situation, outflow in wet and above normal years would be similar to [the Existing Conditions Scenario without Fall X2] in which X2 is more east than under [the Existing Conditions Scenario with Fall X2]. This situation may allow for [*P. amurensis*] to recruit farther into the Central Delta, and conversely, reduce habitat for [*C. fluminea*], which requires more freshwater conditions (<2 ppt). These invasive clams have the potential to reduce food production and export from Restoration Opportunity Areas (ROAs).

(*Id.*, Appendix 5.F, p. 5F-vi:1-14.)

44. BDCP sums up interrelationships of the *P. amurensis* and *C. fluminea* and their physical habitat tolerances this way:

> Thus, a long period of high flows may lead to increases in [*C. fluminea*] but limit [*P. amurensis*] juvenile success and increase adult mortality because of prolonged exposure to low salinities. However, if an extended period of high flows is followed by a dry year, higher than normal numbers of juvenile [*P. amurensis*] may be seen the following year as X2 moves upstream [citation].

(*Id.*, Appendix 5.F, p. 5.F-114:38-42; RTD-189, Section 2.11.)

45. It is my understanding that the analysis in BDCP of the potential efficacy of BDCP restoration efforts depended on understanding both invasive clams' tolerances of different flow and water quality regimes in the Bay-Delta Estuary. It has been shown already that, even factoring out climate change effects on flow and water quality, Petition Facilities' operations have the potential to reduce Delta outflows, increase residence times of water, and cause X2 (the zone in the Delta where salinity averages 2 psu) to migrate further east and upstream in the decades ahead. (RTD-149; RTD-150; RTD-130, p. 81, Figure 19.) As X2 moves east, planktonic food production in the LSZ would be fully consumed by *P. amurensis* (which would also spread eastward into the

Delta, particularly in drier, lower-flow years), turning the western Delta and Suisun into a zone of high nonnative invasive clam production at the cost of reduced plankton abundance. (RTD-180, p. 19; see also RTD-179, pp. 78-79, 82.)

46. As I stated earlier, *P. amurensis* is a formidable clam. Scientists developed a conceptual model for *P. amurensis* that states that prolonged high outflow events are required to reduce *P. amurensis*'s estuary-wide population over an extended period of time or even to shift the east edge of its range westward. (RTD-190, p. 21, p. 39, Figure 4.) It regularly produces larval, pelagic offspring twice a year, which can float upstream with tidal incursions and survive where their salinity ranges permit. (*Id.*, p. 40, Figure 5.) The DRERIP Conceptual Model for *P. amurensis* states:

> Increased outflow periods would need to be maintained for this to be a long term solution, as depauperate periods such as was seen in 2006 can be followed by an increase in the population size of [*P. amurensis*] during subsequent years with normal salinity distributions. Therefore, sustained reduction in grazing would require the water for controlled floods most if not all years.

(*Id.*, p. 21.)

47. BDCP concluded that its activities would result in moderate positive change to zooplankton abundance for larval longfin smelt, and low positive change to zooplankton abundance for juvenile longfin smelt, with low certainty for both. (SWRCB-5, Chapter 5, p. 5.5.2-13: 39-46, and p. 5.5.2-14: 1-4.) Filling the gap in knowledge represented by such low levels of certainty was deferred into the BDCP adaptive management program and, with the curtailment of BDCP in 2015, perhaps to the California WaterFix adaptive management program.

***P. amurensis* selenium bioaccumulation**

48. Selenium dissolved in water is the predominant form (ranging from 80 to 93 percent) of total selenium loading in the Bay Delta, but it represents only a small proportion of organismic exposures. (SWRCB-45, p. 81; RTD-159, p. 38.) Selenium can undergo "partitioning" reactions in a slowing water column through many types of interaction with phytoplankton, algae, and organic particles in suspension. (SWRCB-45, p. 81-83.) The rate and degree of partitioning determine whether and how much selenium remains dissolved or enters what chemists refer to as its "particulate phase." (RTD-159, p. 41; RTD-162.) This is the phase wherein selenium becomes bioavailable and may be taken up by aquatic organisms.

49. It is my understanding that increased residence time and increased SJR flows into the Delta due to north Delta diversions by Petition Facilities could also slow flow velocities because of decreased flows of Sacramento River water into the rest of the Delta. (RTD-163, p. 53.) Currently, SJR flows are mostly diverted at the south Delta CVP and SWP export pumps. (SWRCB-45, p. 94, 116; RTD-163, p. 53.) Along with two adopted TMDL regulations for the Grasslands Marsh area and the Lower San Joaquin River by the Central Valley Regional Water Quality Control Board, this presently helps limit selenium exposures in the Delta and Bay sourced from SJR flows. (RTD-191; RTD-192.)

50. Calm waters of marshes, wetlands, and estuaries facilitate selenium partitioning. Presser and Luoma catalog a range of hydrologic environments and how they influence selenium's partitioning behavior. (RTD-160, p. 692, Table 2, and 703, Figure 6**;** summarized in RTD-161, p. 26, Table 7.) This partitioning is expressed in modeling efforts as a "selenium partitioning factor," which varies with different aquatic environments and hydrologic conditions. (RTD-164, showing a variety of Bay-Delta Estuary K_d values in Supplemental Tables 8 through 10, 14 through 19.) Once selenium is consumed by prey organisms, predators can then bioaccumulate selenium depending on how much these prey are part of predator diets in higher trophic levels of Bay-Delta Estuary food webs. (RTD-159, pp. 41-94; RTD-160, pp. 689-705; RTD-163, pp. 21-24.)

51. As mentioned above, *P. amurensis*'s other "stressor" impact is to take bioavailable selenium into its tissues with high efficiency, and its metabolic elimination of selenium is slow. Consequently, *P. amurensis* specimens subject to high exposures of particulate selenium in their planktonic diet (such as through phytoplankton) will bioaccumulate large concentrations of selenium in their biomass. Seasonal variability in selenium contamination is important since measured selenium tissue concentrations were found to be highest in the fall, when Petition Facilities diversions may be highest with respect to Sacramento River inflows. (RTD-175, p. 62; RTD-176, p. 4525)

52. It is my understanding that *C. fluminea* prefers fresher water and so is found in some central and south Delta channels and upstream into lower San Joaquin River tributaries. (RTD-151.)

53. In one selenium ecological risk assessment, the best predictor of fish selenium concentrations derived from water column selenium concentrations is provided by a logarithmic function that lags fish tissue samples 1 to 7 months after the water column concentration is measured. (Correlation coefficient [R^2] equals 0.76; RTD-194, p. E.2-10.) The same assessment also found that selenium levels in aquatic invertebrates in these wetlands (including crayfish) "are broadly correlated with selenium concentrations in water." The correlation was strongest (R^2 equals 0.68; *id*.) when invertebrate selenium tissue concentrations were lagged 30 to 60 days after measurement of the water column selenium concentration. (*Id.*) It takes just a few weeks for selenium in the water column to become bioavailable through partitioning and deposition in sediments. It is my understanding that this is why residence time of selenium in the water body is so important to its fate and to selenium's toxicity in aquatic food webs.

54. It is my understanding that the Grassland Bypass Project has resulted in decreasing selenium loading to the surface channels of the Grassland marshes upstream of the Delta because this Project diverts selenium-laden agricultural drainage around the marshes before discharging this drainage into Mud Slough (north) downstream of the marshes but several miles upstream of its confluence with the San Joaquin River. This has resulted in improvements to protecting the beneficial uses within the Grassland marshes. (SWRCB-45.)

55. Mud Slough (north) on the west side, the lower San Joaquin River, and Suisun Bay are hydrologically connected, though at present much of San Joaquin River flows and their selenium loads are exported at Jones and Banks pumping plants. Rising selenium levels threaten various vertebrate species, including salmon, white sturgeon, green sturgeon, and migratory birds that feed on benthic organisms like clams and

worms burrowing through sediments where selenium collects. (RTD-164, p. 10.) Selenium concentrations in subsurface drain water in the central area of the San Joaquin River Basin (which includes tile drains in the vicinity of Mud Slough) exceed U.S. Environmental Protection Agency (EPA) aquatic selenium criterion for rivers and streams by 8 to 29 times (depending on whether the arithmetic or geometric mean is compared); by 21 to 73 times the aquatic criterion for wetlands in California, and by 84 to 292 times, the level recommended as non-toxic in animal tissues by the US Geological Survey in recent research. (RTD-181, p. 27, Table 13; RTD-182.) This is the reservoir of selenium toxicity draining from the central area's agricultural return flow drainage water potentially reaching the SJR, and thence to the Delta.

56. Because of findings that both *P. amurensis* and *C. fluminea* can bioaccumulate selenium significantly, benthic food predator fish like green sturgeon and predator birds like greater and lesser scaup and surf and black scoters are at risk of elevated selenium exposure and contamination given selenium loading forecasted projections. (RTD-159, p. 93, Table 33; RTD-160; RTD-164.) Both green and white sturgeon are migratory fish, while scaups and scoters are migratory estuary-based water birds that dive to prey on clams and other bottom-dwelling organisms.

Restore the Delta recommends denial of the Change Petition, but offers permit conditions for Petitioners' water rights permits.

57. The San Francisco Bay Regional Water Quality Control Board (Region 2) approved a TMDL regulation for selenium in November 2015. (SWRCB-45.) The TMDL for selenium is set at 5,300 kilograms of Total Selenium per year (kg/year), which also represents the existing selenium load to the Bay. Selenium load allocations within the TMDL for petroleum refineries, municipal and industrial sources, local tributaries, and atmospheric deposition account for only about 23 percent of total selenium loading to North San Francisco Bay (which includes the western Delta and Suisun Bay). (SWRCB-45, p., 105, Table 24.) The remaining 4,070 kg/year of selenium loading comes from Central Valley sources, of which over 80 percent is dissolved selenium and about 770 kg/year is in particulate form. The Region 2 TMDL does not directly disclose loading from the Sacramento and San Joaquin rivers separately, but it acknowledges that, "[w]hile concentrations of selenium in Sacramento are the lowest in the region, the San Joaquin River concentrations are up to an order of magnitude higher." (*Id.*, p. 114.) One research paper found the average concentration of total dissolved selenium was 0.91 ± 0.27 nano-moles (nmol) per liter in the Sacramento River at Freeport, 8.6 ± 2.5 nmol per liter in the San Joaquin River at Vernalis, and negligible in in-Delta agricultural return water. (RTD-157, p. 4, Table 1.)

58. The Region 2 TMDL further acknowledges that selenium loads from the San Joaquin River to the North Bay may change "if there are increases in the flow of San Joaquin River water to restore beneficial uses and maintain fish populations." (SWRCB-45, p. 116.) The Region 2 TMDL adds that "if there is no continued reduction of San Joaquin River flow due to the State Water Project operations and other upstream diversions, the loads from San Joaquin River may increase." (*Id.*, p. 94.) Currently, as mentioned earlier, the San Joaquin River's selenium loads are

"partially reduced because of diversions of San Joaquin River water" by the Banks and Jones pumping plants before they reach the Northern San Francisco Bay Estuary. (*Id*.)

59. It is my testimony that Restore the Delta recommends denial of the Change Petition by the SWRCB. In the event that the SWRCB chooses instead to approve the Change Petition, we request that the Board consider the following permit conditions relating to potential for increased selenium contamination with operation of Petition Facilities.

60. Extensive, permanent monitoring for selenium loading and concentrations should be included in Change Petition permit conditions. These conditions should include:

- Bird egg monitoring, analysis, evaluation, and quarterly reporting to SWRCB and interested parties.
- Sturgeon muscle plug sampling, analysis, evaluation, and quarterly reporting to SWRCB and interested parties.
- Fin ray sampling from sturgeon and other North San Francisco Bay fish, with analysis, evaluation, and quarterly reporting to SWRCB and interested parties. (SWRCB-45, pp. 117-118.)
- In the event that Sacramento River flows decrease with Petition Facilities' operations relative to San Joaquin River source water entering and flowing through Delta channels, prohibit as an unreasonable use of water application of Sacramento River Basin irrigation supplies on SWP and CVP service area lands high in soil selenium and experiencing high water tables and return flows to the San Joaquin River with significant selenium concentrations. Restore the Delta recognizes it is not possible to assess this presently, but permit conditions for the Change Petition should include a program to identify likely flow thresholds for Sacramento and San Joaquin River inflow and San Francisco Bay tidal exchange, using ecosystem risk methodologies for Delta channels to identify potential flow and export conditions when risks from selenium contamination to Delta ecosystems rise in a hydraulic regime involving Petition Facilities' operations.
- Selenium goes unmentioned in Petition Facilities-related descriptions of the Change Petition's adaptive management framework. (SWRCB-104, Appendix 3.H; SWRCB-106, Appendix A.2.) This omission is unacceptable to Restore the Delta. It is my testimony that SWRCB should further condition the Change Petition to include in its adaptive management research scope and framework a module or element that addresses key research, monitoring, analysis, and evaluation questions concerning selenium in San Joaquin River source water to the Delta as well as its flow timing, magnitude and volume; distribution; partitioning and bioavailability; and pathways into Delta and North San Francisco Bay food webs.

<u>Impacts of CSO Amendments on Giant Garter Snake</u>

Mr. Stroshane's excerpted testimony continues with discussion of potential conveyance impacts to giant garter snake.

REDUCTION OF FLOW, INCREASED RESIDENCE TIME OF WATER, AND DEGRADED WATER QUALITY BY PETITION FACILITIES, AS WELL AS

INCREASED WATER TRANSFERS WILL CAUSE UNREASONABLE ADVERSE EFFECTS TO GIANT GARTER SNAKE HABITAT IN THE DELTA.

61. It is my understanding that the giant garter snake (GGS, *Thamnophis gigas*) is listed as a threatened species under both the federal Endangered Species Act (ESA) and California Endangered Species Act. (CESA). (RTD-196, p. 54060; RTD-197, PDF pages 19-20.) Its threatened status is due primarily to loss, degradation, and fragmentation of wetland habitat due to conversion of wetlands throughout the Central Valley to agricultural and urban and industrial development. (RTD-197, PDF page 19.) Biologists estimate that 90 to 95 percent of its suitable habitat has been lost. (*Id.*; SWRCB-5, p. 2A.28-9; RTD-198, p. iii.) The BDCP includes among GGS stressors habitat loss and fragmentation, predation, selenium contamination, and impaired water quality. (SWRCB-5, p. 2A.28-10.)

62. GGS uses habitat in the Delta. Historically, GGS inhabited fresh water marshes, streams, and wetlands throughout the Sacramento and San Joaquin Valleys in central California. (RTD-198, p. iii.) The U.S. Fish and Wildlife Service (USFWS) currently recognizes nine (9) populations in its recently approved recovery plan, though when it was first listed as threatened in 1993, the agency recognized 13 populations. (RTD-196, p. 54054, column 2.) The reduction in recognized populations resulted from extirpation of two populations, while genetic research indicated it was appropriate to group together some of the populations. (RTD-198, pp. I-10 to I-11, Table 4.)

63. GGS is dormant in winter, often brumating (i.e., reptilian hibernating) from late October through early March in abandoned muskrat, crayfish, or ground squirrel burrows with sunny south- or west-facing aspects that are usually well above high water lines to avoid flood waters. (RTD-199, p. 6.) When active during spring, summer, and warm early fall months, GGS prefers aquatic habitat with a mud bottom, especially marshes and sloughs (there are many of the latter in the Delta). In these locations it prefers vegetation such as tules and cattails that provide cover, with broken tules providing basking sites that also allow ready escape from predators into water below. GGS prefers slow moving water and “is notably absent from large rivers or bodies of water with little vegetation.” (*Id.*, pp. 5-6.)

64. With the loss of native wetland and marsh habitat, it is my understanding GGS has made do in the extensive rice fields of the Sacramento Valley and where rice is cultivated elsewhere in the Central Valley, including Yolo Bypass. In these areas, GGS occupies the inter-webbed irrigation and drainage ditches and canals, where it hunts tadpoles of frogs and toads, and small fish, including introduced species like common carp, western mosquitofish, and all life stages of American bullfrogs. (RTD-196, p. 54054.) The USFWS Recovery Plan states that GGS individuals capture all their food from water. (RTD-198, p. I-6.) Biologists believe that in nocturnal hunting, GGS may use its sense of touch to locate small fish. (RTD-199, p. 11.) They also acknowledged that, “[m]any questions remain regarding the innate prey preferences and prey selection of [GGS], particularly given the highly altered prey communities on which they now depend.” (*Id*.) GGS is preyed on by a number of native mammals and birds, including raccoons, striped skunks, otters, hawks, great egrets, American bitterns, and great blue herons. (RTD-198, p. I-6; RTD-199, p. 11.) The introduced American bullfrog is believed to prey on GGS neonates (young snakes) and consequently “likely

take a large toll" on GGS, taking an estimated 22 percent of annual GGS production. (RTD-199, p. 12.) GGS defends itself through stealth and by taking refuge in burrows and decaying piles of vegetation and can drop into water as a predator approaches within 15 feet. It can also thrash, excrete musk, feces, and uric acid, and inflict bites on its attackers as defense tactics. (*Id.*)

65. The 2017 Recovery Plan for GGS by USFWS states that the list of threats to GGS changed since its original listing in 1993. (RTD-198-p., I-11; RTD-1000, "Five-Factor Analysis," pp. 17-42.) The current list of threats includes habitat loss and fragmentation due to urbanization and changes in levels and methods of rice production, but USFWS also identifies additional threats as including changes in water availability; levee and canal maintenance (due to removal of vegetative cover); water management and water deliveries that do not account for GGS; water transfers (resulting in cropland idling or shifting, reservoir releases, or groundwater substitution); the species' small populations; and invasive aquatic species. (RTD-198, p. I-12.) GGS was recommended for continued threatened status in USFWS's 2012 5-year review due to continuing loss and fragmentation of habitat from urbanization and loss of rice production. This habitat condition contributes to GGS populations' isolation from one another and from suitable habitat in the Central Valley, such as occurs in the Delta, which may or may not be occupied by GGS. Such habitat fragmentation means the species lacks safe corridors by which to reach and use suitable habitat within its range. (RTD-199, p. 6.) A habitat conceptual model found that habitat quality plays a central role in the population ecology of GGS, affecting growth, survival, and fecundity indirectly through its influence on prey availability. (*Id.*, p. 24.) Habitat quality is itself "strongly and directly affected by other variables," including water and refuge availability and emergent vegetation (up to a point when over-dense vegetation hampers GGS mobility). (*Id*.) On the other hand, floating vegetation, submerged vegetation, linear waterways, and scouring floods are seen in the conceptual model as having negative effects for GGS habitat quality. (*Id*.)

66. On May 7, 2015, an individual GGS was sighted on Bradford Island by Anna Swenson and Karen Smith Cunningham, close to the north anchorage of the False River barrier that Petitioner DWR was installing to regulate tidal flow into the western Delta during the last drought. (RTD-1001.) As stated by Barbara Barrigan-Parrilla to the SWRCB at its May 20, 2015, public workshop on drought emergency measures, Ms. Swenson and Ms. Smith Cunningham reported the sighting of the GGS to the California Department of Fish and Wildlife on May 8, 2015, but did not hear back from the agency. (RTD-1002, slides 5 through 8; RTD-1003, Part 6, video minutes 22:26 to 30:17.)

67. It is my understanding that, for biologists studying GGS, much remains unknown about the species due to its sparse population, low detection probabilities, relatively short period of annual activity, stealthy behavior, and preference for vegetative or aquatic cover. (RTD-199, pp. 4 [regarding low detection probabilities], 7 [regarding habitat selection], 11 [regarding prey selection among native versus introduced prey species], 13 [regarding GGS demographic rates, survival of subadult and male GGS too small for radio telemetry tracking, and survival rates of neonate GGS individuals].)

68. The primary strategy of the 2017 GGS Recovery Plan is to protect existing occupied habitat, identifying and protecting areas for habitat restoration, enhancement, or creation, including corridors between habitat locations that provide connectivity that

GGS individuals could colonize. It also calls for maintaining and protecting existing populations. (RTD-198, p. II-1.) It further states that "an essential part of the management of habitat for giant garter snakes is to ensure that sufficient clean water is available to provide adequate aquatic habitat during the summer active season." (*Id*.) The 2017 GGS Recovery Plan states that further research is needed:

> on the ecology, behavior and life history of the giant garter snake…to further define specific recovery tasks, management needs and goals, help assess threats and determine best methods to eliminate or ameliorate the threats, and to analyze aspects of population viability.
>
> (*Id*.)

69. It is my understanding that selenium contamination and impaired water quality have been identified as threats to GGS and contribute to its decline, in addition to habitat loss and fragmentation. (RTD-1000, p. 37.) High levels of selenium contamination have been documented in biota from at least six major canals and water courses in the Grassland Ecological Area of the western San Joaquin Valley where GGS has historically lived. (*Id*.) The USFWS acknowledges that knowledge of how and whether selenium contamination affects GGS is uncertain. (RTD-1000, p. 38.) Studies of similar aquatic snakes found that they accumulate selenium from ingesting seleniferous prey and the resulting contamination can result in maternal transfer of potentially toxic quantities of selenium to offspring and in higher rates of metabolic activity than snakes from uncontaminated sites. (RTD-1000, pp. 38-39.) USFWS also states that, "various selenium and mercury interactions (additive, synergistic, and antagonistic) are known to occur in many organisms including humans" and noted that the potential for such complex interactions to occur in GGS and its habitat in the Grassland Ecological Area is of concern and warrants study. (*Id.*)

70. USFWS also found that toxic levels of environmental contaminants such as sodium sulfate, mercury, pesticides, and herbicides may reduce populations of aquatic prey—the small tadpoles of frogs and toads and small fish—upon which GGS relies for food. (RTD-1000, p. 39.)

71. It is my testimony that Restore the Delta is concerned that increased contributions of selenium loading with increased source waters from the San Joaquin River, as I discussed herein earlier, could increase potential selenium uptake in GGS individuals through as yet unknown food web pathways. It is my understanding from researching GGS for this testimony that more scientific research is needed in this area.

72. It is also my testimony that harmful algal blooms are anticipated to increase with both climate change and reduced through-flow of water in the Delta during summer months. Petition Facilities would also reduce Delta flows, particularly along the Sacramento River and associated sloughs in the north Delta. Algal blooms tend to form in slow-moving bodies of water where irradiance increases water temperatures. They also can form in the presence of abundant nutrients like nitrogen and phosphorus. It is my testimony that with increased water residence time in various parts of the Delta where suitable GGS habitat exists—the small sloughs and/or marshes where slow-moving water persists—may also be water bodies and locations where harmful algal blooms can occur over the summer. Harmful algal blooms can contain the cyanobacterium *Microcystis*, which manufactures a powerful neurotoxin, microcystin.

When ingested by fish or other animals, severe illness and death can ensue; microcystin could result in illness and death of GGS individuals that reside in the Delta. (RTD-236; RTD-237.)

73. As stated herein, GGS relies to a great extent on fresh water marsh and riceland habitat in the Delta and elsewhere in the Central Valley. The California Department of Fish and Game (CDFG) Quantitative Biological Objectives Report (DFG QBO Report) stated as one of its biological goals to contribute to the recovery of GGS. (RTD-1005, p. 18.) The report further recommended protection of existing populations and habitat of GGS within the Delta, and that suitable habitat areas adjacent to known populations should be restored, enhanced, and managed to encourage natural expansion of GGS. (*Id.*, p. 99.)

74. Restore the Delta continues to recommend denial of the Change Petition. But in the event that the SWRCB approves the Change Petition, and in so doing indirectly authorizes increased water transfer activity, we recommend conditions be placed on the Petitioners' permits that help implement GGS protection in the Legal Delta through the 2017 GGS Recovery Plan. (RTD-198.) This would mean requiring funding, expertise, and land purchases by Petitioners reflecting "block pairings" of habitat favored by GGS as described in the 2017 GGS Recovery Plan. (*Id.*, p. II-15.) Those block pairings attempt to take advantage of adjacency of perennial wetland habitat and contiguous active rice lands, and to create wildlife corridors between blocks. (Id.) Petitioners' commitments should be applied in the portions of the Yolo Basin, Cosumnes-Mokelumne Basin, and Delta Basin recovery units identified in the 2017 GGS Recovery Plan that overlap with the Legal Delta. (*Id.*, pp. II-8 through II-11, Figures 8, 9, and 10.) Opportunities for habitat connectivity and suitability exist and should include Stone Lakes National Wildlife Refuge and other publicly owned lands throughout the Legal Delta. (*Id.*, pp. II-16 through II-18.)

75. Change Petition permit conditions must also require Petitioners to improve water quality in habitat suitable for GGS but affected by poor water quality conditions by determining which water bodies are impaired and are occupied by GGS in the Delta, and ensure summer water is available for wetland habitats used by GGS. (*Id.*, p. III-2 to III-3.)

76. Change Petition permit conditions must also require Petitioners to include in their adaptive management, monitoring, and research program scopes the requirement to monitor population and habitat to assess success or failure of management activities and habitat protection efforts (including reintroduction of GGS within suitable Delta habitat); to conduct surveys and research to identify areas requiring protection and management using habitat suitability analysis appropriate for GGS; and to conduct research focused on the management needs of GGS and on identifying and removing specific threats to GGS within the Delta. (*Id.*, pp. III-3 through III-6.)

77. The 2017 GGS Recovery Plan identifies a cost range for plan implementation of between $17.3 million to over $116 million "plus additional costs to be determined." (*Id.*, p. iv.) Change Petition permit conditions must require Petitioners to provide their fair share of Recovery Plan costs (including costs remaining to be identified by plan implementation). Additional costs for which Petitioners should be responsible should include purchase of land or easements in GGS core areas and corridors linking such areas; restoration costs; and development and implementation of

deliberately experimental adaptive management plans as outlined in the 2017 GGS Recovery Plan. Petitioners should also be required to be active partners in the overall conservation and recovery of GGS. (*Id.*, p. iv.)

<u>Fish Screens and Impacts to Special Status Fish</u>

There are only a few references in the PEIR to fish screens, largely in passing mention of features of an "example" conveyance project like California Waterfix. Mr. Stroshane's testimony excerpted below expresses Restore the Delta's concerns about fish screens with respect to such an example project.

Fish screens proposed to mitigate unavoidable impacts to listed fish species have high uncertainty of success.

78. In this section of my testimony I contend that the fish screens proposed for north Delta diversion points would not function as claimed. In so contending, I do not represent myself as an expert on fish screen criteria, engineering, design, construction, operation, monitoring, or evaluation. Nonetheless, within my expertise as an interdisciplinary researcher and urban and environmental planner, I have reviewed technical and environmental documentation and offer evidence and testimony to this effect based on my review.

79. Key to the talking points and mitigation approach of Petition Facilities for addressing direct, in-river impacts of the three north Delta intakes between Courtland and Clarksburg along the lower Sacramento River is the placement and operation of fish screens before the aperture of each intake structure. California WaterFix (i.e., Petition Facilities') promotional descriptions and illustrations acknowledge risks of both flow velocities and predation of covered (and listed) fish as they pass screens of the Petition Facilities' north Delta intakes. (RTD-1025, p. 3, "1. North Delta Diversions.") The illustration of fish screens in this exhibit is not to scale and is therefore misleading because juvenile salmonids (4 to 8 inches) and small delta and longfin smelt (2 to 4 inches) would be tiny compared with fish screens at least 10 to 20 feet high and thousands of feet long.

80. Neither scaled illustrations nor engineered drawings of north Delta intake fish screens are provided in the Draft EIR/EIS or the RDEIR/SDEIS. The RDEIR/SDEIS describes water conveyance from the north Delta to the south Delta through the Tunnels Project. "Water would be diverted from the Sacramento River through three fish-screened intakes on the east bank of the Sacramento River between Clarksburg and Courtland." (SWRCB-3, Section 3, "Conveyance Facility Modifications to Alternative 4," p. 3-2.) For the new sub-alternatives, the RDEIR/SDEIS states: "...implementing a dual conveyance system would align water operations to better reflect natural seasonal flow patterns by creating new water diversions in the north Delta equipped with state-of-the-art fish screens, thus reducing reliance on south Delta exports." (SWRCB-3, Section 4.1, p. 4.1-1 to 4.1-2.)

81. The 2011 *BDCP Fish Facilities Technical Team Technical Memorandum* observed that, "[t]here is a high level of uncertainty as to the type and magnitude of impacts that these new diversions will have on covered fish species that occur within

the proposed diversion reach." (DWR-219, p. 33.) The proposed screens are experimental and have never been employed anywhere else. Their size (multiple, very large, and in close proximity), type (on-bank flat plate), and tidally influenced location make it almost impossible to conform to existing screening criteria. (*Id.*, pp. 22, 33.) Even with a required variance from existing DFW and NMFS fish screening criteria, enormous uncertainties would remain, which is why the technical team suggested phased construction to see if the first one works before constructing the rest. (*Id*., pp. 35, 36.) Part of the problem is that delta smelt can be present at the diversion points during the months of February through June, and no screens can prevent entrainment of larval delta smelt, longfin smelt, Sacramento splittail, and smaller lamprey ammocoetes and adults. (SWRCB-5, pp. 5.B-viii to 5.B-ix, Table 5.B.0-2.)

82. Fish screen descriptions indicate they would exclude fish greater than 20 millimeters (mm) in length (nearly one inch) from being scooped up by diversions, but there is no mention in any of the intake descriptions of BDCP, the Draft EIR/EIS or the RDEIR/SDEIS what happens to fish, larvae and eggs that are 20 mm in size or smaller.

83. The fish screens are assumed to be in place as part of applying north Delta bypass flows in Tunnels Project operational criteria for each of Alternatives 4A (the preferred alternative), 2D, and 5A:

> The objectives of the north Delta diversion bypass flow criteria include regulation of flows to 1) maintain fish screen sweeping velocities; 2) reduce upstream transport from downstream channels in the channels downstream of the intakes [that is, reduce "reverse flows" in the lower Sacramento and its various distributaries]; 3) support salmonid and pelagic fish transport and migration to regions of suitable habitat; 4) reduce losses to predation downstream of the diversions; and 5) maintain or improve rearing habitat conditions in the north Delta.

(SWRCB-3, Section 4.1, p. 4.1-11.)

84. CDFW and NMFS put forward design criteria for fish screens. (RTD-1021; RTD-1022.) Two vectors of flow shape their criteria: approach and sweeping velocity. RTD-1023 compares these agencies' fish screen design criteria with BDCP/Tunnels Project approach to fish screen design criteria. (RTD-1023.)

85. Petitioner DWR's *Conceptual Engineering Report* (*CER*) summarizes current Petition Facilities' fish screens. (DWR-212.) Proposed fish screens for the north Delta intakes are intended to be "self-cleaning." According to the *CER*, they will consist of gear motors with variable speed control; one cleaning system per screen bay group. The capacity of a screen-bay group is 500 cfs, so there are six such screen bay groups per 3000 cfs intake. Therefore there will be six motorized cleaning systems per intake. Each cleaning system will traverse its screen bay at a rate of 0.5 to 2 feet per second (120 feet per minute or 1.4 miles per hour). Each cleaning cycle is estimated to take 5 minutes, maximum. (*Id.*, pp. 6-4 through 6-6, Table 6-2.)

86. Debris removal and "biofouling" can create difficulties for the fish screens, however. "Cleaning frequency depends on the debris load," states the *CER*. Daily checks of intake screen clean functionality must be performed. (*Id*. p. 6-17.) Biofouling has troubling aspects as well, according to the *CER*:

> Biofouling, the accumulation of algae, freshwater sponge, Asian clams, mussels, and other biological organisms, can occlude the screens and jeopardize function. A key design provision for intake facilities is that all mechanical elements can be moved to the top surface for inspection, cleaning, and repairs. The intake facilities have top-side gantry crane systems for removal and insertion of screen panels, tuning baffle assemblies, and bulkheads.
>
> All panels will require removal for pressure washing. Additionally, screen bay groups will require dewatering for inspection and assessment of biofoul growth rates.
>
> With the invasion of Quagga and Zebra mussels into inland waters, screen and bay washing will increase. Coatings and other deterrents will be more thoroughly investigated during preliminary and final design.

(*Id*.) The *CER* anticipates that a

> log boom system will be aligned within the river alongside the intake structure to protect the fish screens and their cleaning systems from damage by large floating debris. Spare parts for vulnerable portions of the intake structure should be available to minimize downtime should repairs be needed. With the majority of working components being submerged and with security provisions in place, vandalism damage is not expected to be significant.

(*Id*., p. 6-18.)

87. No estimate is provided in the CER for how often and how long individual screens must be hoisted from the river for cleaning. Such maintenance would force temporary shutdown of at least that portion of the screened intake. This could cause either loss of screening capability while diversions continued, or interrupt diversions while the screens were cleaned. In either case, it imposes risks to fish or to water diversions.

88. Petitioners allege that benefits of fish screens would offset significant impacts to listed fish species and non-covered fish species that would be expected to encounter the north Delta intakes and their screened entrances. The alleged mitigation begins with the Tunnels Project's approach to adaptive management:

> Specifically, collaborative science and adaptive management will, as appropriate, develop and use new information and insight gained during the course of project construction and operation to inform and improve: . . . the design of fish facilities including the intake fish screens.

(SWRCB-3, Section 4.1.2.4, *Collaborative Science and Adaptive Management Program*, p. 4.1-18, lines 28-31; see also Section 4.1.3.1, p. 4.1-29 for Alternative 2D and Section 4.1.4.1, p. 4.1-36 for Alternative 5A.)

89. This statement demonstrates no confirmed, certain, nor effective mitigation to protect fish in the design of intake fish screens. Petitioners wish to build the intakes with

screens, then improve the screens via adaptive management. However, “as appropriate” is not a definite course of action; it means “whatever we think is best for the project.”

> The collaborative science process will also inform the design and construction of the fish screens on the new intakes. This requires active study to maximize water supply, ensure flexibility in their design and operation, and minimize effects to covered species.

(*Id.*, p. 4.1-20, lines 4-6.)

90. The collaborative science process assumes north Delta intakes with fish screens are built first, then studied. It is not a mitigation program because it allows the fish screens to go forward with no demonstration that impacts to fish would be avoided, minimized, or mitigated. It employs adaptive management in the service of building and operating massive intake structures in the presence of listed fish species and asking California and decision makers to trust Petitioners to solve problems of proper water flow vector velocities and routinized screen cleaning and maintenance, while ignoring consideration of whether the project achieves the Delta Reform Act's coequal goals and reduced Delta reliance policy and complies with the state's reasonable use and public trust doctrines.

91. This “wild card” application of adaptive management to fish screen deployment is applied throughout the Petitioners' treatment of impacts to Delta smelt, longfin smelt, winter-run Chinook salmon, spring-run Chinook salmon, and Central Valley steelhead. The “wild card” fish screens are also applied to non-listed native and non-native species that would also be vulnerable to impingement, entrainment, injury, and death from the north Delta intakes. For winter-run Chinook salmon:

> State-of-the art [footnote] fish screens operated with an adaptive management plan would be expected to eliminate entrainment and impingement risk for juvenile winter-run Chinook salmon.
>
> [Footnote] The fish screens would be state of the art by incorporating the best available technology and operating to fishery agency standards of protection for fishes.

(*Id.*, Section 4.3.7, p. 4.3.7-48, lines 13-15.)

92. Petitioners acknowledge:

> For the purposes of this EIR/EIS, it is assumed that the fish screens would be designed to meet delta smelt criteria, which requires 5 square feet per cfs [cubic feet per second or 5 feet per second]. The fish screen sizes, like the individual intake sizes, would vary depending on intake location and would range from 10 to 22 feet in height and from 915 to 1,935 feet in length. It is anticipated that the screen cleaning system would include several traveling brush cleaning systems installed on the waterside of the intake. As an alternative to the fixed screen panel and brushing system, a traveling screen system with a screen belt and stationary brush/water jet system could be used.

(SWRCB-4, p. 3-87, lines 16-22.)

93. These passages indicate, despite their technological and scientific optimism, that the screens are unproven, experimental, and very much a work in progress.

94. Petitioners conclude that "[p]otential entrainment and impingement risks at the proposed north Delta facilities would be limited because it is outside the main range of delta smelt....The intakes would be screened and would exclude delta smelt of around 22 mm and larger." (SWRCB-3, p. 4.3.7-24, lines 4-7.) This conclusion is speculative. As with last year's Draft EIR/EIS, BDCP did not model and disclose results estimating entrainment and impingement risks for delta smelt at the north Delta intakes to buttress this claim. Table 11-4A-1 presents modeling results of "proportional entrainment . . . of Delta Smelt at SWP/CVP South Delta Facilities for Alternative 4A. . . ." No other such table is presented for entrainment risk at north Delta intakes. This is also true of Alternatives 2D and 5A. (*Id*., Section 4.4.7, Table 11-2D-1, p. 4.4.7-3, and Section 4.5.7, Table 11-5A-1, p. 4.5.7-4.)

95. In comments to the Delta Stewardship Council, the Delta Independent Science Board stated:

> It is unclear how (and how well) the fish screens would work. The description of fish screens indicates that fish >20 mm are excluded, but what about fish and larvae that are <20 mm, as well as eggs?...some fish screens appear to have been installed, but data on their effects are not given. Despite the lack of specific data on how well screens function, the conclusion that there will be no significant impact is stated as certain [citation].
>
> Here, as in many other places, measures are assumed to function as planned, with no evidence to support the assumptions. The level of certainty seems optimistic, and it is unclear whether there are any contingency plans in case things don't work out as planned. This problem persists from the Previous Draft.

(RTD-1024, p. 17.)

96. Assuming delta smelt-friendly design parameters does not mean those parameters are known or have been incorporated into a specific design that would perform as assumed. This passage does not explain where the delta smelt fish screen criterion comes from. Nor is it consistent with NMFS or CDFW criteria. (RTD-1021; RTD-1022; RTD-1023.) North Delta intake fish screen designs likely do not comply with CDFW and NMFS criteria error relative to fish designs. North Delta bypass flow operational criteria may not be sufficiently protective, even just as modeling assumptions.

97. Fish screens "do affect or impact river flow," states the DWR engineering solutions report drafted for compliance with the 2009 NMFS salmonid biological opinion.

> A large amount of system structure would be placed into the water, thus potentially affecting local and regional hydraulic patterns. Another disadvantage...is the potential for debris accumulation. Debris may obstruct or damage parts of the screen, which potentially could lead to minimizing the effectiveness of the system. Therefore, CDFW and NMFS screening criteria may

> not always be met. Debris issues would require constant monitoring and maintenance to assure that the system is working properly.

(RTD-1020, pp. 2-31 to 2-32.) The study adds:

- Boat navigation may also be affected. Some type of boat lock may be necessary to accommodate recreational boat passage.
- In waterways where there are dynamic hydraulics such as reversing flow, there would be potential for fish impingement.

(*Id*.)

98. DWR's study rejected fish screen technology for natural diversion situations where a portion of the Sacramento River split off at either Georgiana Slough or Three Mile Slough, stating:

> The use of fish screens as a deterrence option was evaluated and discussed for each site. Typically, maximum flow diversions are used to size fish screens and meet CDFW and NMFS screening requirements. Given the range of high maximum flows over the Delta daily tidal cycles at the five sites, fish screens would be unreasonably large to meet these requirements. Average flow diversions were also used but resulted in screen sizes that were still large and exceptionally long. These results were presented to the TWG at its January 28, 2014 meeting (see Appendix A). The TWG decided to remove fish screens from further consideration based on the required large structure sizes and concerns over the ability to meet CDFW and NMFS screening criteria.

(RTD-1020, p. 4-1.) Fish screen options were considered at sites just a few miles downstream of the North Delta intakes and were rejected for natural diversions from the Sacramento River. Yet they are deemed acceptable or even necessary for the north Delta intakes associated with Petition Facilities and described by Petitioner DWR as "state-of-the-art." (RTD-1025, p. 3, inset 1.)

99. As X2 migrates upstream, estuarine habitat grows smaller and migrates eastward, and the delta smelt's favored shallow open water habitat grows smaller and migrates eastward (upstream) as well. By the time north Delta intakes with fish screens would be completed and begin operation, and under changing climatic conditions, X2 and delta smelt could frequent this reach more than anticipated presently, assuming they survive that long. Nonetheless, Petitioners conclude: "Predation loss at the north Delta intakes may occur but would be limited because few delta smelt are anticipated to occur that far upstream." This conclusion ignores BDCP modeling results concerning upstream migration of X2 (the estuarine habitat indicator that is a key component of Delta smelt habitat index measurement) due to Tunnels Project operations. (RTD-158, p. 65 and Figure 7.)

<u>Impacts to Fish and the Likelihood of Predator Hotspots Created by Conveyance Projects</u>

The PEIR impact analyses in Chapter 5 contain no reference to or acknowledgement of "predator hotspots" that can be created by introduction of newly constructed diversions or other hydraulic structures in Delta water ways. Mr. Stroshane's excerpted testimony below describes and cites exhibits related to this matter.

Predator Hotspots

100. BDCP stated the conceptual framework of fish predation this way:

> The likelihood of a predation event is a function of three factors: rates of encounter between predator and prey; a decision by the predator to attack the prey; and capture or feeding efficiency of the predator(s). Encounter frequencies between predators and covered fish are related to their overlap in habitat use spatially and temporally, the vulnerability of prey, which is typically linked to environmental conditions like river flows and turbidity…, and their abundance relative to alternative prey[.]

(SWRCB-5, p. 3.4-299, lines 4-9.)

101. "Predation hotspots" were mapped in BDCP, but no definition of predation hotspot was given. (*Id.*, Figure 3.4-32, "Predation Hotspots in the Plan Area.") They appear to have recognizable characteristics: most, if not all, are associated with artificial (human-built) in-channel hydraulic structures like temporary rock barriers, failed levees, submerged bridge abutments, and Jones Pumping Plant. They also include artificial open water areas like Clifton Court Forebay and Franks Tract where open waters lack refuge for prey fish, and prey visibility is high due to relatively shallow conditions. Predators have also learned to wait patiently for deliveries of salvaged fish from Banks and Jones pumping plants at regular locations along the lower Sacramento River. "Total consumption rates," states BDCP, "relate to predator number, predator size, water temperature, prey density, and sometimes prey vulnerability (i.e., microhabitat use of predator and prey and whether the prey has a refuge at low density)." (*Id.*, p. 3.4-299, lines 12-14.) Currently known predation hotspots are listed and briefly described (*Id.*, p. 3.4-299:15-39, and p. 3.4-300:1-11.) Salvage release sites are areas where microhabitat use coincides with predator frequency.

102. Petitioners acknowledge that both the north Delta water diversion facilities and nonphysical fish barriers are expected to create new predation hotspots. (*Id.*, p. 3.4-300:12.)

103. The baseline of predation in the lower Sacramento River between Clarksburg and Courtland for each of the listed fish species is unknown and not disclosed in the RDEIR/SDEIS for its three sub-alternatives. Predation losses for winter-run Chinook salmon at the north Delta intakes are acknowledged by the RDEIR/SDEIS:

> Potential predation effects at the north Delta intakes for juvenile salmonids remaining in the Sacramento River (as opposed to entering the Yolo Bypass) could occur if predatory fish aggregated along the screens as has been observed at other long screens in the Central Valley [citation]. Baseline levels of predation are uncertain, however.

(SWRCB-3, p. 4.3.7-65:36-39.)

104. The RDEIR/SDEIS indicated methodological problems with another fish predation study at the GCID fish screen in the Sacramento River near Hamilton City. (SWRCB-3, footnote 5, p. 4.3.7-66.)

"Appropriate Delta Flow Criteria" and Flow Impacts of an Example California WaterFix Project

The PEIR contains no mention of "appropriate Delta flow criteria," despite their being required in the DRA for any water right permit associated with BDCP and conveyance projects seeking new diversion points in the north Delta. Mr. Stroshane's excerpted testimony below comments on this omission.

SWRCB must rely on the plain language of Water Code section 85086(c)(2) and interpret it in light of the full section of the Delta Reform Act to which it refers.

105. The Legislature's plain language regarding the change in point of diversion from the southern Delta to a point on the Sacramento River in the north Delta literally means relocation of the points of diversion of Petitioners' existing projects.

106. The Legislature's plain language explicitly expresses a change in the point of diversion of the projects from south to north. In the absence of expressed Legislative intent otherwise, this appears to preclude dual conveyance without filing a new water rights application. The plain language does not presently state or mean that existing southern points of diversion (i.e., Banks and Jones pumping plants) would be kept while adding new points on the Sacramento River. For this reason, the Change Petition should be denied as contrary to state law.

Reduced Delta Reliance and the Purpose and Need for New Conveyance

We have commented above about how the DSC fails to interpret properly the place of the DRA's reduced Delta reliance mandate. This excerpt from Mr. Stroshane's testimony and exhibits adds to our treatment of this policy by documenting how the SWP and CVP and their water contractors ignore the reduced Delta reliance mandate in their planning for the California WaterFix project, an example conveyance project analyzed in the PEIR.

THE PETITION'S PURPOSE IS CONTRARY TO STATEWIDE POLICY MANDATING REDUCED RELIANCE ON THE DELTA FOR CALIFORNIA'S FUTURE WATER NEEDS AND IS THEREFORE NOT IN THE PUBLIC INTEREST.

107. The Delta Reform Act of 2009 (Act) mandates that: "The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency." (Water Code section 85021.) I present evidence that the purpose of the California WaterFix project is intended to maintain and likely increase exports of Delta water to meet California's future water needs, contrary to the Act. Evidence shows that Petition Facilities' increased conveyance capacity and north

Delta diversions create expectations that project allocations and water transfers will be facilitated, continuing Petitioners' and water contractors' reliance on Delta exports for future imported water supply needs.

108. Petition Facilities' environmental documents provide no concrete analysis of their compliance with this section of the Act. For example, the BDCP contained no mention and therefore no policy analysis of whether the proposed Conservation Measure 1 facilities complied with Water Code section 85021. (SWRCB-5, search of "85021" yielded no results.) The BDCP Draft Environmental Impact Report/Statement mentions Water Code section 85021 and its statement of reduced Delta reliance, but provides no analysis of the proposed project's compliance with this provision. (SWRCB-4, Appendix 1C, p. 1C.3-18; Appendix 3A, p. 3A-20 to -22, p. 3A-68, and p. 3A-149, Table 3A-15; and Appendix 3D, pp. 3D-68 to 3D-69.) The California WaterFix Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement similarly mentions Water Code section 85021 once but again provides no analysis of the proposed project's compliance with this section of the Act. (SWRCB-4, Appendix 3D, p. 3D-57.)

109. Petitioners' master responses to comments in the California WaterFix Final Environmental Impact Report/Final Environmental Impact Statement state in Master Response 31:

> Under Section 85021, it is the obligation of each region that relies on water from the Delta watershed, not DWR or the Bureau of Reclamation, to determine the best ways to meet this goal by improving regional self-reliance. Neither DWR nor any of the public water agency proponents of the proposed project have the legal authority or duty to impose a statewide investment strategy on different regions of the state or individual water suppliers that depend on water from the Delta watershed. In addition, DWR lacks any legal authority or duty to make and implement localized decisions about water technology investments, to develop and impose investments for new water supply projects that serve particular geographic regions, or to mandate coordinated efforts among local and regional water suppliers.

(SWRCB-102, Volume II, p. 1-277:11-17.)

110. In Master Response 31, Petitioners reject their own responsibility for enforcing the Legislature's command in Water Code section 85021 to reduce reliance on the Delta for California's future water needs. Petitioner DWR is the state agency that owns and operates SWP, and administers contracts for water service from the Project serving northern and southern California regions reliant on the Delta. As a state agency, it is responsible for enforcing this command to reduce Delta reliance by aligning its water service contracts and allocations of SWP with Water Code Section 85021. Petitioner Bureau has similar capacity and responsibility with respect to its owning and operating CVP, and administering contracts for water service within that project's service area. Petitioner Reclamation also has a duty under the National Reclamation Act of 1902 to comply with the water laws of states in which the Bureau operates. This duty includes compliance with the Delta policies of the Delta Reform Act of 2009, including reducing Delta reliance.

111. Master Response 31 by Petitioners also fails to accurately represent the verbatim language of Water Code Section 85021. This section is silent on whether any water agency has specific obligations under the law to achieve reduced Delta reliance. Petitioner DWR construes this to mean (in the above quote) that it and Petitioner Bureau have no responsibility for stimulating local and regional self-sufficiency in water supply separate from Delta reliance. Master Response 31 would let Petitioners continue to operate their projects without regard to the statutory command to reduce Delta reliance. A more logical and reasonable interpretation of 85021—consistent with this command—is that all state agencies should determine what authorities and funding they do have and apply them toward enforcing, encouraging, and assisting local and regional agencies with reducing their reliance on Delta imports. Petitioners' contracting authorities are sufficient to accomplish such changes under state and federal law.

112. A purpose of Petition Facilities—in either their BDCP or California WaterFix forms—is to maintain Delta exports while increasing water supply reliability of the state and federal water projects that export from the Delta. This purpose is, on its face, contrary to Water Code section 85021 of the Delta Reform Act, which commands that reliance on the Delta for California's future water needs must be reduced.

113. Petition Facilities' environmental documents state as among the project's purposes the intent to maintain present export levels into the future and even increase the reliability of delivery to contractors from those exports:

> Restore and protect the ability of the SWP [State Water Project] and CVP [Central Valley Project] to deliver up to full contract amounts, when hydrologic conditions result in the availability of sufficient water, consistent with the requirements of State and federal law and the terms and conditions of water delivery contracts and other existing applicable agreements.

(SWRCB-3, Chapter 2, p. 2-3:21-24 and p. 2-4:29-33; SWRCB-4, Chapter 1, p. 1-8:34-37 and p. 1-9:33-37.)

114. Petition Facilities' environmental documents disclose modeling results indicating that preferred scenarios will not result in significant change to long-term average SWP and CVP deliveries. Deliveries for Alternative 4, Scenarios H3 and H4 of Conservation Measure 1 would range between 4,019 TAF and 4,497 TAF, as compared with existing conditions of about 4,658 TAF, and no action alternative scenarios (future conditions without Petition Facilities) of between 4,043 to 4,305 TAF. (SWRCB-4, p. 7-53, Table 7-7; SWRCB-3, p. 4.3.3-7, Table 4.3.3-1.) Alternative 4A (Petition Facilities) is estimated to result in long-term average deliveries of between 4,273 to 4,776 TAF. This alternative's range of deliveries includes existing average deliveries and is higher than the range of deliveries anticipated for BDCP's Alternative 4 scenarios. (SWRCB-4, p. 7-53, Table 7-7; SWRCB-3, p. 4.3.3-7, Table 4.3.3-1.)

115. It is my understanding that an independent modeling report provided to various upstream and Delta water users by MBK Engineers and Daniel Steiner (MBK/ Steiner) found that BDCP modeling results showed total exports increasing by 540 thousand acre-feet (TAF) over a No Action Alternative base of 4.73 million acre-feet (MAF) or about 5.27 MAF of total exports on average. (RTD-143, Attachment 1, p. 72.) This report acknowledged several necessary adjustments to operational assumptions to

ensure that CalSIM II modeling results better represented how CVP and SWP systems would be operated with incorporation of Petition Facilities. These adjustments included changes approved by Petitioners for the 2013 baseline applied in the SWP Delivery Reliability Report and in this report. (*Id.*, Attachment 1, p. 44-45.) Other changes were made to establish a meaningful and reasonable "Future No Action Alternative" that included several additional revisions to CalSIM II assumptions in the 2013 baseline. (*Id.*, p. 45.) Changes were also made to North Delta Diversion Bypass Flow Criteria (*Id.*, p. 48) and to Delta Cross Channel Gate Reoperation in October. (*Id.*, p. 49.) These changes were intended to make CalSIM II modeling more closely approximate actual operations based on research by MBK/Steiner into known operator behavior. (*Id.*, p. 44.) The independent modeling results showed that combined exports would average 5.61 MAF annually for a "Future No Action" (FNA) alternative, indicating an increase in exports for Alternative 4 of about 750 TAF. (*Id.*, p. 72.) This represents an increase in exports with the Petition Facilities, with more apparently realistic operational assumptions built into their modeling, averaging about 200 TAF annually. (*Id.*) It does not represent reduced reliance on the Delta for California's future water needs.

116. An updated report accepted into evidence of this proceeding from Sacramento Valley Water Users uses many similar adjustments to Petition Facilities' operations in CalSIM II modeling. (SVWU-107.) On average, this report found that while there would be a 2.5 MAF reduction in total South Delta diversions, there would still be a 491 TAF increase in total Delta exports, a 63 TAF increase in Jones Pumping Plant exports for the CVP, and a 428 TAF increase in Banks Pumping Plan exports for the SWP—all relative to the report's consistent adjustments of the No Action Alternative (NAA). Average Delta outflow would decrease by about 464 TAF compared with the NAA. (*Id.*, pp. 49-54, Figures 39, 41, 42, 43, and 46; SVWU-110, slides 36-38, 44-46, and 49-51.)

117. These statements by Petitioners make clear that increased conveyance capacity offered by Petition Facilities boosts not just contractual water supply reliability, but also market-based or "supplemental demand" supply reliability.

118. Petitioner DWR presented modeling scenario results for Petition Facilities in its draft "Water Available for Replenishment Report" issued in January 2017 that shows that Petition Facilities would increase SWP and CVP exports to south of Delta water contractors compared with "No Action." (RTD-1011, p. 56, Figure 11.) This contradicts other claims made by Petitioner DWR that Petition Facilities are intended strictly to maintain existing SWP and CVP export and delivery levels to their water contractors.

119. The Westlands Water District Board of Directors received a staff report for the meeting of September 19, 2017 that analyzed the merits of financial participation in Petition Facilities (under the project's public name "California WaterFix" [CWF]). The report stated that:

> …staff projects that the average combined exports of the SWP and CVP with the CWF will [ap]proximate Boundary 1 (5.6 — 5.8 MAF). Moreover, the increase in exports with the CWF, when compared to existing conditions, will be approximately 1 MAF in all years except Critical years, when the increase is projected to be approximately 400,000 AF. These projects are uncertain, however, because the ongoing re-initiation of consultation on long-term operations of the CVP and SWP may result in additional constraints on south

> Delta exports and the SWRCB may in the ongoing CWF water right proceedings impose outflow criteria that dramatically reduce the yield of CWF.

(RTD-1012, pp. 6-8.)

120. The Westlands staff report states that a reason to participate financially in Petition Facilities is that these Facilities would eliminate a "water loss of approximately 20—30%" to what is called carriage water—fresh water typically from the Sacramento River that creates an hydraulic barrier against tidal salt water entering the western Delta as water passes from the Delta Cross Channel into the central Delta to the south Delta pumps. The significance of reducing carriage water losses would be to increase potential water transfer supplies crossing the Delta through Petition Facilities:

> The CWF would eliminate this loss, which would have a positive effect on the "through the meter cost" of transfer water from north-of-Delta agencies. In addition, the existence of the CWF would improve the opportunity to obtain transfer water from north-of-Delta sources and potentially expand the transfer window beyond the July through September period. The August 29, 2017 presentation by Terry Erlewine and Allison Febbo estimate that the mean increase in transfer capacity with CWF is approximately 915,000 acre-feet. In a dry year, the increase in transfer capacity with CWF would be approximately 1.135 MAF. The analysis presented by Mr. Erlewine and Ms. Febbo demonstrates that restored water supply and increased transfer capacity resulting from the CWF would aid Westlands' compliance with SGMA [Sustainable Groundwater Management Act].

(RTD-1012, pp. 9-10.)

121. On October 26, 2017, the California WaterFix Change Petition hearing service list received a letter from Thomas W. Birmingham, Westlands Water District general manager. The Westlands Board voted not to participate in the project "<u>as presented</u>", he stated, but "not based on any opposition to the project," and that "Westlands continues to support efforts to implement the California WaterFix." Mr. Birmingham explained that their decision was largely a reaction to Petitioner Reclamation's "participation approach" that simply recovered CVP contractors' costs without providing any up-front federal financing for the project—financing which, it is my understanding, involves taxpayer subsidies from across the United States. If CVP contractors like Westlands had to shoulder costs of "incremental water supply" produced by the project, it would be too expensive, resulting in Mr. Birmingham's estimate of "an average blended cost of $565 an acre-foot." Assuming cost allocation issues facing Westlands and perhaps other CVP contractors can be resolved, Mr. Birmingham expressed confidence that "Westlands will revisit its decision." He further stressed that "<u>the decision to not participate was not based on the merits of the project.</u>" (RTD-1013 p. 1; emphases in original.)

122. It is my testimony that, despite the Westlands Board's action not to participate at this time, in financing Petition Facilities that same day, the Westlands Water District staff analysis of and continued support for Petition Facilities' yield

indicates expectation of increased exported water to south-of-Delta contractors—an expectation contrary to the State Legislature's command to reduce reliance on the Delta for California's future water needs.

123. A draft "Policy Regarding Administration of California WaterFix Yield within Kern County" was considered at Kern County Water Agency's (Kern County) Board Meeting on October 26, 2017. (RTD-1014.) It states that "[o]n November 14, 2013, the Kern County Water Agency hosted a policy meeting to review and discuss potential options for the administration of *additional State Water Project ("SWP") yield resulting from participation in California Water Fix ("WaterFix Yield*")." (*Id.*, p. 1; emphasis added.) The goals and objectives stated in the draft policy include: "Encourage Member Units to acquire WaterFix yield"; "Mitigate risk and expense associated with commitment to incremental WaterFix Yield through market opportunities"; "Maximize incremental WaterFix Yield for Kern County"; and "Preservation of the groundwater basin/no net increase in demand" in Kern County. (*Id.*) Water sales by Member Units are further contemplated: "A Member Unit may sell or assign all or a portion of its allocated share of WaterFix Yield subject to the following:…Assignments or sales may be negotiated between Member Units…" (*Id.*, p. 2, subd. 5.a.)

124. A report compiled by Kern County for its Board's decision-making about financial participation in Petition Facilities stated "Average Improvement in [SWP] Project Water Supply" would be 1.3 MAF per year. (RTD-1015, p. 71, Table 9.) Kern County's "overall share of California WaterFix" was projected to be 13.33 percent. (*Id.*) Expressed as water yield from Petition Facilities, this would be an average improvement in imported water supply of approximately 173 TAF per year. This average improvement represents a potential for increase, not reduction, of SWP deliveries to Kern County.

125. The draft policy also states that Member Units may sell to other SWP contractors within Kern County:

> In the event the Member Unit is unable to negotiate an assignment or sale with another Member Unit, the Member Unit may then negotiate with other entities within the State Water Project service area of the Kern County Water Agency and the terms and conditions of the assignment or sale, including price, shall be as agreed upon by the buyer and seller.

(RTD-1014, p. 2, subd. 6.d.)

126. The draft policy further states that Member Units may sell to other State Water Contractors as follows:

> In the event the Member Unit is unable to negotiate an assignment or sale with other entities within the State Water Project service area of the Kern County Water Agency, the Member Unit may then negotiate with other State Water Contractors and the terms and conditions of the assignment or sale, including price, shall be as agreed upon by the buyer and seller. However, such assignment or sale shall be subject to a first right of refusal by other Member Units and/or entities within the SWP service area of the Kern County Water Agency.

(*Id.*, pp. 2-3, subd. 6.e.)

127. It is my understanding that the Metropolitan Water District of Southern California (MWD) is a state water contractor with the largest Table A amount in its contract of any contractors within SWP. In one of its "white papers" issued this summer, MWD stated that Petition Facilities would improve SWP and CVP export water quality through the use of its "dual intake system" because Sacramento River water quality in the vicinity of north Delta intake sites "is generally lower in salinity, organic carbon, and nitrates as compared to the San Joaquin River and south Delta." (RTD-1007, p. 15.) The "white paper" claims that relative to the No Action Alternative, Petition Facilities' operations would reduce levels of salinity in export water by 18 to 22 percent; of total dissolved solids by 17 to 22 percent; of bromide by 31 to 43 percent; of organic carbon by 2 to 11 percent; and of nitrates by 5 to 27 percent. (*Id*.) Water quality is important to MWD for blending with poorer quality Colorado River Aqueduct supplies. According to MWD:

> To meet these blending goals, on average Metropolitan needs 950,000 acre-feet of SWP supplies. Without the water supply reliability improvements provided by the California WaterFix, Metropolitan will be less likely to meet this salinity goal.

(RTD-1009, p. 5.)

128. By managing "high flow events," states MWD, "an additional 1.2 MAF could have been diverted if California WaterFix had been operational in 2016." (RTD-1007, p. 13.) However, Mr. Leahigh's written testimony, however (upon which MWD relied for its above-quoted statement), qualifies this modeling result for annual average yield from Petition Facilities, stating that:

> On average, the annual amount of water diverted and stored by the SWP/CVP, as a result of CWF with the Initial Operational Criteria indicates that the combined SWP/CVP average annual combined diversions may be the same as the no action alternative or may increase up to approximately 500 thousand acre-feet (TAF). Though just over 1.2 MAF of water could have been diverted and stored January through April 2016 with the project in place, the proposed operating rules for CWF would require reduced pumping during drier periods in order to protect the environment.

(DWR-61, p. 18:6-18, and p. 19:1-26; indented quote, p. 19:16-20.) MWD, however, omitted Mr. Leahigh's qualification of Petition Facilities yield, however, evidently preferring the larger estimate for early 2016, except to say that "the actual quantity that may be diverted under similar circumstances in the future could be less than predicted." (RTD-1007, p. 14.)

129. Like Westlands and Kern County, MWD informed its Board that Petition Facilities "would significantly increase the amount of available capacity to accommodate the movement of water transfers across the Delta and the SWP and CVP system." (RTD-1007, p. 14.) MWD stated that "[f]uture water transfers or particular quantities of transfers are not components of California WaterFix," because "any amounts and locations of future water transfers are speculative" and subject to "regulatory approvals and environmental review." Water Code section 1729 states,

however, that "[a] proposed temporary change [of place of use to a water right for a water transfer] under this article shall be exempt from the requirements of" CEQA. "Even with these considerations," states the MWD operations white paper, "California WaterFix would provide much greater capability to manage transfers." (*Id*.)

130. It is my understanding that available unused capacity in any regional or local publicly owned water conveyance facilities, including in the California Aqueduct, must be made available for bona fide transfers, provided fair compensation is paid. (SWRCB-102, p. 1-342:9-11; Water Code section 1810.) Given this legal requirement in the California Water Code, increasing conveyance capacity for cross-Delta water transfers during droughts would make it easier for the state and federal government to facilitate water transfers in drier years. Thus, it would be easier for south-of-Delta SWP and CVP water contractors to employ market forces to pay for and receive Sacramento Valley surface water and groundwater supplies for the benefit of south-of-Delta water contractors.

131. It is my testimony that the Change Petition creates expectations expressed in state and federal water contractor policy documents and staff analyses that additional yield above and beyond SWP contract Table A amounts would be forthcoming from Petition Facilities—expectations driving actions by these entities and Petitioners whose intended outcomes are contrary to the State Legislature's command to reduce reliance on the Delta. (Water Code section 85021.) MWD's Board voted to approve financial participation in the project on October 17, 2017. Kern County's Board voted to approve financial participation in the project on October 26, 2017.

132. In wet or above normal years, these expectations would be met through allocations to meet contractual demands via each project's normal allocation process. In drier years, as indicated by BDCP water transfer modeling assumptions described herein, expectations of these and other SWP contractors would be fulfilled via market-based transfers to meet their Table A contractual demands as much as possible.

133. Petition Facilities are intended to facilitate both more reliable contractual deliveries *and* a water transfer market that moves north-of-Delta willing sellers/senior water right holders' supplies through the Delta in exchange for monetary compensation. The only question in the long-term with a Petition Facilities in place (from the standpoint of objectives, purpose, and need) would be when and under what project allocation conditions water from north of the Delta moves—under contract terms, or under market-based transfer activity. In my opinion, based on this evidence, market-based water transfers are obscured in the Change Petition and Petition Facilities' environmental compliance documentation. They are an important part of Petitioners' and water contractors' efforts to maintain, not reduce, Delta reliance for California's future water needs. Petition Facilities (and the Change Petition containing them) therefore fail to comply with the Legislature's command that reduced Delta reliance for California's future water needs is statewide policy. (Water Code section 85021.)

134. It is my opinion, though I am not a lawyer, that the Legislature's command that it is the policy of California to reduce reliance on the Delta for the state's future water needs is entitled to deference by state agencies, including SWRCB. The foundation for my opinion in this matter is that in affairs of waters of the State of California, courts and state agencies like SWRCB have concurrent jurisdiction over claims made under Article X, Section 2 of the California Constitution. (RTD-1017, p. 7.)

This subject was addressed by the California Office of the Attorney General to the Delta Vision Blue Ribbon Task Force in 2008:

> The Legislature has exercised the powers granted to it by the constitutional provision [Article X, Section 2]. For example, the Legislature has determined that it is the policy of the state to leave wild and scenic rivers in their free-flowing condition and that such use of the water is the "highest and most beneficial use and is a reasonable and beneficial use of water within the meaning of Section 2 of Article X of the California Constitution." (Pub. Resources Code, § 5093.50.) The Legislature has also enacted Fish and Game Code section 5937,…which requires dam owners to release water to keep fish below the dam in good condition, and section 5946, which requires the SWRCB to insert compliance with section 5937 in water rights permits and licenses in Inyo and Mono Counties. In *California Trout, Inc. v. State Water Resources Control Board* (1989) 207 Cal.App.3d 585, the court considered this law to be not only a specific expression of the public trust, but also a legislative determination that such use was reasonable. "We find no preclusion in article X, section 2 of legislative power to make rules concerning what uses of water are reasonable at least so long as those rules are not themselves unreasonable…." [citation] Where various policy views are held concerning the reasonableness of a use of water, the view enacted by the Legislature is entitled to deference by the courts.

(RTD-1017, p. 5.)

135. Given the concurrent jurisdiction of the courts and the board, the Legislature is owed deference from SWRCB in the matter of reduced Delta reliance for California's future water needs and based on evidence provided herein, Petitioners' Change Petition fails to defer to the clear determination of the Legislature on this matter.

<u>Purpose and Need for the Proposed Amendments in the PEIR Fail to Take Account of the Unreasonableness of the Conveyance Method of Diversion Employed as an Example in the PEIR.</u>

Mr. Stroshane's testimony and exhibits analyzed whether the California WaterFix project represents a reasonable method of diversion, and concluded that it is not.

THE PROPOSED CHANGE PETITION FACILITIES WOULD BE AN UNREASONABLE METHOD OF DIVERSION OF WATER AND THEIR APPROVAL WOULD THEREFORE NOT BE IN THE PUBLIC INTEREST AND SHOULD BE DENIED.

136. Petitioners, through their Change Petition for California WaterFix, propose to construct and operate an unreasonable method of diversion of state and federal water supplies from the San Francisco Bay-Delta Estuary along the lower Sacramento River, and to continue operating unreasonable methods of diversion at existing Tracy Pumping Plant and Banks Pumping Plant facilities of CVP and SWP. The California Constitution, Article X, Section 2 requires that the manner and location of diverting water out of

streams and rivers must always be reasonable. This passage commands that the conservation and use of waters must implement as many relevant beneficial uses as may be reasonable. An unreasonable method of water diversion may impair beneficial uses. Because California's water supplies are limited, "the public interest requires that there be the greatest number of beneficial uses which the supply can yield." (*Peabody v. City of Vallejo* (1935) 2 Cal.2d 351, 368.) Because there are many feasible alternatives to meeting California's future water needs—especially in light of the Legislature's command to reduce reliance on the Delta in meeting them—approval of the Change Petition and its Facilities would violate Article X, Section 2.

137. It is my testimony that reasons for denial of the Change Petition include:

1) Approval of the Change Petition is unreasonable because of Petitioners' lack of compliance with the scheme for acquiring and diligently exercising appropriative water rights permits. (RTD-10rev2, ¶ 17-28.)

2) Approval of the Change Petition is unreasonable because it is unreasonable for Petitioners to use a change petition for Petition Facilities that will have region-wide effects, including changes to the predominant source of water diverted, in violation of the principle that "a right cannot be so changed that it in essence constitutes a new right." (SWRCB Water Rights Order 2009-0061, p. 5; Cal. Code Regs., tit. 23, § 791, subd. (a).)

3) Approval of the Change Petition is unreasonable as a method of diversion because, given Petition Facilities' regional-scale effects, the Change Petition process does not call for analysis of whether and how much water is available for Petition Facilities to divert.

4) Approval of the Change Petition is unreasonable as a method of diversion because the processing of the Change Petition is contrary to law and good planning practice for determining beneficial uses to be protected and the water quality objectives and "appropriate Delta flow criteria" to accomplish that protection. In short, the proceeding at hand places setting of appropriate Delta flow criteria applicable to Petition Facilities prior to a watershed-wide planning process for determining tributary inflow requirements, cold water requirements, and Delta outflows to which Petition Facilities would otherwise have to conform. Plumbing should not come before planning.

5) Approval of the Change Petition is unreasonable as a method of diversion because the manner by which Petition Facilities would divert water would cause unavoidable negative impacts to Delta fish species, many of which are protected as rare, endangered, or threatened, because fish screens proposed to mitigate such impacts have high uncertainty of success, and because new water management structures among Petition Facilities would create more "predation hotspots."

6) Approval of the Change Petition is unreasonable as a method of diversion because the project's claimed purpose and need fail to reduce reliance on the Delta for California's future water needs, as commanded by the Legislature, as previously described herein.

7) Approval of the Change Petition is unreasonable as a method of diversion because it would increase the use of the imported supplies it creates for application to irrigate lands in the service area of the San Luis Unit of CVP that are either drainage-impaired, naturally contaminated with selenium, boron, arsenic and other toxic stressors, or both. Drainage from these lands, while bypassing the historic and

environmentally sensitive Grasslands Area, return with San Joaquin River runoff to the Delta and, in the presence of Petition Facilities' operations, would increase risks of benthic food web contamination and toxic tissue loading in listed fish species like green sturgeon, as previously described herein. Specifically, estuarine (EST) and wildlife (WILD) beneficial uses would be degraded or impaired as a result.

Approval of the Change Petition is unreasonable because of Petitioners' lack of compliance with the scheme for acquiring and diligently exercising appropriative water rights permits.

174. I testified and presented evidence accepted into the record in Part 1B that Petitioners improperly submitted a change petition implicitly contending that their existing permits are for projects not yet completed. It was my testimony in Part 1B that (1) the three new points of diversion (SWRCB-102, Volume 2 [Master Responses], p. 1-114:5-8) are not the same as the existing DWR water right permit that contains a single diversion at Hood, and (2) the single point of diversion at Hood for the Peripheral Canal proposal was rejected by the California electorate in 1982. As a consequence, the diversion point at Hood has not been diligently developed as required by California's prior appropriation doctrine. (3) Petitioners' existing water right permits are expired and should be licensed, since the rest of their CVP and SWP facilities in the water right permits are completed and putting water to beneficial use; (4) consequently, Petition Facilities' diversion points, if they are to comply with California's scheme for appropriate water rights acquisition, should be the subject of a new water right application with a priority date reflecting when this new application is eventually filed; and (5) finally, the nature of the diversion points for California WaterFix would take water out of Delta channels and isolate it from through-Delta flow, resulting in depletions in a different river source and location of the Delta than now occurs. This too is a distinct difference from the nature of the diversion originally included in the state water right permits and therefore requires a new application to appropriate.

175. Complicating SWRCB's consideration of this Change Petition is the fact that SWRCB has delayed decisions since 2009 on Petitioners' earlier Requests for Time Extensions for their existing Delta-related water rights permits, as described in my Part 1B testimony for Restore the Delta. (RTD-10rev2; SWRCB exhibits 6 through 9 for Petitioner DWR's permits; SWRCB exhibits 10 through 19 for U.S. Department of the Interior's permits; RTD-118; RTD-121.) While Restore the Delta was not a protestant to Petitioners' requests for time extensions, I was retained by California Water Impact Network at the time and participated in correspondence with both SWRCB and Petitioners' representatives on the Network's behalf at that time. As a party to this proceeding, Restore the Delta briefly but firmly asserts that these existing permits have long been complete and that Petitioners and SWRCB should have processed licenses for CVP and SWP facilities as mandatory ministerial actions by SWRCB. (RTD-10rev2; *California Trout v. State Water Resources Control Board* (1989) 207 Cal.App.3d 585, 611.) However, delay by both Petitioners and SWRCB has led to cold storage of water rights by Petitioners, tolerated by SWRCB, and contrary to California's prior appropriation doctrine. (RTD-10rev2, pp. 13-19, ¶s 40 through 60.)

It is unreasonable for Petitioners to use a change petition for Petition Facilities that would have region-wide effects, including changes to the predominant source of water diverted, violating the principle that "a right cannot be so changed that it in essence constitutes a new right."

176. SWRCB has previously stated that criteria for initiating a new water right include primarily expanding an existing right by volume, increasing the season of diversion, and/or seeking a new source of water to satisfy the right. (Water Rights Order 2009-0061, pp. 5-6.)

177. Existing SWP and CVP pumping plants, operable gate facilities, and temporary rock barriers in the Delta have ecosystem-scale and region-wide effects reflecting manipulations in the estuary by SWP and CVP water management, according to researchers Nancy E. Monsen, James E. Cloern, and Jon R. Burau. ("researchers"; RTD-157.) These researchers found that under high export activity:

> Old and Middle Rivers become a freshwater corridor of Sacramento-derived water. On 6 October 2001, the Mildred Island region [a flooded island along the Middle River corridor] was dominated by Sacramento-derived water. However, San Joaquin source water dominated the region on 6 November, after a month of pump curtailment when the Sacramento freshwater corridor was constricted to Old River [to the west]. The San Joaquin source of water increased inside Mildred Island because the regional mass balance changed: less Sacramento-derived water entered from the north and more San Joaquin derived water exchanged with Mildred Island from the channel at its southeast corner.

(*Id.*, p. 4-5.)

178. Salinity also changed in response to pumping curtailment between Mildred Island and its surrounding channels, with salt exiting Mildred Island to be exported at the pumps during high export activity. When pumping subsided, the researchers observed in some periods that salt re-entered Mildred Island from the direction of the San Joaquin River. (*Id*.) They concluded from this example that "exports generate regional responses. Salinity in the central Delta changed almost instantaneously with changes in export diversions occurring 25 km [about 16 miles] away." (*Id*., p. 8.)

179. The researchers also investigated flow and salinity changes associated with Delta Cross Channel (DCC) gate operations. Located along the Sacramento River near Walnut Grove, DCC supplies SWP and CVP stored water to central Delta channels (including mixing with Mokelumne River distributaries via Snodgrass Slough) to a point where south Delta pumping action can pull the stored water in for export. When the gates are closed, such as on 26 November 2001 on which the researchers report, more Sacramento River water flows down the main stem from Walnut Grove toward Rio Vista and beyond and away from the central Delta. The researchers observed that, on one hand, "less fresh water was available in the central Delta to prevent salinity intrusion on the San Joaquin stem of the western Delta." (*Id*., p. 9.) On the other hand, "[s]alinity decreased at Emmaton on the Sacramento River, but tidally-averaged salinity increased almost immediately on the San Joaquin at Jersey Point and Dutch Slough. Salt intrusion into the San Joaquin progressed until export pumping was curtailed on 10 December" to avoid violating Contra Costa Water District's Rock Slough diversion water quality

objective of 250 mg/L chlorine standard. (*Id*.) Export pumping curtailment enabled more fresh San Joaquin-derived water to repel intruding sea water and reduced salinities at both Jersey Point and Dutch Slough. In sum, the researchers found that "changes in DCC operations altered salinity across the central Delta including the large shallow habitat of Franks Tract." (*Id*., p. 10.) They concluded that this example:

> illustrates how a localized diversion in the north Delta can influence regional-scale water quality through its modification of the flow paths of Sacramento- and San Joaquin-derived river water….The Delta is subjected to multiple diversions and this example highlights the compounding effect of gate and export operations on salinity distributions.

(*Id*.)

180. These two examples illustrate the regional-scale effect of existing SWP system facilities in the Delta. My Part 1B testimony draws on Petitioners' environmental documentation to show the regional-scale effects on hydrodynamics and flow in and through the Delta, indicating that Petition Facilities will remove fresh water from the Sacramento River causing flow reductions evident for at least a stream-length of 21 miles; increased frequency of reverse flows or "upstream transport" at times of reduced Delta inflow; increased residence time of water; and altered water sources in various Delta locations. (RTD-10rev2, pp. 31-37, ¶ 95-112; p. 37, ¶ 113; p. 37-38, ¶ 114-115; p. 38, ¶ 116.) My testimony also stated that flow alterations would lead to water quality changes that would violate water quality objectives and degrade water quality in the Delta and which would adversely affect the City of Stockton's drinking water and groundwater supplies. (*Id.*, pp. 38-41, ¶ 117-124; pp. 41-47, ¶ 125-140; pp. 47-48, ¶ 141-142.)

181. The flow and water quality alterations I just summarized would be accomplished by removal of water from the lower Sacramento River in the north Delta by Petitioners' proposed intake facilities. (RTD-10rev2, p. 5:19-22.) No part of the proposed method of diversion is at present described or addressed by existing permits for the SWP and CVP. Nor are any facilities contained in the Petition authorized by state or federal legislation. (*Id*., p. 5:23-25.) Petition Facilities are not represented in any of the existing Petitioners' water rights permits. Consequently the Change Petition's requested rights for three new north Delta points of diversion represent a change in the essence of Petitioners' existing water rights and thus exceed any reasonable basis on which change petitions could be properly granted by SWRCB. The source of water for Petitioners' water rights would be fundamentally altered from its present mixed sources of San Joaquin and Sacramento River water to one that would become predominantly sourced from Sacramento River water. The flow and water quality characteristics of the Delta estuary would be fundamentally changed by Petition Facilities' introduction of a method of diversion that removes Sacramento River water from downstream Delta channels into diversions connected to tunnels beneath the estuary for conveyance to Jones and Banks pumping plants. This change in the source of water for Petitioners' water rights permits is further confirmed by modeling results for Petition Facilities' north and south Delta exports comparing the No Action Alternative with Alternative 4A. North Delta exports increase from zero (0) TAF to 2,435 TAF in the long-term average; 0 TAF

to 3,763 TAF for the wet year average; and 0 TAF to 1,082 TAF in the dry and critical year average. (SWRCB-102, Figures 5-51, 5-52, 5-53; see also Figures 5-65, 5-66, and 5-67.)

182. Herein I have also indicated that Petitioners and important CVP and SWP contractors have created and nurtured expectations that overall SWP and CVP exports would increase. Such expectations, while contrary to the Delta Reform Act as noted herein, are also evidence of expectations that water rights to divert and export from the Delta would be exceeded; in which case, the Petition Facilities should be processed as an initiation of a new water right. (RTD-10rev2.)

183. It is unreasonable for Petitioners to use a change petition for Petition Facilities that would have such region-wide deleterious and degrading effects on flow and water quality in the Estuary, including but not limited to changes in the predominant source of water currently diverted by removal of Sacramento River water from flow through other Delta channels. This would violate the principle in Title 23 of the California Code of Regulations that "a right cannot be so changed that it in essence constitutes a new right." (SWRCB Water Rights Order 2009-0061, p. 5; Cal. Code Regs., tit. 23, § 791, subd. (a).)

Petition Facilities are unreasonable as a method of diversion because the Change Petition process, including SWRCB's duty to impose appropriate Delta flow criteria on them, does not require analysis of whether and how much water is available for Petition Facilities to divert, given Petition Facilities' regional-scale effects.

184. It is my understanding that courts and state agencies addressing competing water rights claims of parties throughout a watershed should take into consideration all of the water available and then determine, considering the entire supply, the needs of the parties, their methods of use, methods of diversion, and other necessary factors. (*Rancho Santa Margarita v. Vail* (1938) 11 Cal.2d 501, 558.) Indeed, California Constitution, Article X, Section 2's purpose is to ensure that the state's water resources will be available for the constantly changing needs of all of its people, according to the California Office of the Attorney General (citing case law). (RTD-1017, p. 4.) SWRCB is obligated under statutory and case law to set water quality standards, including "appropriate Delta flow criteria," to protect beneficial uses, even if it means that other water users would have to contribute to that protection. (RTD-1017, p. 10; RTD-1019, p. 2; *United States v. State Water Resources Control Board* (1986) 182 Cal.App.3d 82, 120.) SWRCB must consider all competing demands for water in determining a reasonable level of water quality protection. (RTD-1019, p. 4.)

185. SWRCB performs water availability analysis when considering new water rights applications. Because this proceeding goes forward considering a Change Petition for Petitioners' California WaterFix project, it appears that no SWRCB water availability analysis will be performed. However, SWRCB summarized Central Valley Bay-Delta watershed water rights for the Delta Vision Blue Ribbon Task Force (Task Force) in 2008, finding that as part of a water availability analysis, SWRCB:

> looks at both the demand characteristics associated with the proposed use and the likelihood that supply will be adequate to supply that demand. The State

> Water Board is required to maximize the beneficial use of water. Historically, the State Water Board has approved permits for agricultural projects if water is available in 50 percent of years, under the condition that water cannot be diverted in years in which there is insufficient supply to satisfy prior vested rights.
>
> (RTD-1018, p. 3.)

186. Restore the Delta has included in its case in chief exhibit RTD-131, a water availability analysis of Sacramento and San Joaquin River watershed water rights for SWRCB's consideration here. This study's methodology incorporates SWRCB 2010 DFC Report public trust determinations for Delta inflow sources and estimates water availability for diversion under claimed water rights. In other words, it examines public trust beneficial uses together with claimed water rights. Petitioners' contractors include many agricultural water agencies south of the Delta. As indicated herein, some agricultural water agencies actively entertain expectations of obtaining deliveries of irrigation water via Petition Facilities once constructed and in operation. I know of no analysis performed by SWRCB or any other party to this proceeding that examines whether water is actually available in 50 percent of years to satisfy either their expectations or their Table A contract amounts, or those of any other SWP contractors, or those of other non-propertied beneficial uses.

187. In summarizing case law concerning SWRCB's water quality planning role (which also includes "appropriate Delta flow criteria"), the California Office of the Attorney General informed the Task Force that SWRCB must establish water quality standards at the level needed to protect all beneficial uses in the Delta, not just those of water rights holders. (RTD-1019, p. 4.)

188. When it approved Water Rights Decision 1485 in 1978, SWRCB employed a "without project" level of protection: "[t]he objectives were designed to maintain the levels of water quality in the Delta which would theoretically exist if the [SWP and CVP] projects had never been constructed." (*Id*.) The California Third District Appellate Court found this in error. Conducting this proceeding as it has, SWRCB risks unreasonably setting appropriate Delta flow criteria for the Petition Facilities' permit conditions based on comparison of the No Action Alternative with Alternative 4A of Petition Facilities, which would be similar to committing its error of forty years ago. Such a process is contrary to SWRCB's role in setting "appropriate Delta flow criteria," required by the Legislature, where it must protect all beneficial users in the Delta.

189. Establishing appropriate Delta flow criteria for the Petition Facilities must be based on a reasonable water availability analysis that fulfills SWRCB's responsibilities under the Delta Reform Act, the Porter-Cologne Water Quality Control Act, and the California Constitution, Article X, Section 2.

Attachment 1
State and Federal Environmental Justice, Human Right to Water, and Anti-Discrimination Policies

Environmental justice—the potential for public decisions to avoid or mitigate disproportionate or discriminatory environmental impacts (including water-related impacts) to minority and low-income people and populations—is a solemn and vital consideration in the deliberations of state and federal agencies. They must simultaneously consider environmental justice concerns in the framework of the public interest, "the greatest public benefits," and protection of public trust resources.

The California Water Code provides that the people of California have a paramount interest in the use of all the water of the State and that the State shall determine what water, either surface or ground water, can be converted to public use or controlled for public protection. (California Water Code [C.W.C.] Sec. 104). In California's Water Code, protection of the public interest is of vital concern in the development of the water resources of the State, and the State is authorized to determine in what way all the water of the State should be developed for the greatest public benefit. (C.W.C. Sec. 105)

While neither "public interest" nor "the greatest public benefit" are defined in the water code, the code designates domestic use of water for drinking, bathing, cooking and cleaning as the highest use of water in California. (C.W.C. Sec. 106) Recently, a "human right to water" was added to the water code, stating that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes." (C.W.C. Sec. 106.3(a))

Federal and state laws require their agencies to consider environmental justice and to prohibit discrimination in their decision making processes. Title VI of the Civil Rights Act of 1964 and related statutes require that there be no discrimination in Federally assisted programs on the basis of race, color, national origin, age, sex, or disability (religion is a protected category under the Fair Housing Act of 1968), and that, "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participating in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

Federal Executive Order (EO) 12898 (1994) requires Federal agencies, including the United States Bureau of Reclamation, to make environmental justice part of their mission and to develop environmental justice strategies.[16] This Order further requires that each Federal agency may, whenever practicable and appropriate, translate crucial public documents, notices, and hearings relating to human health or the environment for

[16] Executive Order 12898 of February 11, 1994, *Federal Actions to Address Environmental Justice in Minority {Populations and Low-Income Populations,* Federal Register 59(32): February 16, 1994, Section 2-2. Accessible at https://portal.hud.gov/hudportal/HUD?src=/program_offices/fair_housing_equal_opp/FHLaws/EXO12898.

limited English speaking populations.[17] As important, the Order also states that "Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public."[18]

The Bureau of Reclamation takes US Department of the Interior goals as its own. The Interior Department's 1995 Goal 1 states that "The Department will involve minority and low-income communities as we make environmental decisions and assure public access to our environmental information."[19]

For its 2012-2017 Environmental Justice Strategic Plan, the Interior Department added as a new goal to its environmental justice commitments that it will "identify and address environmental impacts that may result in disproportionately high and adverse human health or environmental effects on minority, low-income, or tribal populations."[20]

California Anti-Discrimination and Environmental Justice Policy

The State of California defines "environmental justice" as: "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies." (Cal. Gov. Code Sec. 65040.12, subd. (e).) The State Attorney General's office states that "fairness in this context means that the benefits of a healthy environment should be available to everyone, and the burdens of pollution should not be focused on sensitive populations or on communities that already are experience its adverse effects." The State Attorney General adds, "environmental justice requires an ongoing commitment to identifying existing and potential problems, and to finding and applying solutions, both in approving specific projects and planning for future development."[21]

California's anti-discrimination policy states:

> No person in the State of California shall, on the basis of race, national origin, ethnic group identification, religion, age, sex, sexual orientation, color, genetic information, or disability, be unlawfully denied full and equal access to the benefits of, or be unlawfully subjected to discrimination under, any program or activity that is conducted, operated, or administered by the state or by any state agency, is funded directly by the state, or receives any financial assistance from the state.

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[17] *Ibid.*, Section 5-5(b).

[18] *Ibid.*, Section 5-5(c).

[19] U.S, Department of the Interior, Environmental Justice Strategic Plan, 2012-2017, p. 13.

[20] *Ibid.*, p. 14, pp. 18-21.

[21] California Department of Justice, Fact Sheet: Environmental Justice at the Local and Regional Level, Legal Background, updated 7/10/2012, p. 1.

(California Government Code [C.G.C.] Sec. 11135(a).)

The State Attorney General's office states that this policy does not expressly include the phrase "environmental justice," but in certain circumstances it can require agencies to undertake the same consideration of fairness in the distribution of environmental benefits and burdens called for in the state's definition of environmental justice. In addition, the State Attorney General's office notes that agencies "should evaluate whether regulations governing 'equal opportunity to participate' and requiring 'alternative communication services' (e.g., translations) apply. (See Cal.Code Regs., tit.22, secs. 9801, 98211.)"[22]

Presence of EJ populations and communities in the Delta region

Low income communities and communities of color comprise a significant number of residents throughout Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties. Although distributed throughout the Delta, many of these communities are more densely represented in northern, eastern and southern census blocks.[23] Within these counties, the most significant concentrations of non-white populations occur in Antioch (45 percent), Pittsburg (60 percent), Fairfield (47 percent), Suisun City (59 percent), Lathrop (44 percent), Manteca (25 percent), Sacramento (45 percent), Stockton (50 percent), Tracy (33 percent), and West Sacramento (30 percent).[24]

Even in smaller communities throughout the Delta region, non-white residents make up substantial portions of the rural populations of Freeport (40 percent), Hood (33 percent), Courtland (43 percent), and Isleton (24 percent).[25]

Low-income and impoverished communities

Impoverished communities of all races and ethnicities are vulnerable to environmental injustices in the Delta region. The western, northern, central, and southern parts of the Delta in particular are home to high concentrations of low-income residents.[26] The most significant concentrations of people and families whose incomes in 2014 were below the

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[22] *Ibid.*, p. 2.

[23] Bay Delta Conservation Plan (BDCP) Draft Environmental Impact Report/Statement (DEIR/S), Chapter 28, Figure 28-1.

[24] Environmental Justice Communities in the Delta - American Community Survey 2014 data on population by race and Hispanic or Latino Ethnicity (of any race), accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_205.pdf.

[25] *Ibid.*

[26] BDCP DEIR/S, Figure 28-2.

federally-recognized poverty level occur in Antioch, Pittsburg, Clarksburg, Sacramento, Stockton, and West Sacramento.[27]

Delta region residents face isolating language barriers

There is a significant concentration of linguistically isolated residents who experience daily language barriers in Antioch, Pittsburg, Lathrop, Fairfield, Tracy, Stockton, Sacramento, and West Sacramento.[28]

Delta region has vital subsistence fishing beneficial uses

Most of the Delta region's environmental justice communities are concentrated in its largest cities: Antioch and Pittsburg in the western Delta; Fairfield, Suisun City, West Sacramento, and Sacramento in the northern Delta; and Stockton in the southern Delta, where the most distressed environmental justice communities reside. Environmental justice residents of these cities drink water from the Delta and use it for food preparation and sanitation. Some have jobs that rely on Delta water to grow crops or process raw materials into finished commodities, some for sale to environmental justice communities in the Delta region. Some fish the Delta for sustenance. Restore the Delta testimony to the State Water Board regarding the proposed California WaterFix change petition provides examples of environmental justice community entrepreneurship and other businesses expanding access to local agriculture with linkages to other sectors that provide jobs and healthful affordable food to poor and minority residents in the Stockton area. (See Attachment 5 to this letter.) Relative to their respective counties and to the United States, environmental justice communities are disproportionately represented in the Delta region's population.

Established Beneficial Uses Pertain to Environmental Justice Communities

The State Water Resources Control Board's 2006 Water Quality Control Plan established numerous beneficial uses to be protected by water quality objectives. They directly pertain to and reflect common linkages of environmental justice communities with employment, business, non-profit, and leisure pursuits. These beneficial uses include municipal and domestic supply; agricultural supply; groundwater recharge; navigation; contact water recreation; non-contact water recreation; shellfish harvesting; commercial and sport fishing; warm freshwater habitat ; cold freshwater habitat; migration of aquatic organisms; spawning, reproduction, and/or early development of

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[27] Environmental Justice Communities in the Delta - American Community Survey 2014 Data on Percentage of Families and People Whose Income in the Past 12 Months is Below the Poverty Level, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_206.pdf.

[28] Environmental Justice Communities in the Delta - American Community Survey 2014 Data on Language Spoken at Home, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_207.pdf.

aquatic organisms; estuarine habitat; wildlife habitat; and rare, threatened, or endangered species.[29]

Beneficial Uses Now Under Consideration by the State Water Board

The Board is also presently considering designation of beneficial uses for tribal traditional and cultural purposes, tribal subsistence fishing, and subsistence fishing uses of water.[30] In so doing, the State Water Board acknowledges that "tribes have cultural practices and ways of life that they wish to preserve and pass on to future generations."[31] Degradation of state waters, along with new sources of contamination and pollution to those waters, creates "distinctive changes to the tribes and their members….Providing beneficial use categories and descriptions designed to protect Native American uses of waters is an important step in ensuring that tribes have the opportunity to continue to practice their culture."[32]

Subsistence fishing, the Board also acknowledges, is practiced by both Native American and other cultures and individuals throughout California.[33] For many non-native cultural communities, subsistence fishing is also an integral cultural tradition preserved when these communities emigrated to the United States. Many are from Southeast Asia. They and other individuals and families may engage in subsistence fishing to provide food when low incomes make buying fish unaffordable. Many such subsistence fishers may also face language barriers, as the American Community Survey suggests.[34] The Board acknowledges that "in areas where bioaccumulatives have built up in fish tissue to unsafe levels to support subsistence fishing, most of the public is unaware of the dangers associated with consuming large amounts of fish and steps are not being taken to either reduce the contaminants in the fish or to educate the public."[35]

No state agency has yet conducted quantitative or qualitative surveys of subsistence fishing within the Delta.

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[29] State Water Resources Control Board, *Beneficial Uses Development: Tribal Traditional and Cultural, Tribal Subsistence Fishing, and Subsistence Fishing Beneficial uses, Stakeholder Outreach Document,* June 2016, pp. 8-9.

[30] *Ibid.*, pp. 3-4.

[31] *Ibid.*, p. 4.

[32] *Ibid.*

[33] *Ibid.*

[34] *Ibid.*; see also Attachment 2, regarding Delta region language barriers.

[35] *Ibid.*

Attachment 2
American Community Survey Data on Delta Region Environmental Justice Populations

Non-White Populations in the Delta Region

The presence of Black or African-American residents, for example, is significant in some notable Delta cities, like Antioch (21 percent), Pittsburg (21 percent), Sacramento (16 percent), Stockton (14 percent), Fairfield (18 percent), and Suisun City (25 percent) ; exceeding both county-wide and national population levels.[36]

American Indian and Native Alaskan populations throughout the Delta region are also significantly larger than their corresponding county-wide and national averages in Antioch (2.1 percent), Pittsburg (2.1 percent), Bethel Island (3.3 percent), Oakley (4 percent), Discovery Bay (1.9 percent), Sacramento (2.5 percent), Hood (28.6 percent), Isleton (1.9 percent), Lathrop (3.2 percent), Manteca (2.2 percent), Stockton (3.3 percent), Tracy (3.1 percent), Fairfield (1.8 percent), Rio Vista (2 percent), Suisun City (2.2 percent), Clarksburg (2.5 percent), and West Sacramento (3.4 percent).[37]

The concentration of Asian residents exceeds county-wide and national averages as well in the cities of Antioch (14.5 percent), Pittsburg (19.3 percent), Brentwood (11.6 percent), Oakley (10.9 percent), Discovery Bay (6.6 percent), Sacramento (21.5 percent), Walnut Grove (8.1 percent), Isleton (5.9 percent), Lathrop (23.3 percent), Manteca (9.8 percent), Stockton (24.4 percent), Tracy (18.8 percent), Fairfield (19.4 percent), Rio Vista (8.5 percent), Suisun City (24 percent), and in West Sacramento (13.7 percent).[38]

Native Hawaiian and Other Pacific Islander populations are larger relative to their share of either county population or that of the United States in Antioch (2.1 percent), Pittsburg (2.9 percent), Brentwood (0.8 percent), Oakley (0.8 percent), Discovery Bay (1.4 percent), Sacramento (2.3 percent), Walnut Grove (0.3 percent), Lathrop (2.2 percent), Manteca (1.5 percent), Stockton (1.4 percent), Tracy (2.5 percent), Fairfield (2.3 percent), Suisun City (2.9 percent), and West Sacramento (3.2 percent).[39]

Delta-area residents self-identify as “Some Other Race” in census tract data at rates higher than the national average in Antioch (14.2 percent), Pittsburg (21.8 percent), Brentwood (6.2 percent), Oakley (9.4 percent), Sacramento (9.7 percent), Freeport

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[36] Environmental Justice Communities in the Delta - American Community Survey 2014 data on population by race and Hispanic or Latino Ethnicity (of any race), accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_205.pdf.

[37] *Ibid.*

[38] *Ibid.*

[39] *Ibid.*

(39.7 percent), Courtland (37.1 percent), Hood (22.5 percent), Isleton (18.3 percent), Lathrop (14 percent), Manteca (13.5 percent), Stockton (14.5 percent), Fairfield (14.3 percent), Suisun City (14.2 percent), and West Sacramento (12.9 percent).[40]

Finally, the Hispanic or Latino community, comprised of residents of any race, is significantly higher than the corresponding county or national averages in Antioch (34 percent), Pittsburg (40.2 percent), Brentwood (25.8 percent), Byron (41.9 percent), Oakley (36.9 percent), Sacramento (27.6 percent), Freeport (39.7 percent), Courtland (39 percent), Hood (65 percent), Walnut Grove (29.8 percent), Isleton (34.6 percent), Lathrop (43.1 percent), Manteca (39.9 percent), Stockton (41.3 percent), Fairfield (27.3 percent), Suisun City (25.1 percent), Clarksburg (18 percent), and West Sacramento (31.9 percent).[41]

Impoverished Communities in the Delta Region

In Contra Costa County, the poverty rates for families, children (persons under 18 years), adults (18 years and over), and seniors (65 and over) are below the national rate. The poverty rate among all people in the county is 10.7 percent, about two-thirds the 15.6 poverty rate for the U.S.[42] In Antioch, about 10.5 percent of all families, 21 percent of those under 18 years, and 12.4 percent of those 18 years and over are considered impoverished. Poverty rates among Antioch seniors 65 years and over was 7.9 percent, exceeding the County's senior poverty rate of [ ] percent. In Pittsburg, about 14.6 percent of all families, 26.9 percent of all children, and 15 percent of all adults 18 years and over were considered impoverished. Poverty among Pittsburg seniors was 9.4 percent, also exceeding the County's senior poverty rate and equaling the nation's. In Oakley, about 10.1 percent of all adults and 13 percent of all seniors are considered impoverished.[43]

In Sacramento County, poverty rates for families, children, adults, and seniors exceed the national poverty rate. The County's poverty rate among all people in the county is 19.4 percent, compared with 15.6 percent for the U.S.[44] In the city of Sacramento, about 17.7 percent of all families, 31.7 percent of all children, 19.3 percent of all adults, and 11.7 percent of all seniors are considered impoverished. In Courtland, 30.3 percent of all adults, and 52.7 percent of all seniors are considered impoverished. In Isleton, 17.9 percent of all families, 48 percent of children, and 18.7 percent of adults are considered

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[40] *Ibid.*

[41] *Ibid.*

[42] Environmental Justice Communities in the Delta - American Community Survey 2014 Data on Percentage of Families and People Whose Income in the Past 12 Months is Below the Poverty Level, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_206.pdf.

[43] *Ibid.*

[44] *Ibid.*

impoverished. In Walnut Grove, 14.1 percent of adults and 13.6 of seniors are considered impoverished.[45]

In San Joaquin County, poverty rates for families, children, adults, and seniors exceed the nation's. County-wide, poverty is concentrated in the city of Stockton, where about 21.4 percent of families, 35.3 percent of children, 21.8 percent of adults, and 12.9 percent of seniors are considered impoverished.[46]

In Solano County, poverty rates for families, children, adults, and seniors are below the nation's. In Rio Vista, poverty rates exceed county and national levels for related children under 5 years of age, and adults 18 to 64 years. In Suisun City, 19.4 percent of children under 18 years are considered impoverished, exceeding both the county's and nation's poverty rates.[47]

In Yolo County, poverty rates for families and children under 18 are below the national poverty rates. (RTD-206.) However, Yolo County's poverty rates for adults 18 years and over and seniors exceed the nation's. In West Sacramento, 15.6 percent of all families, 29.1 percent of children under 18, 17.8 percent of adults, and 14 percent of seniors are considered impoverished. In Clarksburg, 11.5 percent of families, nearly half (49.2 percent) of children under 18, 13.8 percent of adults and 11.2 percent of seniors are considered impoverished.[48]

Delta Region Populations Facing Isolation from Language Barriers

In Contra Costa County, the 33.5 percent of the population 5 years and older that speaks languages other than English (categorized in the American Community Survey as Spanish; other Indo-European; Asian and Pacific Islander; and "other" languages), exceeds that of the nation's population (20.1 percent). Of the non-English language speakers in the county, the share of those people 5 years or older speaking English less than "very well" exceeds the national average of 8.7 percent. Delta region populations of those speaking a language other than English and that speak English less than "very well" that exceed the national rate occur in Antioch, Pittsburg, Byron, and Oakley. Delta region populations of those speaking English less than "very well" that exceed both the national and county rates occur only in Byron.[49]

In Sacramento County, 31.3 percent of the population 5 years and up speak languages other than English, exceeding the national average. Of the non-English language

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[45] *Ibid.*

[46] *Ibid.*

[47] *Ibid.*

[48] *Ibid.*

[49] Environmental Justice Communities in the Delta - American Community Survey 2014 Data on Language Spoken at Home, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_207.pdf.

speakers in the county, the share of those people 5 years or older speaking English less than "very well" exceeds that of the nation by more than 50 percent (13.6 to 8.7 percent). Residents of the cities of Hood, Isleton, Sacramento, and Walnut Grove, in particular, report speaking a language other than English, and indicate that they speak English less than "very well," in numbers that also significantly exceed national and county average rates.[50]

In San Joaquin County, 40 percent of the population 5 years and up speak languages other than English, exceeding the national rate. Of the non-English language speakers in the county, the share of those people 5 years or older speaking English less than "very well" exceeds that of the nation by nearly 200 percent (40 to 20.1 percent). Delta region residents that speak a language other than English, that speak English less than "very well," and that exceed the national rate occur in Manteca and Tracy. Delta region populations of those speaking a language other than English and that speak English less than "very well" and meet or exceed the national and county rates occur in Lathrop (18.1 percent) and Stockton (21.5 percent).[51]

In Solano County, 29.5 percent of its population 5 years and up speak languages other than English, exceeding the national rate. Of the non-English language speakers in the county, the share of those people 5 years or older speaking English less than "very well" exceeds that of the nation (11.2 to 8.7 percent). Delta region populations that speak a language other than English, that speak English less than "very well," and that exceed the national rate occur in Suisun City (9.8 percent). Delta region residents of those speaking a language other than English and that speak English less than "very well" and meet or exceed the national and county rates occur in Fairfield (13.2 percent).[52]

In Yolo County, 35 percent of its population 5 years and up speak languages other than English, exceeding the national rate. Of the non-English language speakers in the county, the share of those people 5 years or older speaking English less than "very well" exceeds that of the nation by nearly double (15.1 to 8.7 percent). Delta region populations of those that speak a language other than English, that speak English less than "very well," and that meet or exceed the national and county rates occur in West Sacramento (18.2 percent) and Clarksburg (16.4 percent).[53]

Within specific language categories of the American Community Survey, there are numerous Delta region cities and communities where the percentage of non-English

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[50] *Ibid.*, showing that residents in Hood report at a rate of 33.3 percent; residents of Isleton report at a rate of 22.8 percent; and Sacramento and Walnut Grove residents report at a rate of 16.1 percent and 16 percent respectively.

[51] *Ibid.*

[52] *Ibid.*

[53] *Ibid.*

speakers that speak English less than “very well” exceeds the national and county rates.[54]

[54] *Ibid.*

Attachment 3
Delta Region Distressed Community Index Scores and Narrative

Delta region residents of color and low income residents, including those with language barriers, live in quantifiably distressed areas

The presence of environmental justice communities does not tell the full story of the economic and public health challenges some of the most vulnerable Delta-area residents face. To help fill in that story, a recent study uses a "Distressed Communities Index" (DCI) that combines indicators of educational attainment (i.e., no high school degree), housing vacancy rate, adults not working, poverty rate, median income ratio (i.e., the ratio of community median income to that of the state), and changes in employment and business establishments between 2010 and 2013.[55] The DCI draws from seven indices of social and economic conditions using currently available data from the American Community Survey of the United States Census Bureau and other government data. They were chosen, according to this study, because:

> Distress manifests itself in a lack of residential investment, in shuttering businesses, and in disappearing job opportunities; prosperity the inverse. A high school diploma is the entry-level ticket to opportunity in the economy, and they remain scarce in many struggling neighborhoods.
>
> Low rates of adult employment identify communities where connections to the labor market have frayed; prospering communities, on the other hand, draw people back into the labor market with job opportunities. Poverty rates differentiate well-off from struggling communities too. And neighborhood median income relative to state median income sizes [i.e., measures] earnings differentials while controlling for differences in cost of living across the country.
>
> …The DCI does not surmount…inherent challenges [of the indicators used], but the index approach does mitigate their individual biases.[56]

1. Distress Scores

Distress scores are calculated, according to the study, "based on a geography's rank on each of the seven equally weighted variables. The ranks are then averaged and normalized to be equivalent to percentiles, resulting in distress scores between 0 and 100. The higher the distress score, the greater the distress."[57]

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[55] Economic Innovations Group, The 2016 Distressed Communities Index: An Analysis of Community Well-Being Across the United States, p. 5. Accessible at http://eig.org/wp-content/uploads/2016/02/2016-Distressed-Communities-Index-Report.pdf.

[56] *Ibid.*, pp. 6-7.

[57] *Ibid.*, p. 7.

The study used states, counties, cities with populations of 50,000 or more, and zip codes as its geographic units. The City of Stockton ranked sixth nationally among the most distressed large cities with a distress score of 95.2; 70.2 percent of the city's population lives in distressed zip codes.[58]

Among Delta region counties, Contra Costa County has the lowest distress score of 8.1, while San Joaquin County has the highest distress score at 58.5 (out of a possible 100). The study estimated that 43 percent of San Joaquin County's population resides in distressed zip codes.[59] Four of Stockton's zip codes had distress scores exceeding 90 (95202, 95203, 95205, and 95210), and three more had distress scores exceeding 80 (95204, 95206, and 95207). The zip code for French Camp, adjacent to Stockton, had a distress score of 95.4.[60]

Of the Delta cities measured in the study, Stockton had the highest distress score (95.2), while Sacramento had a distress score of 77.5. The study also included Antioch (distress score of 77.0) and Pittsburg (67.6).[61]

2. Adults with no high school degree

California's overall rate of adults without a high school degree is 19 percent. San Joaquin County exceeds this rate, at 22 percent, and a number of Delta communities significantly exceed, or at best, match the state-wide rate. Twenty-five percent of Stockton's adult population has no high school degree, compared with 23 percent in Pittsburg (zip code 94565), 17 percent in Sacramento, and 16 percent in Antioch (94509). Stockton-related zip codes have much higher rates: 47 percent in East Stockton (95205), 39 percent in the South Delta (95206), 37 percent in downtown Stockton (95202), 29 percent in East Hammer (95210), 28 percent in the Port/West Downtown (95203), 19 percent in the Country Club area (95204), and 43 percent in more rural French Camp ((95231).[62]

Zip code communities of central and southern Sacramento that also have very high rates of adults without high school degrees include: 40 percent in Parkway-South Sacramento (95824), 32 percent in Discovery Park area (95815), 27 percent in Florin (95828), 26 percent in Parkway (95823), 21 percent in the Sacramento City College

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[58] *Ibid*., p. 26, Figure 16.

[59] Summary of Delta Region Distressed Community Index Scores, with supporting data from Economic Innovations Group, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_212.pdf.

[60] *Ibid.*, PDF p. 2, Distress Score Column.

[61] *Ibid.*

[62] *Ibid.*, PDF p. 3, No High School column.

area (95822), 18 percent in North Oak Park (95817), and 17 percent in downtown Sacramento (95814).[63]

Other Delta zip codes have high rates of adults with no high school degree, including 31 percent in Freeport/Meadowview (95832), 24 percent in Northwest Sacramento (95605), and 20 percent in the Isleton area (95641).[64]

3. Housing vacancy rates

California had a 2014 housing vacancy rate of 6 percent state-wide, while Delta counties had vacancy rates ranging between 5 (Contra Costa) and 7 percent (Sacramento, San Joaquin, and Solano) overall, with many Delta region zip codes far exceeding these state and county-wide rates. In 2014, downtown Stockton's housing vacancy rate was 31 percent (zip code 95202). The Locke/Walnut Grove area experienced a housing vacancy rate of 22 percent in the same year; (zip code 95690), while Courtland experienced a 21 percent vacancy rate (zip code 95615). Downtown Sacramento had a housing vacancy rate of 15 percent (zip code 95814), and the Isleton area also had 15 percent vacancy rate (zip code 95641).[65]

4. Adults not working

Forty-four (44) percent of California adults were not working in 2014. Except for Contra Costa County at 41 percent, the other Delta counties ranged from the state's rate (Yolo County), up to 48 percent of adults not working in San Joaquin County. Forty-nine (49) percent of adults were not working in Stockton, while 45 percent were not working in Sacramento, 46 percent in Antioch, and 43 percent in Pittsburg. Zip code communities with the largest shares of adults not working include French Camp (73 percent), downtown Stockton (69), east Stockton (53), south Delta, Port/West Downtown Stockton, Lincoln Village, East Hammer (each 52), and Country Club area (49).[66]

Among Sacramento zip code distressed communities, all exceeded 50 percent of adults not working, ranging from 51 percent (Florin and Parkway) to 56 percent (Parkway-South Sacramento).[67]

Other Delta zip code communities exceeded the state's rate of non-working adults, ranging from 47 percent (Courtland) to 56 percent (Isleton area) of their adult populations, except for the Locke/Walnut Grove area (42 percent).[68]

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[63] *Ibid.*

[64] *Ibid.*

[65] *Ibid.*, PDF p. 4, Housing Vacancy Rate column.

[66] *Ibid.*, PDF p. 5, Adults Not Working column.

[67] *Ibid.*

[68] *Ibid.*

5. Median income ratio

Among Delta counties, Contra Costa had the highest median income ratio (county median income:state median income, 130 percent) and San Joaquin the lowest (87 percent). Among Delta cities, Stockton had the lowest median income ratio at 74 percent, followed by Sacramento (81), Antioch (88), and Pittsburg (91). Among zip code communities, downtown Stockton had the lowest median income ratio at 24 percent, followed by seventeen zip code communities whose median income ratios ranged from 46 percent (Parkway-South Sacramento) to 74 percent (Florin). Only two interior Delta zip codes exceeded 90 percent of the state median income: Locke/Walnut Grove (91 percent) and the Courtland area (96 percent).[69] (RTD-212, PDF p. 7, Median Income Ratio column.)

6. Employment growth

California saw growth in employment of 6.8 percent between 2010 and 2013. Among Delta counties, only Contra Costa exceeded this rate at 6.9 percent, while Sacramento saw 6 percent, Solano and Yolo each 5.6 percent, and San Joaquin just 3.5 percent growth in employment among its residents. Among Delta region cities, employment growth was negative for Pittsburg (-4.7 percent) and Antioch (-3.4), and only slightly positive for Stockton (2.7 percent) and Sacramento (2.4).[70] Among Delta zip code communities, three saw double-digit decreases in employment among their residents (Isleton area [-13.6 percent], East Hammer [-12.6] and Port/West Downtown [-11] in Stockton). Another seven zip codes saw single-digit employment declines or no employment growth, ranging from 0 percent for Courtland area to -8 percent for French Camp, with northwest Sacramento, downtown Sacramento, Country Club in Stockton, Locke/Walnut Grove, and Parkway-South Sacramento areas seeing intermediate declines. Zip code communities with positive employment growth ranged from 2.8 percent (Sacramento City College area) to 16.4 percent (downtown Stockton) with eight other zip code communities filling out this range.[71]

7. Growth in business establishments

California saw a 2.9 percent growth in business establishments between 2010 and 2013.[72] Among Delta counties, Contra Costa, Yolo, and Sacramento saw positive growth below the California rate (2, 1.9 and 1.4 percent respectively), while Solano and San Joaquin counties lost businesses (-1 and -1.5 percent respectively). Among Delta cities, only Sacramento saw positive growth in business establishments of 1.3 percent during this period, while Antioch (-7.5 percent), Stockton (-4.3), and Pittsburg (-0.1) all saw declines. Among Delta zip code communities, only one zip code nearest the legal

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[69] *Ibid.*, PDF p. 7, Median Income Ratio column.

[70] *Ibid.*, PDF p. 8, Percent Change in Employment column.

[71] *Ibid.*

[72] *Ibid.*, PDF p. 9, Percent Change in Businesses column.

Delta saw positive growth of businesses, Freeport/Meadowview (95832, 21.2 percent). Generally, most Delta zip code communities saw declines in business establishments. Stockton zip codes were among those hardest hit, ranging from a -10.1 percent decrease for downtown Stockton to -2.9 percent for the south Delta area (95206). Sacramento area zip codes saw decreases in business establishment of -9.3 for downtown Sacramento to -0.2 percent for the Sacramento City College area. Hardest hit among Delta zip codes included Locke/Walnut Grove (-14.1 percent) and the Isleton area.[73]

[73] *Ibid.*

Attachment 4
Delta Region Food Deserts: Narrative and Maps

Food deserts add to economic distress and unhealthy outcomes in the Delta region, including the Stockton Area

The economic distress faced by environmental justice communities in the Stockton region includes food insecurity and "food deserts," where entire districts and neighborhoods are no longer served by grocery stores making available healthy, fresh food choices to residents at easily accessible locations. (Delta region food deserts are mapped in Attachment 4 to this letter.)

Low income neighborhoods are at high risk of low access to grocery stores selling fresh, healthful foods. United States Department of Agriculture Economic Research Service maps illustrate the presence of census tract neighborhoods in the Delta region that face low access to healthy food options. The standard "food desert" definition is the absence of a grocery store within a 1-mile radius of residents in an urban census tract and a 10-mile radius for rural census tracts.

Many of the neighborhoods overlap with zip code neighborhoods that exhibit economic distress.[74] Significant portions of Stockton, Manteca, Lodi, Pittsburg, Antioch, Delta islands in Contra Costa County (south side of the San Joaquin River), Suisun City, Fairfield, Vacaville, Davis, and south Sacramento have low income census tracts whose residents have low access to grocery stores.[75]

Fifty-four percent of the five Delta counties' census tracts are low income and have low access to grocery stores serving healthful fresh food.[76] Over half of Sacramento and San Joaquin counties' census tracts are low income and low access.[77] Solano County has the highest share (17.1 percent) of census tracts in the Delta region meeting these characteristics, followed by Contra Costa and Sacramento counties.[78] However, urban census tracts in Delta counties face a severe shortage of grocery stores, to the point where there are fewer and fewer within even a half mile of residents, which is measured in US Department of Agriculture food access data. In the Delta, 58 percent of low

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[74] Summary of Delta Region Distressed Community Index Scores, with supporting data from Economic Innovations Group, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_212.pdf.

[75] United States Department of Agriculture, Economic Research Service, Food Access Maps and documentation, accessed July 24, 2016, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_238.pdf.

[76] Delta Food Access summary data from United States Department of Agriculture, Economic Research Service, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_239.pdf.

[77] *Ibid.*

[78] *Ibid.*

income and low-access census tracts lack grocery stores within one-half of a mile in urban census tracts and 10 miles in rural, led by Yolo County (74 percent), San Joaquin County (65 percent), and Sacramento County (57 percent).[79] Across the Delta, about one-sixth of census tracts have sizable low-income and low food access populations without vehicle access to facilitate grocery shopping.[80]

The lack of affordable healthy food choices that are also accessible can contribute to poor health outcomes in low-income environmental justice communities. A 2013 San Joaquin County health assessment found that 10 county zip codes had obesity rates exceeding the state average (24.8 percent). Three zip codes were found to have food deserts meeting the federal definition in which at least 500 people and/or 33 percent of the population live more than one mile (urban) or 10 miles (rural) from a supermarket or large grocery store.[81] None of the 10 zip codes had a farmers' market located within the zip code boundary at the time.[82] The County-wide adult obesity rate in 2016 was 29.1 percent, compared with the state average of 22.3 percent.[83]

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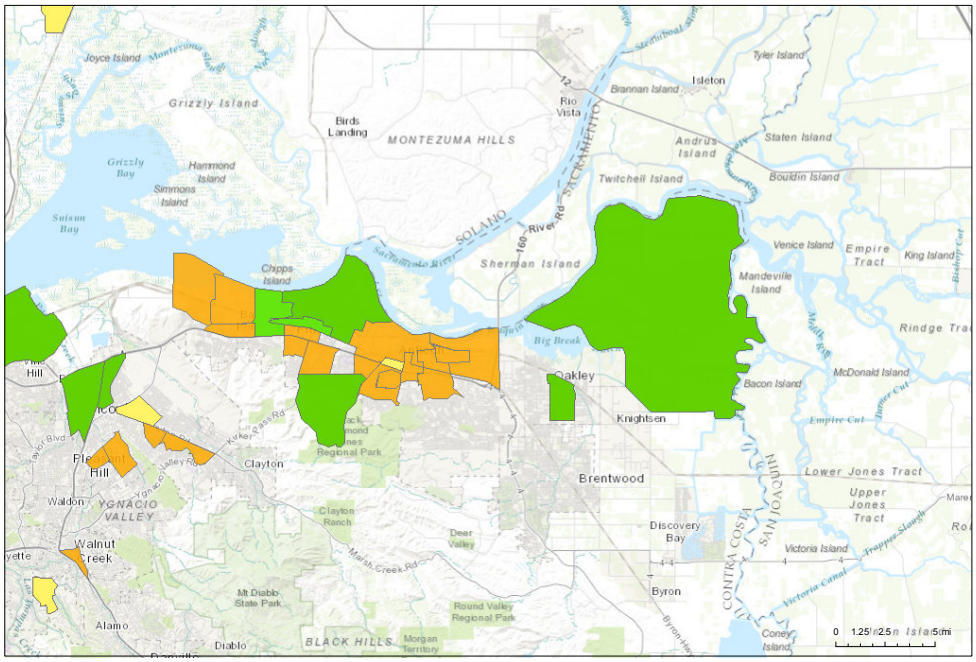
[79] *Ibid.*

[80] *Ibid.*

[81] Valley Vision, Inc., A Community Health Needs Assessment of San Joaquin County, conducted on behalf of San Joaqui County Community Health Assessment Collaborative, March 2013, pp. 34-35, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_240.pdf.

[82] *Ibid.*

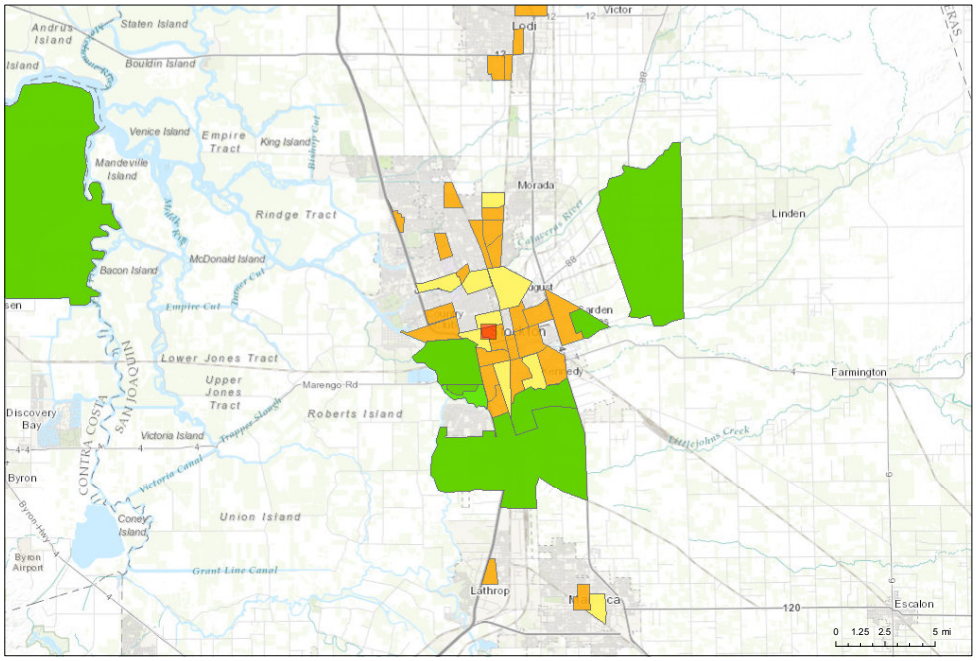
[83] San Joaquin County 2016 Community Health Needs Assessment, p. 15, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_246.pdf.



Central Western Delta Food Access Map

LILATracts_1And10Gen: LILA at 1 and 10
LILATracts_VehicleGen: LILA using Vehicle Access
LILATracts_1And20Gen: LILA at 1 and 20
LILATracts_halfAnd10Gen: LILA at 1/2 and 10

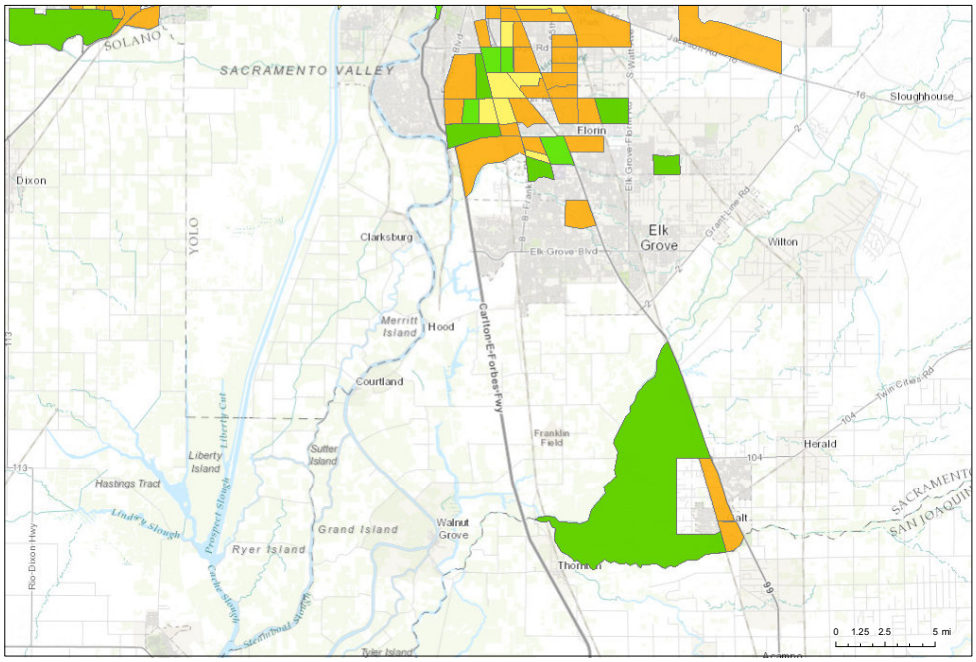
Date: 7/22/2016 Source: USDA Economic Research Service, ESRI. For more information: http://www.ers.usda.gov/data-products/food-access-research-atlas/documentation.aspx



Stockton Low Income and Low Access Map

LILATracts_1And10Gen: LILA at 1 and 10
LILATracts_VehicleGen: LILA using Vehicle Access
LILATracts_1And20Gen: LILA at 1 and 20
LILATracts_halfAnd10Gen: LILA at 1/2 and 10

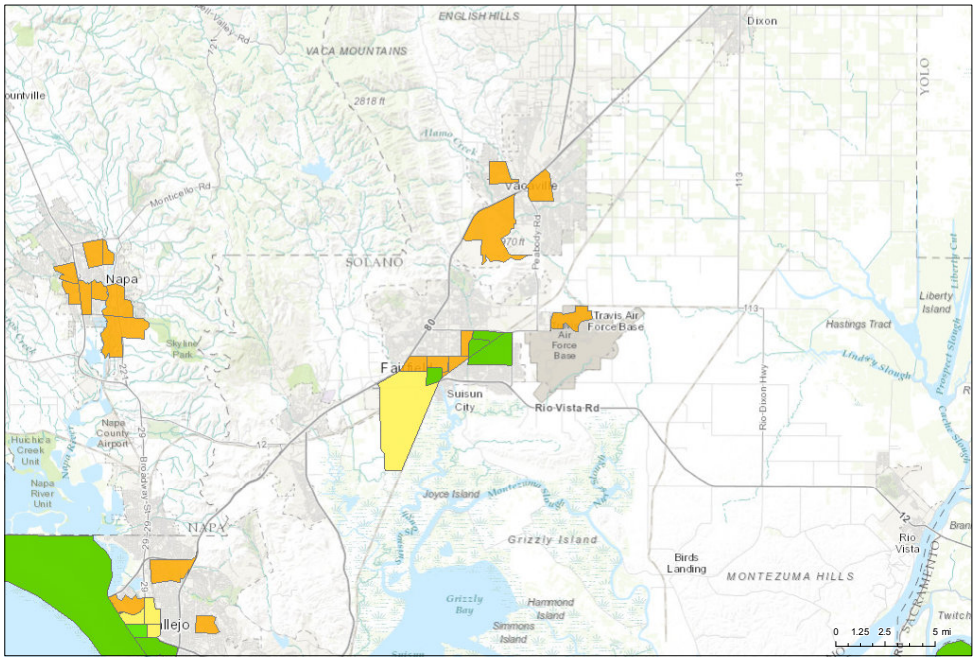
Date: 7/22/2016 Source: USDA Economic Research Service, ESRI. For more information: http://www.ers.usda.gov/data-products/food-access-research-atlas/documentation.aspx



North Delta Food Access Map

LILATracts_1And10Gen: LILA at 1 and 10
LILATracts_VehicleGen: LILA using Vehicle Access
LILATracts_1And20Gen: LILA at 1 and 20
LILATracts_halfAnd10Gen: LILA at 1/2 and 10

Date: 7/22/2016 Source: USDA Economic Research Service, ESRI. For more information: http://www.ers.usda.gov/data-products/food-access-research-atlas/documentation.aspx



Solano Area Food Access Map

LILATracts_1And10Gen: LILA at 1 and 10
LILATracts_VehicleGen: LILA using Vehicle Access
LILATracts_1And20Gen: LILA at 1 and 20
LILATracts_halfAnd10Gen: LILA at 1/2 and 10

Date: 7/22/2016 Source: USDA Economic Research Service, ESRI. For more information: http://www.ers.usda.gov/data-products/food-access-research-atlas/documentation.aspx

Attachment 5
Stockton Retail Water Sources and Related Drinking Water Quality Description

The City of Stockton is a majority minority city, and is the largest city closest to the legal Delta. The city and its environmental justice communities faces an array of threats to its fresh water supply and water quality. This attachment summarizes these threats, and the City of Stockton's efforts to address them.

"Under natural conditions," stated civil engineer and Delta expert Thomas Means in 1928, "the boundary between salt and fresh water was Carquinez Straits. In late summer, Suisun Bay became brackish, but salt water penetrated as far as Antioch only rarely and then for but a few days' time."[84] With "no large increase of cultivated land in the delta region," the increasingly salty waters in the Delta threatened agriculture and industry in the region. Their incursion was due to upstream diversions of fresh water in the Sacramento Valley reducing flow entering the Delta "to a small fraction of the flow under natural conditions."[85] The quality of water was found crucial to the economic, agricultural, and industrial development and vitality of the San Francisco Bay estuary. Means described four relationships between Delta water quality and local economic development:

> First, [increased salinity] renders questionable the irrigation of permanent crops, particularly such crops as are sensitive to salt; second, it has a tendency through the percolation beneath the levees of sub-irrigating the adjoining land with saline water; third, it reduces the value of lands through the fear of salinity; and fourth, it adds expense and uncertainty to the question of domestic supply, for on most of the delta the river is a source of domestic water.[86]

The factors Means identified are no less true today. The City of Stockton draws water from the Delta for domestic and municipal use. The City of Stockton obtained water right permit 21176 (Application 30531A) from the State Water Resources Control Board on December 20, 2005, to divert a flow not to exceed 317 cubic feet per second and 33,600 acre-feet per year from the San Joaquin River at the southwest tip of Empire Tract.[87] This permit required the City to complete its point of diversion, raw water and treated water transmission pipelines, and its 30 million-gallon-per-day (MGD) water treatment facility by December 31, 2015. Permit 21176 requires the City to complete application of water to its authorized uses by December 31, 2020.

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[84] Thomas H. Means, Salt Water Problem, San Francisco Bay and Delta of Sacramento and San Joaquin Rivers, April 1928, p. 17. Accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_213.pdf.

[85] *Ibid.*, p. 21.

[86] *Ibid.*

[87] Stockton Retail Water Sources, 2015, accessible at the end of Attachment 5 and at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_225.pdf.

The City received its water supply permit (01-10-15P-001 for public water system No. 3910012) on July 21, 2015, and is operating the diversion and treatment facility at this time to deliver water to its north and south Stockton customers.[88] The City's domestic water supply system diverts raw water at the Delta Water Supply Project (DWSP) under permit 21176 for treatment at the new Water Treatment Facility, pumps four (4) groundwater wells in south Stockton and 13 in north Stockton, and purchases treated water from Stockton East Water District and raw water from Woodbridge Irrigation District.[89] The City's permit for Delta water use constrains diversions between February 15 and June 15. During this period, the City's purchase contract with Woodbridge Irrigation District (WID) provides an alternative source during the City's Delta curtailment period in the period March 1 through July 30. From February 15 through March 15, Delta water pumping and Water Treatment production may not exceed 15 MGD.[90] From March 1 through March 15, WID water may be blended with Delta water or WID water used exclusively from the WID source. Between March 15 and May 21, no Delta water may be pumped, and the raw water needs of the plant must be met exclusively from the WID source. From May 21 to June 15, either Delta water or WID water may be used exclusively to meet the raw water needs of the plant up to its capacity of 30 MGD. From June 15 to July 30, either Delta water or WID water may be used exclusively to meet raw water needs of the plan up to its capacity of 30 MGD, or a blend of the two sources may be used. Between July 30 and February 15, the Delta water diversion may be used to meet the City's raw water needs up to the plant's capacity of 30 MGD.[91]

The City of Stockton started operation of its DWSP in 2012. The City may take delivery of up to 17,500 acre-feet per year through its purchase contract with Stockton East Water District (SEWD).[92] Currently, due to drought and a reduction in SEWD's supplies, the City takes much less, about 5,634 acre-feet in 2015, and expects to receive 6,000 acre-feet in 2016 from SEWD's reservoir supplies of Stanislaus and Tuolumne River sources. The City's urban water management plan states that Stockton will use approximately 6,000 acre-feet per year from SEWD.

From WID, the City of Stockton executed an agreement in 2008 to purchase up to 6,500 acre-feet annually. This water originates from the Mokelumne River. Stockton

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[88] State Water Resources Control Board, Transmittal of Water Supply Permit to City of Stockton, July 21, 2015, pp. 1-10; accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_220.pdf.

[89] *Ibid.*, p. 4, 11-12.

[90] *Ibid.*, p. 26, Section 4.2.

[91] *Ibid.*

[92] City of Stockton, Draft Urban Water Management Plan, 2015, May 2016, p. 5-1, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_218.pdf.

anticipates that its WID purchases will double to 13,000 acre-feet by 2025.[93] In all, the City of Stockton's Municipal Utilities Department water supply portfolio supplied 24,843 acre-feet of water during 2015 to its 47,000 domestic, municipal, and industrial customers. The City claims as its total water rights or safe yield water supplies of up to 96,480 acre-feet, nearly four times its 2015 deliveries.[94] The City of Stockton projects it will increase its DWSP diversions to 50,000 acre-feet by 2035.[95]

The City of Stockton is concerned about the future reliability of water quality at its DWSP intake and potential water treatment cost increases if California WaterFix facilities are constructed and operated. The City of Stockton alleges that DWR and the Bureau have failed to use data collected near the City's Delta Water Supply Project (DWSP) for impact analysis of potential harm.[96] Instead, Petitioners relied on a DWR monitoring station at Buckley Cove, nearly 10 miles southeast of the City's DWSP diversion point. The City stated that "Buckley Cove cannot be considered representative of the water quality available at the City's intake."[97] The City informed Petitioners:

> The City has been collecting water quality data in the stretch of the San Joaquin River near its intake for over 30 years. Despite being on notice about the City's significant concerns about water quality effects in the area of its intake, the BDCP proponents did not obtain or use any of this data in preparing the DEIR/EIS. Moreover, DWR maintains a water quality station less than one-half mile from the City's intake. It was unreasonable for the DEIR/EIS to not have used data from that water quality station in order to more accurately evaluate impacts to the City's drinking water supply. It is not possible for the project proponents or the City to determine how the BDCP will affect water quality conditions at the City's intake until a Delta Simulation Model run is conducted for our intake site proximity.[98]

With enough time, whatever land saline water touches can turn salty, unless there is enough water to leach out salts.[99] Uses of water in the Delta depend largely on the

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[93] *Ibid.*, p. 5-12, Table 5-7; Projected Water Supplies for Stockton, 2020 to 2040, p. 1. See end of Attachment 5 to this letter.

[94] *Ibid.*, p. 5-11, Table 5-6.

[95] *Ibid.*

[96] City of Stockton, 2014 Bay Delta Conservation Plan comments, pp. 38-43.

[97] *Ibid.*, p. 38, 39.

[98] *Ibid.*, p. 38.

[99] Thomas H. Means, Salt Water Problem, San Francisco Bay and Delta of Sacramento and San Joaquin Rivers, April 1928, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_213.pdf, and California Department of Water Resources, Quantity and Quality of Waters Applied to and Drained from the Delta Lowlands, Report No. 4, July 1956, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_148.pdf.

quality of water available, rather than the quantity, but if quality degrades it may become unusable.[100] About one-quarter of Stockton's urban water supplies will rely on groundwater, a source that is connected to Delta surface water percolation.[101] The region is at risk of salinity incursion regionally from the west due to increased salinization of Delta channels.[102]

The Stockton region is poised for growth in the near future

While distressed, the Delta region has prospects for growth and sustainability in jobs and economic development, at least some of which depend on protecting and improving Delta region water quality. For example, water quality is important to agricultural and urban economic development in the Delta region.

The Delta region, and especially metropolitan Stockton, is poised for employment and income growth. According to the University of the Pacific Eberhardt School of Business May 2016 forecast:

> Recent years have seen substantial economic growth and recovery in the Stockton and Fresno MSAs [Metropolitan Statistical Areas, identified by the U.S. Office of Management and Budget] to the surprise of many. As its largest city, Stockton, fell into bankruptcy in 2012 many predicted doom and stagnation for the Stockton MSA (San Joaquin County). Instead, the Stockton MSA is in the process of posting its 4th consecutive year of job growth above 3 percent, led by a booming logistics sector that has added more than 6,000 warehousing and trucking jobs in the last year as Amazon and other fulfillment centers have flocked to its strategic location as the closest part of the Central Valley to the booming Bay Area. Most of this expansion has been in the southern half of San Joaquin County (i.e. Tracy, Lathrop, Manteca) but it has also provided an employment and economic boost to Stockton city residents. The economic gains are especially impressive since the devastated residential construction industry has only begun to recover and remains one-fourth its pre-recession size as

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[100] W. Turrentine Jackson and Alan M. Paterson, The Sacramento-San Joaquin Delta: The Evolution and Implementation of Water Policy, an Historical Perspective, Caliofrnia Water Resources Center, Contribution No. 163, June 1977, http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_215.pdf.

[101] Stockton Retail Water Sources, 2015, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_225.pdf; and Projected Water Supplies for Stockton, 2020 to 2040, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_226.pdf.

[102] Northeastern San Joaquin County Groundwater Banking Authority, Eastern San Joaquin Groundwater Basin, Groundwater Management Plan, 2004, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_146.pdf; and San Joaquin County Flood Control and Water Conservation District, Water Management Plan, Phase 1 - Planning Analysis and Strategy, October 2001, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_147.pdf.

> housing demand and costs rise. There is substantial room for additional growth and we project the Stockton MSA will lead Northern California in job growth in 2016 and 2017 before slowing down.[103]

Between 2016 and 2020, per capita income in the Stockton MSA is projected to grow from an estimated $38,400 at the end of 2015 to about $45,200 at the end of 2020, a nearly 18 percent increase. Total employment is forecast to rise from 222,300 non-farm jobs at the end of 2015 to about 241,200 jobs by the end of 2020 (an 8.5 percent increase over the five-year period), while the region's unemployment rate is forecasted to fall from 8.6 percent at the end of 2015 to about 7.5 percent at the end of 2020.

Threats to environmental justice communities' beneficial uses from conveyance proposals like California WaterFix

Delta agriculture continues as the region's economic base, and irrigation water quality is the foundation for the sustainability of that future growth. Threats from conveyance projects exist to beneficial uses of water by environmental justice communities in the Delta region, particularly in the Stockton area where the largest and most distressed environmental justice communities are found.

Delta environmental justice communities are isolated from more mainstream levels of prosperity by language barriers, low educational attainment rates, and lack of economic opportunity. Since environmental justice communities are closely linked to issues raised by California WaterFix like drinking water quality; agricultural, land use, and socioeconomic issues; and fish contamination issues, their residents are made more vulnerable by the disproportionately distressed conditions in which they live. Water quality impacts from construction and operation of California WaterFix would be environmental blunt trauma to a region on the threshold of recovery and sustainable prosperity, if water quality in the Delta and underground water sources can be improved.

Environmental justice communities in the Delta region face quantifiable economic distress where they live, and threats to beneficial uses of water they enjoy. There is also evidence that the Delta region's economy has prospects for improving income, employment and economic opportunity generally in the near future.

We provide additional detailed evidence concerning the need to protect crucial beneficial uses of drinking water for predominantly low-income Stockton customer service areas and public health concerns for human use of Delta waters related to subsistence fishing, due to the current presence of long-term contaminants and the potential for increased frequency of harmful algal blooms due to operational effects of California WaterFix Facilities.

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[103] University of the Pacific Eberhardt School of Business, Center for Business and Policy Research, May 2016 California and Metro Forecast, p. 7, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_216.pdf.

Operation of California WaterFix Facilities would degrade water quality in Delta channels, which would in turn degrade raw water diversions and, via deep percolation, the eastern San Joaquin County groundwater basin, both of which serve as sources of drinking water for Stockton metropolitan area residents.

The two largest suppliers of urban drinking water in Stockton are the City of Stockton Municipal Utilities Department and California Water Service Company (CWSC). Both suppliers recently prepared urban water management plans.[104]

Urban Water Supplies and Demand of Stockton's Environmental Justice Communities.

CWSC delivered about 22,090 acre-feet to its Stockton District customers in 2015. To meet these supplies, CWSC purchased 15,350 acre-feet (69.5 percent) from Stockton East Water District (SEWD) and pumped 6,740 acre-feet (30.5 percent) of local groundwater in 2015. CWSC projects that by 2040 its customers will increase demand to 30,740 acre-feet per year, a 39 percent increase over the next 25 years, although an absolute increase of just 8,650 acre-feet. Total urban water supplies for Stockton delivered by these two water suppliers in 2015 came to 46,933 acre-feet.[105]

Both water suppliers disclosed how much water their low-income customer households use. These customers live in census blocks where the median income is less than 80 percent of the state median income. They comprise about 43 percent of housing stock in the City's water service areas in north and south Stockton, according to the City's recent general plan housing element. Their water use in the City's service area is estimated at 10,300 acre-feet per year.[106]

CWSC reports that, for purposes of estimating water demand of lower income households, the City's general plan housing element indicated that 47 percent of CWSC's service area would qualify as lower income households. In 2015, lower income household customer demand was about 5,475 acre-feet of water use. By 2040, lower income household customer demand is projected to be about 8,213 acre-feet.[107]

Total low-income household water use amounts to about 15,775 acre-feet at present in Stockton. Together, the City and CWSC project about 18,500 acre-feet of low-income household demand by 2040. This is approximately the drinking water demand for Stockton's environmental justice communities.

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[104] California Water Service Company, 2015 Urban Water Management Plan, Stockton District, June 2016 (hereafter CWSC UWMP); and City of Stockton, Draft Urban Water Management Plan, 2015, May 2016 (hereafter Stockton UWMP).

[105] CWSC UWMP, p. 67, Table 6-8.

[106] Stockton UWMP, p. 3-7.

[107] CWSC UWMP, pp. 36-37.

Urban Drinking Water Quality in Stockton

Each year, urban water suppliers release a summary water quality report based on samples of their treated drinking water. Both the City of Stockton and CWSC's water quality reports distinguish their reporting results by groundwater versus surface water sources.[108] In Stockton's case, surface water quality sampling distinguishes between treated water supplies purchased from SEWD and the Delta Water Treatment Plant (which originated from the Stockton Delta Water Supply Project (DWSP)).[109] At present, the only primary water quality standard violation Stockton experienced during 2015 concerned total trihalomethanes in surface water, which reached as high as 84 micrograms per liter (µg/L), in just one sample at Westchester Circle (the maximum contaminant standard is 80 µg/L).[110]

CWSC suffered one primary water quality standard violation in 2015 when its purchased water supplier (SEWD) did not meet the total organic carbon (TOC) compliance standard.[111] TOC provides a medium for formation of disinfection byproducts like trihalomethanes and halo-acetic acids. According to CWSC's water quality report, SEWD is now meeting the TOC standard in 2016.[112]

Both the City and CWSC report a somewhat elevated presence in their water samples of total dissolved solids (TDS), which is a secondary drinking water matter (addressing water's discoloration or odor). Stockton reports a TDS range in its groundwater of 210 to 560 milligrams per liter (mg/L) and an average of 358 mg/L, while its surface water sources have generally lower ranges and annual average concentrations of TDS.[113]

CWSC's groundwater has TDS concentrations that range higher than the City's groundwater but has a lower overall average TDS for groundwater than the City. CWSC's surface water TDS averages 160 mg/L, while Stockton's Delta water averages about 216 mg/L, and its purchased Stockton East water averages about 151 mg/L.[114]

Regarding California WaterFix environmental documents, Contra Costa Water District (CCWD) commented on carcinogens, of which bromide is a precursor to the formation of disinfection byproducts (which include bromate, bromoform, and other brominated trihalomethanes [THMs], and halo acetic acids. All of these constituents are potentially

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[108] City of Stockton Water Quality Report for 2015, June 2016 (hereafter Stockton WQR); California Water Service Company, 2015 Water Quality Report (hereafter CWSC WQR).

[109] Stockton WQR, p. 3.

[110] *Ibid.*, p. 3, 4, footnote 8.

[111] CWSC WQR, p. 15.

[112] *Ibid.*, p. 15, footnote 5.

[113] Stockton WQR, p. 5.

[114] CWSC WQR, p. 16; Stockton WQR, p. 5.

harmful to human health through municipal water supplies.[115] CCWD commented further that neither environmental review of Petition Facilities is adequate, first because tallying just the number of days the bromide objective is violated fails to disclose the magnitude of the excess bromide. Similarly, the percent change in concentration also obscures human health risks of increased bromide levels.The absolute magnitude is directly related to the level of health risk from bromide due to its contribution to carcinogen production during the water treatment process. If the bromide analysis looks only at the number of days or percent change in which a threshold is exceeded, it obscures the human health impact of the exceedance.[116]

Such contaminants cumulating in Delta water channels would have to be treated prior to distributing drinking water supplies obtained therein. CCWD further commented that:

> Conventional water treatment plants are not capable of removing many of these toxic and noxious algal byproducts and could require costly upgrades to handle increases in these compounds. CCWD's two water treatment plants (Bollman and Randall-Bold) have ozone treatment systems that are capable of removing current levels of algal byproducts at the proper ozone dosage and pH level. However, the expected increase in algal byproducts caused by the BDCP would require a corresponding increase in ozone dosage; the amount of such an increase is limited by the requirement not to increase bromate formation to levels that exceed the bromate maximum contaminant level, established to prevent the potential carcinogenic effects of excess bromate in drinking water.…
>
> CCWD provides treated water to its customers from the Bollman water treatment plant in Concord and Randall-Bold water treatment plant in Oakley. Both water treatment plants use flocculation, sedimentation, filtration, ozonation, and chloramination to produce high quality drinking water. CCWD relies on ozone application to reduce tastes and odors but the effectiveness of the treatment is limited by pH and regulated disinfection byproduct limits. Increased cyanobacteria in Delta waters would necessitate more frequent changes of filtration materials and increase chemical usage (ozone and sulfuric acid) to control pH, disinfection byproducts [citation], and noxious tastes and odors.[117]

Based on the array of treatment techniques identified by CCWD the City of Stockton would likely have to raise water rates on top of those increases it identified in its 2016 water rate study, in order to ensure distribution and delivery of safe, clean and affordable drinking water in its service area for the long term.

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[115] Contra Costa Water District, Comments on Bay Delta Conservation Plan and Draft EIR/EIS, July 25, 2014, including attachments, p. 56.

[116] *Ibid.*, p. 57.

[117] *Ibid.,* p. 62.

Stockton's efforts to protect its drinking water supplies and its protest to the State Water Resources Control Board on California WaterFix.

The City informed the State Water Resources Control Board in January 2016 that it sought to develop the DWSP to protect regional groundwater from increasing overdraft and to reduce its draw on groundwater because of that source's higher TDS content.[118] The City stated:

> Groundwater levels improved over the past few decades in the Stockton vicinity, but if groundwater must be relied upon more extensively as a result of the proposed action, groundwater levels will be expected to decline, and TDS levels in potable supplies and wastewater discharges will increase. Indirect groundwater-related effects of this nature would be inconsistent with the Sustainable Groundwater Management Act or its goals.[119]

The City also stated, in protest of the California WaterFix proposal, that:

> …the City's economy, and the health and well-being of City residents, are dependent on the health of the Delta, including water quality and fish and wildlife resources, and Delta agriculture.[120]

The City's DWSP was developed under a California Water Code section that provides that a municipality discharging water into the San Joaquin River "may file an application for a permit to appropriate an equal amount of water, less diminution by seepage, evaporation, transpiration or other natural causes between the point of discharge and the point of recovery, downstream from said disposal plant and out of the San Joaquin River or the Sacramento-San Joaquin Delta." (Cal.Water Code § 1485.) The DWSP now appropriates Delta water supplies to serve some 47,000 residential, commercial, and industrial customers with an estimated service population of 170,000 people in the City's service area.[121] The City expressed grave concerns that DWR and the Bureau have ignored City water rights, quality, and supply, as these would be affected by California WaterFix during the BDCP environmental review process in 2013-2014 as well as the California WaterFix environmental review process during 2015.[122]

The City, representing its service area customers and its economic base, commented that water quality effects on agriculture and urban water supplies are also connected to the City's future prospects:

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[118] City of Stockton, Protest of California WaterFix Change Petition, January 5, 2016, p. 2.

[119] *Ibid.*, Attachment 2, p. 2, and Attachment 4, p. 1.

[120] *Ibid.*, Attachment 2, p. 1.

[121] City of Stockton, 2014 Bay Delta Conservation Plan Comments, p. 1.

[122] *Ibid.*; City of Stockton, 2015 California WaterFix RDEIR comments.

> There is no analysis of the relative effect on the City's economy, despite its role as a major center of agricultural-dependent business in the Delta. There are many agricultural processing, packing and shipping, and other (e.g., insurance) businesses within the City that could be adversely affected as a result of the impacts to agriculture from the BDCP (loss of agricultural production in areas surrounding the City). The BDCP could have adverse socioeconomic impacts as a result of adverse effects to agriculture-dependent businesses, agricultural recyclers, and their labor force who reside in the City. There is a trend of agricultural industries leaving the City, and the BDCP could exacerbate this trend. Reduced economic activity will result in empty buildings, decreased investment, reduced tax revenues, which will further constrain the City's ability to maintain public infrastructure, and therefore physical blight through deterioration of physical and aesthetic conditions within the City.[123]
>
> [A]griculture in the Delta will be harmed from increased levels of salinity resulting from the operation of the Delta tunnels. The DEIR/EIS water quality chapter claims that BDCP impacts on salinity will be minimal based on the BDCP's modeling, but these results are strongly disputed. Furthermore, the state has repeatedly violated current water quality standards in the Delta or relaxed standards in dry years such as 2014 [and 2015]. Given this history of weak enforcement in the current system, the tens of billions of dollars borrowed to build the isolated conveyance system, and the fact that this debt will be repaid from revenues of water sales from the Delta, the risk of the BDCP actually operating differently than described in the DEIR/EIS and serious degradation of Delta water quality through excessive North Delta diversions is great.[124]

In its comments on California WaterFix in October 2015, the City reminded DWR and the Bureau that the City's 2014 comments "identified numerous problems with BDCP and DEIR/DEIS" and stated that "to the City's surprise and dismay, none of the problems [we] identified…were addressed by the changes to the Project or the revised environmental documents."[125]

Water affordability in Stockton

The City of Stockton and its residents are under financial pressure to pay down debt incurred to develop the DWSP. The City announced in May 2016 water rate increases for 2016 and 2017 of 18 percent and 11 percent, with 3 percent increases projected for future years, according to its recent water rate study.[126] Should California WaterFix be

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[123] Stockton 2014 BDCP comments, p. 50.

[124] *Ibid.*, p. 52.

[125] Stockton 2015 California WaterFix Comments, p. 2.

[126] City of Stockton, Municipal Utilities Department, May 2016 Water Rate Study, p. 4, 58.

permitted, would have a construction period as long as 14 or 15 years.[127] Meanwhile, water quality impacts (including increased risk of turbidity, salinity, and mobilization of mercury or methyl mercury, and selenium from Delta channel sediments) from the construction and operation of these facilities could result in increased treatment costs beyond those contemplated in Stockton's water rate study. **These upward pressures on local water costs could further disproportionately burden Stockton's environmental justice communities' drinking water supplies with higher water rates over the next 15 years, and beyond.** The proponents of California WaterFix have failed to demonstrate that Stockton's water rights at DWSP and the City's urban drinking water customers would not be injured by construction and operation of California WaterFix. This oversight has profound environmental justice implications for Stockton residents, many of whom are environmental justice communities and neighborhoods.

Petition Facilities' potential to degrade water quality would affect subsistence fish consumption by environmental justice communities in the Delta region, should the frequency of environmental conditions that foster toxic algal blooms increase.

DWR and the Bureau acknowledge occurrence of subsistence fishing and risks of adverse effects to people consuming fish caught from Delta channels in the period when California WaterFix operates. There has never been a census of Delta subsistence anglers, despite the potential health risks of catching and consuming fish routinely from Delta channels. Using publicly available data from the California Department of Fish and Wildlife (DFW), Restore the Delta estimates through two distinct methodologies that there are, on any given day, between 66 and 110 licensed subsistence anglers from distressed communities fishing Delta water ways.[128] Our methodologies rely on both an angling hours survey and county-level fishing license data from DFW. Assumptions are spelled out in our exhibits accepted into evidence by the State Water Board detailing how we arrived at our estimates.[129] Our methods conservatively assume that each angler fishes just once a year, which probably underestimates total subsistence fishing activity in the Delta. Despite this limitation of our methods, we estimate between 24,000 to 40,000 subsistence fishing visits annually in the Delta from local residents of distressed communities. We offer no estimate of the mass of fish nor the number of persons actually consuming those fish.

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[127] California WaterFix RDEIR/SDEIS, July 2015, p. 4.3.8-18:7, p. 4.3.8-25:20, p. 4.3.8-41:1, 37, p. 4.3.12-1:8, p. 4.3.16-1:11

[128] Methodology for Estimating Population of Delta Region Subsistence Anglers from Fishing License Data, p. 2, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_229.pdf; and Methodology for Estimating Delta Counties Subsistence Anglers from Angling Intensity (Hours) Data, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_230.pdf.

[129] *Ibid.*

Delta region subsistence anglers have been found to fish along both the Sacramento and San Joaquin Rivers, despite the latter being an impaired water body for a number of contaminants.[130] Delta region subsistence anglers are known to catch and consume a variety of native and introduced fish species, including American shad, bluegill, carp, catfish, crappie, Chinook salmon, largemouth bass, pike minnow, Sacramento split tail, Sacramento sucker, steelhead/rainbow trout, striped bass, sturgeon, and sunfish.[131]

Many fish caught and consumed by subsistence anglers consume prey from the bottom of river channels where contaminants can accumulate. Other fish consumed by subsistence anglers feed on prey consumed in open water or other parts of river channels. In the course of consuming prey, these species may also consume contaminants such as mercury, pesticides, selenium, and other chemicals that accumulate in prey tissues and that are regulated via Total Mean Daily Loads adopted by the State Water Board and Central Valley Regional Water Quality Control Board. Consequently, environmental justice communities are at risk of heightened exposure to health risks associated with consuming fish caught through subsistence angling in the Delta.[132]

In addition, such fish may be vulnerable to disease and death from exposure to toxins released by harmful algal blooms, such as microcystin, a hepatotoxin (toxic to liver tissue and skin) produced by *Microcystis*, a common cyanobacterium found in the Delta since 1999.[133] Key factors believed by scientists to drive algal blooms that cause harm in open water ways include water temperature, sunlight irradiating water, water clarity, a

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[130] F. Shilling, et al, 2010. Contaminated fish consumption in California's Central Valley Delta. *Environmental Research* 110(2010): 335, Figure 1, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_231.pdf.

[131] *Ibid.*, p. 336 Table 1; J.A. Davis, et al., 2008. Mercury in sport fish from the Sacramento-San Joaquin Delta region, California, USA. *Science of the Total Environment*, 391: 69, Table 2, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_232.pdf.

[132] Shilling, et al, 2010; Davis, et al, 2008; E. Silver, et al, 2007. Fish consumption and advisory awareness among low-income women in Sacramento0-San Joaquin Delta, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_235.pdf.

[133] Berg, M. and M. Sutula, 2015. Factors affecting the growth of cyanobacteria with special emphasis on the Sacramento-San Joaquin Delta, Southern California Coastal Water Research Project Technical Report 869, August 2015, p. 4, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_236.pdf; and P.W. Lehman, et al, 2013. Long-term trends and causal factors associated with *Microcystis* abundance and toxicity in San Francisco Estuary and implications for climate change impacts. *Hydrobiologia* 718: 142, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_237.pdf.

stratified water column coupled with long residence times of water; availability of nitrogen and phosphorus, and salinity.[134]

Two of these factors would be directly affected by operation of Petition Facilities: residence time of water and salinity. Increased residence time of water decreases the loss rate of cyanobacteria from a water body.[135] Increased residence time of water also influences inversely the stratification of the water column; the slacker the flow of water the more the upper levels of a water column can warm to an optimal growth temperature range for *Microcystis*, between 25 and 35 degrees Centigrade (77 to 95 degrees Fahrenheit).[136] Such conditions may occur mainly in late summer months, but climate change effects may shorten California's winter wet season and contribute to extending the season during which harmful algal blooms may occur.[137]

Operation of California WaterFix would also increase residence time of water in the Delta. When such increased residence time is combined with reduced flows and increased salinity, also caused by California WaterFix, the period of time could increase during which environmental conditions favor algal blooms.

The environmental justice effects of increased harmful algal blooms would include increased contamination of fish populations locally from microcystin uptake and accumulation and increased risk of illness and death for environmental justice community members and pet dogs they may take with them fishing, due to contact with water while engaged in subsistence fishing. These effects would be borne disproportionately by racial and ethnic minorities, people in poverty, and people challenged by language barriers. These disproportionate effects would accumulate with the economic distress already prevalent in their communities and would undermine long-term growth in jobs, economic output, and sustainable economic development in the Stockton region.

DWR and the Bureau bear the burden to prove that legal users of water, including members of the environmental justice communities, will not be harmed by the new north Delta points of diversion. While the RDEIR/S attempts to bury, dismiss, and lessen significant water quality impacts, it should be remembered that the RDEIR/S states the following regarding the Delta's significant environmental justice community:

> Alternative 4A [the preferred California WaterFix alternative] would result in disproportionate effects on minority and low-income communities resulting from land use, socioeconomics, aesthetics and visual resources, cultural resources, noise, and public health effects. Mitigation and environmental commitments are available to reduce these effects; however, effects would remain adverse. For

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[134] Berg and Sutula, *ibid.*, p. ii, and pp. 21-33.

[135] *Ibid.*, p. 33.

[136] *Ibid.*, p. 31, 33.

[137] *Ibid.*, p. iii, 32, 48, 51.

> these reasons, effects on minority and low-income populations would be disproportionate and adverse.[138]

The City's attorney, Kelley Taber, elicited from modeling panel testimony that Petitioners' modeling team was unfamiliar with or did not recall seeing the City's comment letters, or responded to one or both of them only in the context of preparing responses to comments for the California WaterFix's Final EIR/EIS.[139] Ms. Taber also elicited testimony from the California WaterFix modeling panel before the SWRCB stating that the modeling team did not model Stockton's Empire Tract intake for its DWSP. This contrasts with the modeling team's inclusion of modeling results for urban drinking water intakes at Banks and Jones Pumping Plants, Contra Costa Water District's Rock Slough Intake for the Contra Costa Canal, and the City of Vallejo's municipal intake in the north Delta.[140] The modeling team, according to this testimony, indicated that they relied upon conversion equations applied to water quality modeling results derived from water quality stations near to Stockton's wastewater treatment plant and water treatment plant intake.[141] The nearest of these water quality stations was, as DWR witness Parviz Nader-Tehran stated, "a few miles" away from Stockton's discharges and intakes.

Contra Costa Water District (CCWD) noticed this assumption by the Draft BDCP EIR/EIS in its 2014 comments because Petitioners applied this assumption not only to Stockton's intake on the San Joaquin River but to CCWD's intakes at Rock Slough, Old River, and Victoria Canal.[142] CCWD termed this assumption "inappropriate" and "unreasonable" because the actual intakes and their presumably representative locations were up to 17 miles apart.[143] Moreover, CCWD chose to locate new intakes further east in the Delta to escape encroaching salinity from reduced Delta inflows:

> [I]ndeed, it is the difference in salinity at different locations in the Delta interior that drove CCWD's construction of its Old River intake and Middle River intake on Victoria Canal (collectively "Old and Middle River intakes"). Even intakes that are relatively close together such as CCWD's Old and Middle River intakes have very different water quality because of the complexity of the hydrodynamics in the Delta.[144]

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[138] California WaterFix RDEIR/SDEIS, July 2015, p. 4.3.24-8 [PDF page 1,202].

[139] Cross examination of Modeling Panel, August 25, 2016, morning session.

[140] California WaterFix RDEIR/SDEIS, July 2015, p. 4.3.24.8 [PDF page 1,202].

[141] *Ibid.*

[142] Contra Costa Water District, Comments on Bay Delta Conservation Plan and Draft EIR/EIS, July 25, 2014, including attachments, p. 70, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_153.pdf.

[143] *Ibid.*, pp. 70-71, Figure 2-1.

[144] *Ibid.*, p. 70.

CCWD's 2014 comments also directly criticized the attempt to use Buckley Cove as "representative" in water quality conditions to the location of the City of Stockton's DWSP intake, stating that "results from modeling of the No Action Alternative, performed for BDCP Draft EIR/EIS and provided to CCWD by DWR [citation], illustrate that salinity at the City of Stockton's intake differs significantly from salinity at…Buckley Cove. The quality of water at the Buckley Cove is not representative of the City of Stockton's intake."[145] This figure shows modeled salinity differences reflecting electrical conductivity results on the order of 300 to 600 microsemens per centimeter for a modeled period similar to the 1975 through 1977 drought.[146]

Differences in water quality at varied locations in the interior Delta can often be due to differences in source water. Some locations' source water is dominated by water originating from the Sacramento River, while other locations are dominated by San Joaquin River water; still other locations may be dominated by Bay waters. According to source water analysis obtained by CCWD from DWR, Stockton's intake often receives greater than 70 percent of its water from the Sacramento River, while Buckley Cove seldom receives water from the Sacramento.[147]

Concerning bromide effects, the City of Stockton alleges that Petitioners chose Buckley Cove as the monitoring station for modeling changes in bromide levels representative of the City's DWSP intake.[148] The City expressed its concern that:

> What would the bromide concentration level increases be at the City's Delta intake? The BDCP must evaluate the effects of changes in bromide levels at or near the City's intake on the San Joaquin River, including effects on consumers of water and on City operations. Further, if treatment plant upgrades may be necessary due to increased levels in bromide due to the BDCP, significant environmental and economic impacts need to be evaluated and mitigated by the BDCP, not left to the City to address.[149]

Evaluating a high bromide or salinity, but non-representative water quality site between the No Action Alternative baseline conditions and California WaterFix's operational effects, would overstate concentrations of salinity and bromide at the baseline, and by doing so could, in turn, minimize the change in salinity or bromide concentrations.

CCWD also commented on carcinogens, of which bromide is a precursor to the formation of disinfection byproducts (which include bromate, bromoform, and other brominated trihalomethanes [THMs], and halo acetic acids). All of these constituents are

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[145] *Ibid.*, p. 72, Figure 2-2.

[146] *Ibid.*

[147] *Ibid.*, pp. 73-74, Figure 2-4.

[148] City of Stockton, 2014 Bay Delta Conservation Plan comments, p. 39.

[149] *Ibid.*, p. 40.

potentially harmful to human health through municipal water supplies.[150] CCWD commented further that neither environmental review of Petition Facilities is adequate, first because tallying just the number of days the bromide objective is violated fails to disclose the magnitude of the excess bromide. The magnitude is directly related to the level of health risk from bromide due to its contribution to carcinogen production during the water treatment process. If the bromide analysis looks only at the number of days a threshold is exceeded, or percent change in concentration, it obscures the human health impact of the exceedance.[151]

Similarly, CCWD stated that California WaterFix's environmental reviews obscure bromide concentration impacts by limiting its identification of significant bromide impacts to those at Barker Slough/North Bay Aqueduct.[152] No other locations were analyzed, although it is possible that significant bromide impacts would occur at other drinking water intakes in the Delta, such as Stockton's.

Nitrosamines and harmful algal blooms were also identified in CCWD's comments as potential human carcinogens if found in drinking water supplies above safe thresholds.[153] In particular, CCWD commented that operation of Petition Facilities would contribute to physical factors that would contribute to the type of environment in which cyanobacteria (species that can make up harmful algal blooms) thrive, such as: increased nutrients (such as ammonium), increased tidal mixing contributing more salinity to Delta waters; increased residence time of water; and increased water clarity.[154]

California WaterFix is expected to increase residence times of water in Delta channels. CCWD commented that projected increases in residence time would allow cyanobacteria blooms to thrive and last longer than they now do in the Delta. This would be expected particularly in the south Delta, where south Delta exports at Banks and Jones pumping plants will decrease as SWP and CVP operators "would likely preferentially use" the north Delta intakes, which could result in a negative feedback where the north Delta intakes would be used more and more in the event that higher residence times in the south contribute to longer-lasting harmful algal blooms, exacerbating the impact.[155]

Concerning chloride effects, the City of Stockton alleges that the Petitioners failed to address impacts from chloride to its DWSP intakes, preferring in the BDCP DEIR/EIS to

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[150] Contra Costa Water District, Comments on Bay Delta Conservation Plan and Draft EIR/EIS, July 25, 2014, including attachments, p. 56.

[151] *Ibid.*, p. 57.

[152] *Ibid.*

[153] *Ibid.*, pp. 60-65.

[154] *Ibid.*, pp. 63-64.

[155] *Ibid.*, pp. 64-65.

defer impact disclosure and possible mitigation to "some later date," which the City called unacceptable.[156]

190. Water quality effects on groundwater supplies for municipal beneficial uses.

Such water quality effects in Delta channels would affect groundwater, since surface and groundwater supplies in the Delta are connected. The Delta area has a large pumpage depression or "cone of depression" that causes an influx of water from the Delta to percolate to underground water supplies.[157] United States Geological Survey groundwater modeling estimates that Delta surface channels lose between 100 to over 500 acre-feet per year to groundwater percolation.[158] Surface water was also found to recharge groundwater from Calaveras and Stanislaus rivers and Dry Creek. On average there was a net lateral inflow to the groundwater system of 120,000 acre-feet between 1970 and 1993 (an estimated annual average of about 5,000 acre-feet per year).[159] Generally, groundwater pumping rates in San Joaquin County in 2004 were found to exceed the sustainable yield of the groundwater basin, estimated to be approximately 150,000 to 160,000 acre-feet.[160] The eastern San Joaquin groundwater basin management plan assumed that "all basin inflow in west Stockton is saline" because "accretions in the western fringes of the Basin and the Lower San Joaquin River are undesirable due to elevated salinity levels. Saline groundwater intrusion has forced the closure of several wells in the Calwater service area."[161] The City of Stockton's domestic water supply permit from the State Water Resources Control Board shows that Stockton has nine inactive wells and has destroyed another 17 wells.[162] Increased west-to-east flow is considered by San Joaquin County's groundwater basin management plan is

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[156] City of Stockton, 2014 Bay Delta Conservation Plan comments, p. 41.

[157] Faunt, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, p. 167, column 2, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_145.pdf.

[158] *Ibid.*, pp. 171-172, Figure C19.

[159] Northeastern San Joaquin County Groundwater Banking Authority, Eastern San Joaquin Groundwater Basin, Groundwater Management Plan, 2004, p. 69, Section 2.3.4.4. Accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_146.pdf.

[160] *Ibid.*, p. 69, Section 2.3.6.

[161] *Ibid.*

[162] State Water Resources Control Board, Transmittal of Water Supply Permit to City of Stockton, *op. cit.*, pp. 13-14.

"undesirable," as this water is typically higher in TDS and chloride levels and causes degradation of water quality in the Basin.[163] The plan further states:

> Degradation of water quality due to TDS or chloride contamination threatens the long-term sustainability of a very important water resource for San Joaquin County, since water high in TDS and/or chloride is unusable or either urban drinking water needs or for irrigating crops. Damage to the aquifer system could for all practical purposes be irreversible due to saline water intrusion, withdrawal of groundwater from storage, and potential subsidence and aquifer consolidation.[164]

The saline front of groundwater intrusion beneath south and downtown Stockton is projected to move another 1.5 miles east by 2030, just as future urban water demand was expected to see a net increase among the cities of San Joaquin County of 146,600 acre-feet per year.[165]

191.Summary of Water Quality Degradation

Increased groundwater percolation from Delta channels containing surface water that is made more saline by operation of California WaterFix facilities would increase the risk that poorer DWSP water quality would force Stockton and its other urban water supplier, California Water Service Company, to rely more on groundwater sources to supply their customers.

There are many legal users of water in the north Delta, where major agricultural crops include pears, vineyards, and other permanent deciduous crops which depend on good quality fresh water supplies. Removal of 20 percent or more of the fresh water in this region of the agricultural Delta will reduce fresh water supplies to farmers and cause injury to their water rights and crop productivity when salts build up in soil horizons, which must be leached out.[166] Available salinity modeling from the RDEIR/SDEIS indicates that central Delta locations will see increased salinity conditions as an effect of construction and operation of Petition facilities. Increased salinity conditions in affected

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[163] Northeastern San Joaquin County Groundwater Banking Authority, Eastern San Joaquin Groundwater Basin, *op. cit.*, p. 71, Section 2.3.7.

[164] *Ibid.*

[165] *Ibid.*, p. 74, Figure 2-27, p. 75, Table 2-4; San Joaquin County Flood Control and Water Conservation District, Water Management Plan, Phase 1 - Planning Analysis and Strategy, October 2001, pp. 2-15 to 2-16, Figures 2-8 and 2-9, and p. 2-18, Table 2-3, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_147.pdf.

[166] California Department of Water Resources, Quantity and Quality of Waters Applied to and Drained from the Delta Lowloands, Report No. 4, July 1956, accessible at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/RTD_148.pdf.

parts of the Delta will mean agricultural uses will be injured by having either to accept lower crop yields or shift to more salt-tolerant crops, or both.

Stockton Retail Water Sources, 2015

		2015 (Acre-feet quantities)		
Water Supply	**Additional Detail on Water Supply**	**Actual Volume**	**Water Quality**	**Total Right or Safe Yield**
City of Stockton				
Purchased water	SEWD	4,159	Drinking water	6,380
Purchased water	WID (DWSP Intake Facility)	4,628	Raw water	6,500
Supply from storage				
Groundwater	Eastern San Joaquin Sub-basin 5-22.01	6,628	Raw water	50,000
Surface water	Delta (DWSP Intake Facility)	9,428	Raw water	33,600
Recycled water		0		0
Desalinated water		0		0
Stormwater use		0		0
Transfers		0		0
Exchanges		0		0
City of Stockton Total Supplies		**24,843**		**96,480**
California Water Service Company				
Purchased or imported water	SEWD	15,350	Drinking water	
Groundwater	Eastern San Joaquin Sub-basin 5-22.01	6,740	Drinking water	
California Water Service Company Total Supplies		**22,090**		**0**
Total, Urban Stockton Water Supplies		**46,933**		**96,480**

Sources: RTD-219, p. 67, Table 6-8; RTD-218, p. 5-11, Table 5-6.

Projected Water Supplies for Stockton, 2020 to 2040

		2020		2025		2030		2035		2040	
Water Supply Type	**Water Supply Source**	**Available Volume**	**Total Right or Safe Yield**	**Available Volume**	**Total Right or Safe Yield**	**Available Volume**	**Total Right or Safe Yield**	**Available Volume**	**Total Right or Safe Yield**	**Available Volume**	**Total Right or Safe Yield**
City of Stockton											
Purchased water	SEWD	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Purchased water	WID	6,500	6,500	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000
Supply from storage											
Groundwater		23,100	50,000	23,100	50,000	23,100	50,000	23,100	50,000	23,100	50,000
Surface water	Delta (DWSP Intake Facility)	33,600	33,600	33,600	33,600	33,600	33,600	50,000	50,000	50,000	50,000
Recycled water		0	0	0	0	0	0	0	0	0	0
Desalinated water		0	0	0	0	0	0	0	0	0	0
Stormwater		0	0	0	0	0	0	0	0	0	0
Transfers		0	0	0	0	0	0	0	0	0	0
Exchanges		0	0	0	0	0	0	0	0	0	0
City of Stockton Total Supplies		**69,200**	**96,100**	**75,700**	**102,600**	**75,700**	**102,600**	**92,100**	**119,000**	**92,100**	**119,000**
California Water Service Company											
Purchased or imported water	SEWD	24,000		24,000		24,000		24,000		24,000	
Groundwater		5,642		5,772		6,040		6,361		6,740	
California Water Service Company Total Supplies		**29,642**		**29,772**		**30,040**		**30,361**		**30,740**	
Total, Urban Stockton Water Supplies		**98,842**	**96,100**	**105,472**	**102,600**	**105,740**	**102,600**	**122,461**	**119,000**	**122,840**	**119,000**

Attachment 6

Media Release

Statewide Water Savings Exceed 25 Percent in February

Conservation to Remain a California Way of Life

FOR IMMEDIATE RELEASE
April 4, 2017

Contact: George Kostyrko
george.kostyrko@waterboards.ca.gov

SACRAMENTO — The State Water Resources Control Board today announced that urban Californians' monthly water conservation was 25.1 percent in February, more than double the 11.9 percent savings in February 2016, when state-mandated conservation targets were in place.

The cumulative statewide savings from June 2015 through February 2017 remains at 22.5 percent, compared with the same months in 2013. Since June 2015, 2.6 million acre-feet of water has been saved – enough water to supply more than 13 million people – exceeding a third of the state's population – for a year.

"Even with a banner year for winter precipitation, Californians have continued to practice sensible conservation, with a significant drop in water use in the South Coast," said State Water Board Chair Felicia Marcus. "Though our water picture is significantly improved in most of California, we have to maintain our drought memory and shift to planning and action to prepare for the long term. From transitioning to California-friendly landscapes and smart irrigation systems, to reducing leaks and increasing use of recycled water and other measures – we need to keep in motion to face a future with longer and more severe droughts under climate change."

In November, the State Water Board and other state agencies released a draft plan for achieving long-term efficient water use and meeting drought preparedness goals that reflect California's diverse climate, landscape, and demographic conditions.

The plan, "Making Water Conservation a California Way of Life," includes making permanent the monthly reporting of water use from urban water suppliers. It also includes permanently prohibiting wasteful practices like hosing off sidewalks and driveways, excessively watering lawns or watering lawns during or within 48 hours after a rain event.

The plan's fundamental premise is that efficient water use helps all of California better prepare for longer and more severe droughts caused by climate change. A final plan is expected to be released soon.

Conservation Data

- Statewide water savings for February 2017 was 25.1 percent (85,962 acre feet or 28 billion gallons), an increase from January 2017's 20.7 percent savings, and more than double February 2016's 11.9 percent savings (13.6 billion gallons).
- All but one hydrologic region reported greater water savings in February 2017 than for the same month last year. Notably, the South Coast hydrologic region decreased its water production substantially (saving about 51,208 acre-feet or 16.7 billion gallons), and contributed almost 60 percent to the statewide water savings in February 2017.
- Cumulative statewide percent reduction for June 2015 – February 2017 (twenty-one months) is 22.5 percent, which equates to 2,597,681 acre-feet (846.5 billion gallons).
- Statewide average water use for February 2017 was 57.5 gallons residential gallons per capita per day (R-GPCD), the lowest R-GPCD reported to date (below the 57.9 R-GPCD reported for January 2017).
- See the February fact sheet here. All February data can be found on this page.

Background

To learn about all the actions the state took to manage our water system and cope with the impacts of the drought, visit Drought.CA.Gov. To learn more about the state's efforts to build long-term water sector resilience, visit the Governor's Water Action Plan page

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Attachment 7

Making Water Conservation a California Way of Life

Implementing Executive Order B-37-16

FINAL REPORT
April 2017

This report was prepared by the California Department of Water Resources, State Water Resources Control Board, California Public Utilities Commission, California Department of Food and Agriculture, and California Energy Commission in response to Governor Edmund G. Brown Jr's Executive Order B-37-16 and to provide information to the California Legislature and the public.

This report is available in electronic form:
http://www.water.ca.gov/wateruseefficiency/conservation/

Edmund G. Brown Jr.
Governor
State of California

William Croyle
Acting Director
California Department of Water Resources

Felicia Marcus
Chair
State Water Resources Control Board

Michael Picker
President
California Public Utilities Commission

Karen Ross
Secretary
California Department of Food and Agriculture

Robert B. Weisenmiller
Chair
California Energy Commission

Executive Summary

The past five years have brought both historic drought and flooding to California – a reflection of the fact that California experiences the most extreme variability in yearly precipitation in the continental United States. Variability marks California water resources not just year to year, but also by season and location. Our water systems routinely move water hundreds of miles to serve large cities and immense agricultural productivity, but also must help sustain ecologically valuable river and estuary systems. Our population of nearly 40 million people is expected to grow, and climate change is expected to bring rising sea levels, reduced snowpack, and altered precipitation patterns that will affect our ability to maintain water supplies and wildlife habitat. Widespread, careful use of water will help us cope no matter how conditions change. We must always be prepared for extreme fluctuations and use water more wisely, eliminate waste, strengthen local drought resiliency and improve agricultural water use efficiency and drought planning.

The California Water Action Plan, first released in 2014 and updated in 2016, is the five-year roadmap used by the Brown Administration to bring resilience and reliability to our water systems and to restore important ecosystems. Ten principles define California's Water Action Plan, including "Make Conservation a California Way of Life."

In May of 2016 Governor Edmund G. Brown Jr. signed Executive Order (B-37-16) that instructed State agencies to help Californians adopt permanent changes to use water more wisely. The Executive Order laid out a framework for moving the state from temporary, emergency water conservation measures to a more durable approach customized to the unique conditions of each local water agency. This report builds upon the Executive Order and provides recommendations for how to implement long-term improvements to water supply management that support water conservation.

Building on Past Success

After Governor Brown called for a 25 percent reduction in urban water use in 2015, Californians rose to the challenge and saved an average of more than 24 percent during the twelve months the mandate was in place. Executive Order B-37-16 builds on that conservation success to establish long-term water conservation measures.

Key to the Executive Order is a requirement that the state's 409 urban water suppliers meet new water use targets. Rather than measuring water savings as a percentage reduction from a chosen baseline, the new standards recognize past investments by water suppliers in advancing conservation, and take into account the unique climatic, demographic and land-use characteristics of each urban water agency's service area. This approach allows regions to develop an approach best suited for their community.

Managing water under this framework will require the collective and concerted efforts of state and local governments, non-governmental organizations, businesses, and the public. All of these groups responded to the Governor's call for mandatory water conservation efforts in 2015, and must continue the collaboration to implement the important actions laid out in the Executive Order and this report.

Preparing This Report and Key Recommendations

Five state agencies – the Department of Water Resources, the State Water Resources Control Board, the California Public Utilities Commission, the California Department of Food and Agriculture, and the California Energy Commission (collectively referred to as the "EO Agencies") – were charged with implementing the Executive Order's four inter-related objectives: using water more wisely, eliminating water waste, strengthening local drought resilience, and improving agricultural water use efficiency and drought planning.

The EO Agencies will undertake a suite of actions that can be implemented using existing authorities to implement the four objectives. These include rulemaking proceedings, expanded technical assistance, and evaluation and certification of new technologies. Where necessary, the EO Agencies also recommend additional actions and authorities needed to meet the goals of the Executive Order.

Using Water More Wisely

Emergency Conservation Regulations (Executive Order Item 1): The State Water Resources Control Board (Water Board) will rescind the emergency requirement for a water supply stress test or mandatory conservation standard for urban water agencies, but, to provide a bridge to permanent requirements, it will continue to require monthly reporting and to prohibit wasteful practices (see below).

New Water Use Targets (Executive Order Items 2 and 6): Upon statutory authorization, the EO Agencies will adopt a new urban water use target methodology. Urban water suppliers would, in turn, be required to calculate their unique water use targets based on those standards and local conditions.

Permanent Monthly Reporting (Executive Order Item 3): The Water Board will open a rulemaking process to establish permanent monthly urban water reporting on water usage, amount of conservation achieved, and any enforcement efforts.

Eliminating Water Waste

Water Use Prohibitions (Executive Order Item 4): The Water Board will open a rulemaking process to establish permanent prohibitions on wasteful water practices, such as hosing down sidewalks and watering lawns after rain. This will build on the current prohibited uses in the emergency regulation.

Minimizing Water Loss (Executive Order Items 5 and 6): Senate Bill 555 (Wolk, 2015) requires all urban retail water suppliers in the state to submit a completed and validated water loss audit annually to the Department of Water Resources. The EO Agencies will take additional actions to accomplish the directives in that law related to reducing water supplier leaks. These actions include establishment of rules for validated water loss audit reports, water loss performance standards, and technical assistance for water loss audits and minimizing leaks.

Innovative Water Loss & Control Technologies (Executive Order Item 7): The California Energy Commission (CEC) is evaluating various options for certification of water loss detection and control technologies at utility, household, and appliance levels. The CEC is also making investments in research and funding programs for water saving devices and technologies.

Strengthening Local Drought Resilience

Water Shortage Contingency Plans (Executive Order Items 8, 9, and 6): Upon statutory authorization, urban water suppliers will be required to submit a Water Shortage Contingency Plan, conduct a Drought Risk Assessment every five years, and conduct and submit a water budget forecast annually.

Drought Planning for Small Water Suppliers and Rural Communities (Executive Order Item 10): The EO Agencies' recommendations focus on working with small water suppliers and rural communities to continue to develop more specific drought vulnerability assessments and supplier readiness and responsiveness during drought.

Improving Agricultural Water Use Efficiency and Drought Planning

Strengthened Agricultural Water Management Plan Requirements (Executive Order Items 11, 12, 13, and 6): Upon statutory authorization, the proposal described in this report would expand existing requirements to require agricultural water suppliers providing water to over 10,000 irrigated acres of land to prepare, adopt, and submit plans by April 1, 2021, and every five years thereafter.

Table ES-1 summarizes the organization of the conservation framework presented in this report and the corresponding Executive Order items.

Implementation

The Administration will work closely with the Legislature to implement the recommendations of this report. The EO Agencies hope that this report will advance our progress under the California Water Action Plan and help "Make Conservation A Way of Life."

Table ES-1. Actions and Recommendations Summarized in this Report

Chapter Section and Title where Item is Addressed	Executive Order Items													Within Existing Authorities (Chapter 2)	Requires New Authority (Chapter 3)
	Use Water More Wisely			Eliminate Water Waste				Strengthen Local Drought Resilience			Improve Agricultural Water Use Efficiency & Drought Planning				
	1	2	3	4	5	6	7	8	9	10	11	12	13		
2.1 Emergency Water Conservation Regulations for 2017	●													✓	
2.2 Permanent Prohibition of Wasteful Practices			●	●										✓	
2.3 Reduced Water Supplier Leaks and Water Losses					●	●								✓	
2.4 Certification of Innovative Technologies for Water Conservation and Energy Efficiency							●							✓	
3.1 New Water Use Targets Based on Strengthened Standards		●				●									✓
3.2 Water Shortage Contingency Plans						●		●	●						✓
3.3 Drought Planning for Small Systems & Rural Communities										●					✓
3.4 Agricultural Water Management Plans						●					●	●	●		✓

Note: The Executive Order directs DWR, Water Board, and CPUC to develop methods to ensure compliance with the provisions of the order, including technical and financial assistance, agency oversight, and, if necessary, enforcement action by the Water Board to address non-compliant water suppliers. These are described in Chapters 2 and 3.

Contents

Acronyms and Abbreviations

20x2020	20 percent reduction in urban per capita water use by 2020
20x2020 Plan	20x2020 Water Conservation Plan
AB	Assembly Bill
AU	Agronomic Use
AW	Applied Water
AWMP	Agricultural Water Management Plan
AWUF	Agronomic Water Use Fraction
AWWA	American Water Works Association
BMP	best management practice
CASGEM	California Statewide Groundwater Elevation Monitoring
CCF	centum cubic feet
CCR	California Code of Regulations
CCUF	Crop Consumptive Use Fraction
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
CII	commercial, industrial, and institutional
CIMIS	California Irrigation Management Information System
CPUC	California Public Utilities Commission
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
DWR	California Department of Water Resources
E	evaporation
EO	Executive Order B-37-16
EO Agencies	California Department of Water Resources, State Water Resources Control Board, California Department of Food and Agriculture, California Public Utilities Commission, California Energy Commission
EPIC	Electric Program Investment Charge
ETo	Reference evapotranspiration
ETc	evapotranspiration of crops
ETAF	Evapotranspiration Adjustment Factor

ETAW	Evapotranspiration of Applied Water
EU	Environmental Use
EWMP	Efficient Water Management Practice
GPCD	gallons per capita per day
GRC	General Rate Case
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
MOU	Memorandum of Understanding
MWELO	Model Water Efficient Landscape Ordinance
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RF	Recoverable Flows
SB	Senate Bill
SGMA	Sustainable Groundwater Management Act
SRA	Shortage Response Action
SWRCB or Water Board	State Water Resources Control Board
TWUF	Total Water Use Fraction
USEPA	U.S. Environmental Protection Agency
UWMP	Urban Water Management Plan
Water Action Plan	California Water Action Plan
Water Loss TAP	California Water Loss Control Collaborative' s Technical Assistance Program
WET	Water Energy Technology
WMF	Water Management Fraction
WSCP	Water Shortage Contingency Plan

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Chapter 1 – Introduction

Water has been a scarce resource in California, and conservation must become a way of life for everyone. Much has changed in the past half century, and our technology, values, and awareness of how we use water have helped to integrate conservation into our daily lives. More can be done, however, and all Californians must embrace and make part of their daily lives the principles of wise water use.

Water has played a significant role in California's history and development. Droughts have often marked critical shifts or tipping points in water resources management, altering how citizens and elected officials view and manage water. Over time, an awareness of water use and water conservation has evolved that has fueled best management practices, funding programs, and legislative and regulatory actions.

California droughts are expected to become more frequent and persistent, as warmer winter temperatures driven by climate change reduce water held in the Sierra Nevada snowpack and result in drier soil conditions. Current drought conditions, which severely impacted the State over the last several years, may persist in some parts of the State into 2017 and beyond. Recognizing these new conditions, permanent changes are needed to use water more wisely and efficiently, and prepare for more frequent, persistent periods of limited supply in all communities and for all water uses, including fish, wildlife, and their habitat needs.

This chapter describes Executive Order B-37-16 (EO), provides a brief summary of California's evolving awareness of and actions relating to drought preparedness and response, and describes the proposed framework for realizing conservation as a California way of life.

1.1 Executive Order B-37-16

Moving to bolster California's climate and drought resilience, Governor Edmund G. Brown Jr. issued the EO on May 9, 2016. The EO builds on temporary statewide emergency conservation requirements and tasks State agencies with establishing a long-term framework for water conservation and drought planning, including permanent monthly water use reporting, new urban water use targets, reducing system leaks and eliminating clearly wasteful practices, strengthening urban drought contingency plans, developing new county drought plans to address the needs of rural communities and small water systems, and improving agricultural water management and drought plans.

The EO directs the California Department of Water Resources (DWR), State Water Resources Control Board (Water Board), California Department of Food and Agriculture (CDFA), California Public Utilities Commission (CPUC), and California Energy Commission (CEC) – collectively referred to as the "EO Agencies" – to summarize in a report a framework for implementing the EO and incorporating water conservation as a way of life for all Californians.

The framework described herein promotes efficient use of the State's water resources in all communities, whether conditions are wet or dry, and prepares the State for longer and more severe drought cycles that will mark our future. The EO directs DWR, the Water Board, and CPUC to develop methods to ensure compliance with the provisions of the EO, including technical and financial assistance, agency oversight, and enforcement action by the Water Board to address non-compliant water suppliers, if necessary.

The full text of the EO is in Attachment A and at https://www.gov.ca.gov/docs/5.9.16_Attested_Drought_Order.pdf.

The actions directed in the EO are organized around four primary objectives: (1) use water more wisely, (2) eliminate water waste, (3) strengthen local drought resilience, and (4) improve agricultural water use efficiency and drought planning.

Use Water More Wisely

The EO calls for DWR and the Water Board to require monthly reporting by urban water suppliers on a permanent basis.[1] This includes information regarding water use, conservation, and enforcement.

It also directs DWR and the Water Board to develop new water use efficiency targets as part of a long-term conservation framework for retail urban water agencies – through a public process and working with partners such as urban water suppliers, local governments, and environmental groups. These targets are to go beyond the 20 percent reduction in per capita urban water use by 2020 that was embodied in Senate Bill (SB) X7-7[2], and are to be customized to fit the unique conditions of urban water suppliers.

The Water Board is also directed to adjust emergency water conservation regulations through the end of January 2017, in recognition of the differing water supply conditions across the State, and develop proposed emergency water restrictions for 2017 should the drought persist.

The "Use Water More Wisely" objective includes EO Items 1, 2, and 3.

Eliminate Water Waste

The EO calls for the Water Board to permanently prohibit wasteful practices, consistent with temporary, emergency prohibitions that were put in place in July 2014. These practices include hosing off sidewalks, driveways, and other hardscapes; washing automobiles with hoses not equipped with a shut-off nozzle; and watering lawns in a manner that causes runoff.

The Water Board and DWR are also directed to take actions to minimize water system leaks across the State. DWR estimates that leaks in water distribution systems siphon away more than 700,000 acre-feet of water a year in California – enough to supply 1.4 million homes for a year. Audits of urban water systems have found that leaks account for an average loss of 10 percent of their total supplies.

The CPUC is directed to prepare a consistent resolution for implementation by its investor-owned utilities. The CPUC is not in a regulatory capacity; see Section 2.3 for information on this directive.

The "Eliminate Water Waste" objective includes EO Items 4, 5, 6, and 7.

Strengthen Local Drought Resilience

DWR is directed to consult with urban water suppliers, local governments, environmental groups and other partners to strengthen standards for local Water Shortage Contingency Plans (WSCP) that are part of the Urban Water Management Plans (UWMP) that urban water suppliers must submit every five years. These strengthened standards would promote planning for adequate actions to respond to droughts lasting at least five years, as well as more frequent and severe periods of drought. For areas not covered by WSCPs, DWR is directed to work with counties to improve drought planning for small water suppliers and rural communities.

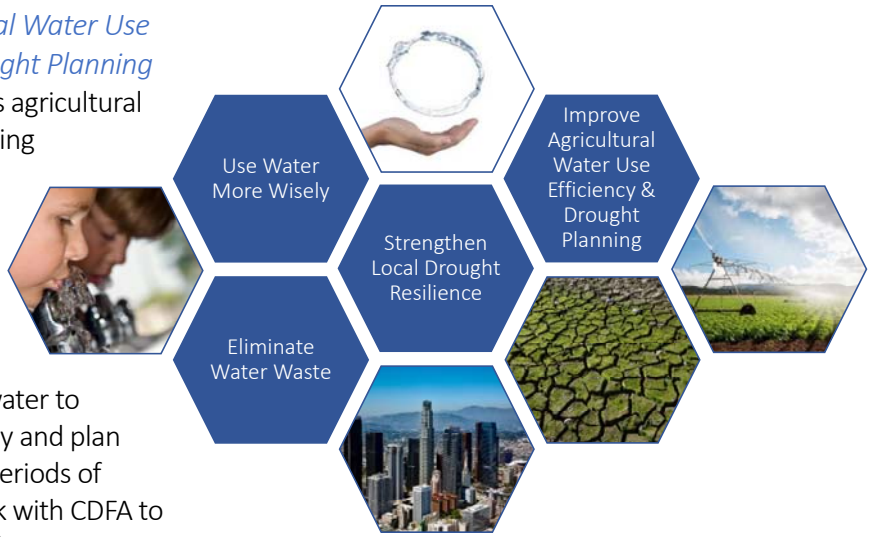
The "Strengthen Local Drought Resilience" objective includes EO Items 8, 9, and 10.

[1] This applies to retail urban water suppliers only as they provide water directly to end users (as opposed to wholesalers that do not provide water directly to end users).

[2] The Water Conservation Act of 2009.

Improve Agricultural Water Use Efficiency and Drought Planning

Current law requires agricultural water suppliers serving 25,000 irrigated acres or more to file Agricultural Water Management Plans (AWMP). In the EO, DWR is directed to update existing requirements for these plans, including requiring suppliers of irrigation water to quantify their water use efficiency and plan for water supply shortages and periods of drought. DWR is directed to work with CDFA to seek public input on the updated requirements. The EO also increases the number of agricultural water suppliers that must file AWMPs by lowering the threshold to those water suppliers serving 10,000 irrigated acres or more.



The "Improve Agricultural Water Use Efficiency and Drought Planning" objective includes EO Items 11, 12, and 13.

1.2 Evolution of Water Conservation in California

California has experienced several major droughts throughout its recorded history. In response to the State's highly variable and seasonal climate, Californians have developed hundreds of water projects and programs – at local, regional, and statewide scales – while learning to adapt to periodic droughts and other hydrologic extremes. Growing awareness of the critical role water plays in the State's economy, health and safety, and environment has precipitated legislative actions and funding programs that have fundamentally transformed the way California's greatest resource – water – is managed.

1.2.1 Historical Droughts

One of the most extreme examples of drought in California occurred in 1976 and 1977, with the 1976 water year ranking as the driest on record and the 1977 water year ranking among the top five driest in California's recorded history. However, while the drought caused unprecedented shortages in the municipal, industrial, and agricultural water sectors, the 1976-1977 drought is often credited with initiating an era of water conservation awareness in California, the results of which are still evident today, including formation of a drought emergency task force and emergency conservation actions. The 1976-1977 drought also caused numerous legislative proposals to be submitted, all with the goal of increasing California's drought responses and resiliency.

Other statewide droughts that have occurred in recent history include the 1987-1992 drought and the 2007-2009 drought. These droughts affected all communities and types of water users, and led to many of the requirements and guidelines in place during the recent drought. 2012 through 2014 are on record as California's driest three consecutive years and 2013 was the driest single year of record in numerous communities across the State, triggering numerous emergency actions at State and local levels.

1.2.2 Resulting Statewide Water Conservation and Related Water Management Planning Efforts

The State's arid climate and history of drought have prompted a variety of programs, actions, and efforts geared toward preparing for and responding

to periods of low water availability. The following highlights some of the key events and actions that have marked this evolution of conservation and water use efficiency in California in recent decades.

Water Conservation Act of 2009

California became the first state to adopt a water use efficiency target with the passage of SB X7-7 in 2009. SB X7-7 mandated the State achieve a 20 percent reduction in urban per capita water use by 2020. The reduction goal is also known as "20x2020." SB X7-7 directed water suppliers to develop individual targets for water use based on an historical per capita baseline.

The 20x2020 Water Conservation Plan (20x2020 Plan) set forth a statewide road map to maximize the State's urban water efficiency and conservation opportunities between 2009 and 2020, and beyond. The recommendations acknowledged that agricultural water use efficiency must also be improved.

What is Drought?

Drought can be defined in many ways, and there is no statutory process in California for defining or declaring a drought. Drought can be described in meteorological terms (a period of below normal precipitation), in hydrologic terms (a period of below average runoff), or in more qualitative terms (shortage of water for a particular purpose). Drought can be any length of time – spanning a single water year or multiple years – and rarely affects all water users or geographies equally. For example, one part of the State may experience severe drought conditions while another experiences a year of above normal rainfall. Drought is often considered a function of drought impacts to water users. Further, the economic, social, and environmental impacts of drought have changed over time as the State's population has grown and our extensive system of water infrastructure has evolved.

Implementation of the 20x2020 Plan includes three phases: (1) completion of the 20x2020 Plan (2009 through 2010); (2) implementation, monitoring, evaluating, and making adjustments (2011 through 2020); and (3) performance evaluation based on improvements from established baseline values for each supplier.

Mandatory Conservation, Water Use Prohibitions, and Other Water Saving Measures during the Recent Drought

As a statewide drought progressed during 2014 and into 2015, California took unprecedented steps to preserve its water supply. With issuance of an emergency drought proclamation by the Governor in 2014, the Water Board was directed to collect monthly water use data from the State's urban water suppliers. The proclamation also called on Californians to voluntarily conserve water, with a goal of reducing water use by 20 percent when compared to pre-drought water use in 2013. However, the collected data showed that voluntary statewide conservation efforts had reached 9 percent – an effort that saved billions of gallons of water, but was well short of the 20 percent goal.

With drought conditions worsening, and the 2014-2015 water year snowpack the lowest in the State's history, the Governor's April 1, 2015 Executive Order (EO B-29-15) directed the Water Board to develop emergency water conservation regulations to implement mandatory water reductions in cities and towns across California. EO B-29-15 also set a goal to reduce potable urban water usage by 25 percent statewide. The Water Board's adoption of the May 2015 drought emergency regulation set mandatory reductions in potable urban water use between June 2015 and February 2016 by identifying a conservation tier for each urban water supplier, based on residential per capita water use for the months of July – September 2014. Conservation tiers ranged from 4 percent to 36 percent.

Under these emergency urban water conservation regulations, statewide cumulative savings from June 2015 to March 2016 totaled 23.9 percent

compared with the same months in 2013. Statewide average water use lowered to 66 residential gallons per capita per day (GPCD) in March 2016, saving nearly 1.3 million acre-feet of water from June 2015 through March 2016.

Recognizing persistent yet less severe drought conditions during the 2015-2016 water year, the Water Board modified and extended its emergency regulation in May 2016. This new approach allowed suppliers to replace their prior percentage reduction-based water conservation standard with a localized "stress test," where they could demonstrate whether a supply shortfall would develop under three additional drought years. Mandatory conservation levels were set for suppliers with projected shortfalls following three additional dry years. Alternatively, suppliers could keep their pre-existing mandatory conservation standard rather than adopting a stress-test conservation standard.

In addition to State-mandated conservation standards, the Water Boards' emergency regulations have specific prohibitions against certain water uses. Those prohibitions include watering down a sidewalk with a hose instead of using a broom or a brush, and overwatering a landscape such that water is running off the lawn, over a sidewalk, and into the gutter.

In total, the Water Board's emergency regulations have resulted in conservation of over 2.15 million acre-feet of water, enough to supply over 10 million people for a year.

EO B-29-15 also called on DWR to establish additional water saving measures, including:

- A statewide initiative to replace 50 million square feet of lawns with drought tolerant landscapes.
- A time-limited statewide toilet replacement and appliance rebate program with the CEC.
- Updating the State Model Water Efficient Landscape Ordinance (MWELO).
- Additional requirements for AWMPs.

DWR quickly established rebate and direct installation programs for both lawn conversion and the replacement of older toilets with high efficiency toilets. In addition, DWR collaborated with nonprofits to provide over 230 workshops statewide on landscape and irrigation efficiency, turf replacement, high efficiency toilet replacement, water management planning for agricultural and urban water suppliers, and conveyance system audit and leak detection for small water systems, rural communities, agricultural water suppliers and tribal governments.

DWR developed and sponsored a key exhibit at the California State Fair, providing hands-on advice to homeowners on lawn conversion and water saving measures.

Indoor and Outdoor Water Use Efficiency

Landscaping typically accounts for over half of residential water demand, and was the focus of some of the State's earliest efforts related to water use efficiency. Passed in 1990, Assembly Bill (AB) 325, the Water Conservation in Landscaping Act, directed DWR to develop MWELO. Initially drafted in 1992 and updated in 2010, the MWELO established a water budget for new construction and certain rehabilitated landscapes. Local agencies were required to adopt the MWELO or a local ordinance at least as effective as the State ordinance. The MWELO was updated in 2015 in response to EO B-29-15. AB 2515 requires DWR to update the MWELO every three years if needed.

Indoor water use has also prompted action at State and federal levels. The efficiency of water fixtures used in California residential dwellings and commercial buildings is being improved through updated requirements in the California Plumbing Code (Part 5 of the California Building Standards Code) per requirements in SB 407 of 2009 and AB 715 of 2007. In addition, new construction is subject to the requirements of the California Green Building Standards Code (Part 11 of the California Building Standards Code) that requires water fixture efficiency exceeding the existing national standards set forth by U.S. Environmental Protection Agency (USEPA) and U.S. Department of Energy. Concurrently, the CEC is updating its Appliance Efficiency Regulations to include stronger standards for fixtures sold in the State.

Water Management Planning and Funding

Conservation and water use efficiency are foundational water management tools that, along with diverse regional and statewide water portfolios, help to ensure adequate and reliable water supplies for all uses. Conservation and water use efficiency are prominent in State water management plans, integrated regional water management plans, the plans of urban and agricultural suppliers, and various associated funding programs.

The 2013 California Water Plan Update highlighted water conservation as one of 17 statewide water management objectives, and emphasized urban water conservation as a water management strategy that would be most effective at matching supply with demand. The plan recognized urban water conservation as the foundation for achieving the 20x2020 mandate.

Conservation and drought protection are also two of the focus areas of the 2014 California Water Action Plan (Water Action Plan)[3] and Water Action Plan 2016 Update. Making water conservation a California way of life is the first action identified in the plan and drought resiliency is the fifth action. These are part of a comprehensive approach to water management that includes actions related to integrated water management, Sacramento-San Joaquin Delta management, ecosystem restoration, storage, and flood protection. The Water Action Plan also calls for increasing operational and regulatory efficiencies and identifying sustainable, integrated financing opportunities.

California Water Action Plan

The Water Action Plan provides a roadmap for sustainable water management. It has guided the work of numerous State agencies and prioritized funding at the State level, and provided the groundwork for several important bills and legislation necessary to manage California's water supply during droughts.

Building on the 2014 plan, the 2016 Update describes 10 key actions to align State efforts and investments to ensure reliable water supplies in the future. The first action is to "make conservation a California way of life." To this end, the Water Action Plan includes several specific components:

- *Expand agricultural and urban water conservation and efficiency to exceed SB X7-7 targets*
- *Provide funding for conservation and efficiency*
- *Increase coordinated water energy efficiency and greenhouse gas reduction capacity*
- *Promote local urban conservation ordinances and programs*

The Water Action Plan also provides direction on planning activities to better prepare for droughts in the future, including preparation of drought contingency plans and water shortage contingency plans.

[3] *California Water Action Plan*. California Natural Resources Agency. January 2014.

Water conservation in California has gained support from a series of State grant programs to provide important financial assistance required to implement conservation programs. Those State grant programs include funding from Proposition 13 (2000, $565 million), Proposition 50 (2002, $680 million), Proposition 84 (2006, $1.2 billion), and Proposition 1 (2014, $810 million).

Various federal agencies also provide conservation and drought funding, including the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and the USEPA. Reclamation's Drought Response Program under WaterSMART provides assistance to water users for drought contingency planning, including climate change and actions that build towards long-term drought resiliency. USEPA provides funding for various infrastructure and conservation projects through the Clean Water State Revolving Fund and the Drinking Water State Revolving Fund, both of which are managed and administered by the Water Board in California.

Groundwater Sustainability

Groundwater is an important component of California's water supply, particularly in dry years. The Sustainable Groundwater Management Act (SGMA) requires development of specialized groundwater sustainability plans in each region to support a more reliable and resilient water supply portfolio for the State as a whole. It is common for rural communities, small systems, and agriculture to rely heavily on groundwater, including private wells, to meet their supply needs. Consequently, SGMA and its implementation could have significant effects on water conservation, water use efficiency, and long-term water supply reliability.

1.2.3 Recent Drought Actions and Effects

In recent years, dry conditions throughout the State have underscored the importance of water conservation and achieving greater climate and drought resilience and preparedness.

CONSERVATION versus EFFICIENCY

The terms water conservation and water use efficiency are often used interchangeably. As used in this report, water conservation is defined as a reduction in water loss, waste, or use. The general term water conservation may include water use efficiency, in which more water-related tasks are accomplished with lesser amounts of water.

2012 through 2014 are on record as California's driest three consecutive years with respect to statewide precipitation. 2013 was the driest on record in numerous communities across the State, including San Francisco, Sacramento, and Los Angeles. Parts of Northern California had no measurable precipitation for more than 50 consecutive days during winter months that historically see the year's highest precipitation totals. Reservoirs remained low in the spring, and groundwater pumping increased dramatically throughout the State as surface water supplies became limited or unavailable.

Persistent dry conditions prompted a series of Executive Orders from 2014 through 2016 that have guided California's drought response. The Governor proclaimed a State of Emergency on January 17, 2014. This drought proclamation directed State agencies to take specified actions and requested that Californians voluntarily reduce their water usage by 20 percent compared with the 2013 baseline. Following the 2014 emergency declaration, the Governor and State Legislature worked closely to secure and accelerate appropriation of funding for drought-related actions. Emergency drought legislation contained in Senate Bills 103 and 104 provided $687 million to assist drought-stricken communities and implement projects to better capture, manage and use water resources. Over $400 million was provided through Proposition 84 bond funds for grants to local agencies for integrated regional

water management projects, including projects that strengthened water conservation.[4]

Subsequent Executive Orders directed local urban water suppliers to immediately implement water shortage contingency plans, ordered the State's drinking water program to target communities in danger of running out of water, and supported the Water Board to administer various water rights actions, including curtailments and mandatory conservation (described earlier in this chapter).

In addition, the Water Action Plan provided guidance to State agencies to better align their priorities related to water resources management, including long-term drought resilience and response. The plan and its 2016 Update have facilitated the Governor and State Legislature's engagement in several key legislative efforts, subsequent bond initiatives, and state budgeting efforts.

The recent drought related actions and response activities culminated in Executive Order B-37-16 in May 2016. The EO builds on the conservation successes achieved in recent years to establish long-term water conservation measures and improve proactive drought planning and response.

The impacts of the current drought have been severe, characterized by limited or exhausted drinking water supplies in some communities, lost agricultural production and jobs, severely depleted groundwater basins, and significant harm to native habitats and species. Despite Californians responding to the call to conserve water, more frequent and extended dry periods are anticipated under our changing climate, which would be characterized by warmer winter temperatures and reduced water supplies held in mountain snowpack.

Californians Respond

Californians demonstrated their inherent resilience and ability to conserve water and adapt to changing conditions. Between June 2015 and March 2016, urban water systems reduced water use by 23.9 percent, saving enough water to provide 6.5 million residents with water for one year.

"Californians stepped up during this drought and saved more water than ever before, but now we know that drought is becoming a regular occurrence and water conservation must be a part of our everyday life."

Governor Edmund G. Brown Jr.

The effects of drought are likely to intensify in the future as the State population continues to grow and competition for water resources intensifies. It is recognized that permanent reductions in per capita water use, and increases in water use efficiency across all sectors, will be needed to ensure long-term water supply reliability for the State. It is also acknowledged that new goals and targets will be needed that go beyond 2020 to support continued economic prosperity and healthy ecosystems, while adapting to a changing climate.

1. 3 Framework for Realizing Water Conservation as a California Way of Life

This document was prepared in response to the Governor's directive to publish a framework for implementation of the EO. In support of water conservation, EO Agencies recognize that the legislature has, through California Water Code (CWC) Section 1011, deemed reductions in water use due to conservation as equivalent to reasonable beneficial use of that water. The proposed framework is not intended to affect or

[4] Additional drought funding was also included in subsequent State budgets (http://www.ebudget.ca.gov/).

otherwise limit any rights to water conserved under applicable law, including without limitation, water conserved consistent with CWC Section 1011.

This report was prepared to inform the Governor, the California Legislature, and the public of the actions and recommendations of the EO Agencies in implementing the EO. Water suppliers that may be affected by the EO may use this document to better understand the proposed requirements and when those requirements could go into effect.

This section describes the process used by EO Agencies in developing the conservation framework, including public and stakeholder engagement.

1.3.1 Executive Order B-37-16 Process

The EO Agencies have worked collaboratively to identify actions and recommendations that can satisfy the directives in the EO, and identify a timeline for their implementation. Underlying this process was the intent to provide:

- Clarity in the new requirements;
- Flexibility for retail water suppliers in carrying out their local responsibilities;
- Transparency in desired conservation outcomes and accountability; and
- A rational means for tracking progress over time.

The intent of the long-term conservation framework is to:

- Establish greater consistency in the elements of UWMPs, WSCPs, and AWMPs among water suppliers statewide.
- Enable water suppliers to customize water management strategies and plan implementation to regional and local conditions.
- Empower water suppliers to take a place-based response to water shortages caused by drought or other emergencies.

The EO Agencies coordinated closely in developing the recommendations for implementing the EO. This included forming cross-agency teams at agency leadership, management, and project staff levels. These teams met regularly to share progress, discuss proposals, and develop the report.

1.3.2 Public Outreach and Stakeholder Engagement

EO Agencies developed a collaborative program to formulate the long-term framework for water conservation and drought planning with extensive public outreach and stakeholder engagement (see also Attachment B).

Public Listening Sessions

The EO Agencies hosted a series of public listening sessions in Northern, Central, and Southern California in June 2016. These sessions provided an overview of the EO and solicited early stakeholder input.

Stakeholder Advisory Groups

The EO directs DWR, the Water Board, and CDFA to "consult with urban water suppliers, local governments, environmental groups, agricultural water suppliers and agricultural producers, and other partners" in carrying out several of the directives: Use Water More Wisely, Strengthen Local Drought Resilience, Eliminate Water Waste, and Improve Agricultural Water Use Efficiency and Drought Planning.

To this end, an Urban Advisory Group and an Agricultural Advisory Group were formed in July 2016 to advise the EO Agencies, solicit input on the recommendations and associated methodologies, and exchange information. Advisory Group members were invited to provide broad representation including urban water suppliers, agricultural water suppliers, local government, academia, professional organizations,

environmental advocates, and other interested parties.

1.3.3 Framework Components

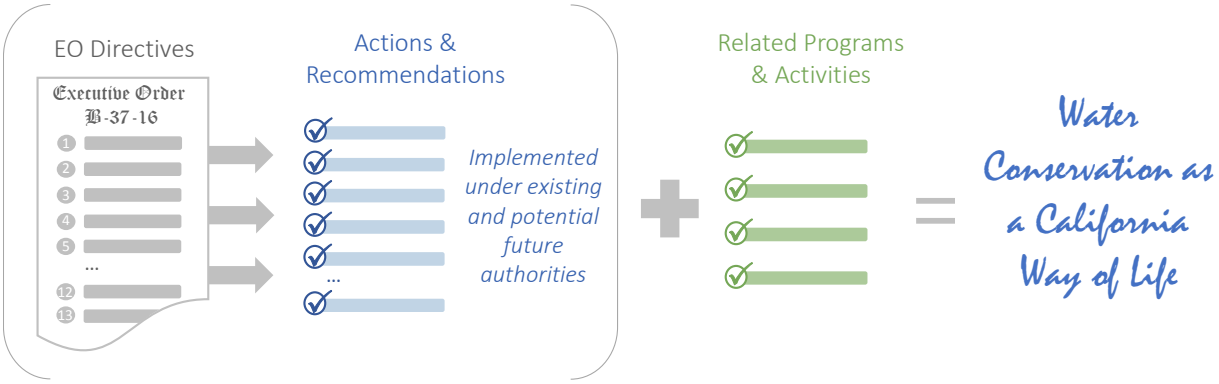
This report describes actions and recommendations for implementing the EO.

- Actions are efforts that have been or may be undertaken within existing authorities to implement portions of the EO. Actions that can be implemented under existing policy or regulatory authorities include potential 2017 emergency water conservation regulations, permanent restrictions on water waste, efforts to reduce water supplier leaks and system losses, and certification of innovative technologies for water and energy conservation.

- Recommendations are efforts proposed by the EO Agencies that may be undertaken to implement portions of the EO but that will require additional authorities. Recommendations include new water use targets, water shortage contingency plans, drought planning for small systems and rural communities, and agricultural management plans.

In addition to the actions and recommendations specific to meeting the directives of the EO, the EO Agencies are engaged in various other programs and activities related to water conservation, water use efficiency, and planning for droughts and other water emergencies. These ongoing efforts encompass technical assistance, funding mechanisms, guidance documents, rulemaking, and enforcement. Related programs and activities are critical to achieving the State's water use efficiency and conservation goals.

The EO actions and recommendations, along with other related State programs and activities, constitute the framework for making conservation a California way of life (Figure 1-1), as described in the EO and in the Water Action Plan.



Many of the needed actions and recommendations in this report cannot be implemented without new or expanded authorities. This document describes the additional steps and legislative authority that will be needed. The actions and recommendations herein, together with existing State programs and activities related to conservation and water use efficiency, represent a statewide framework for making conservation a California way of life.

Figure 1-1. Framework for Making Water Conservation a California Way of Life

Table 1-1. EO Actions and Recommendations Summarized in this Report

Chapter Section and Title where EO Item is Addressed	EO Item													Within Existing Authorities (Chapter 2)	Requires New Authority (Chapter 3)
	Use Water More Wisely			Eliminate Water Waste				Strengthen Local Drought Resilience			Improve Agricultural Water Use Efficiency & Drought Planning				
	1	2	3	4	5	6	7	8	9	10	11	12	13		
2.1 Emergency Water Conservation Regulations for 2017	●													✓	
2.2 Monthly Reporting and Permanent Prohibition of Wasteful Practices			●	●										✓	
2.3 Reduced Water Supplier Leaks and Water Losses					●	●								✓	
2.4 Certification of Innovative Technologies for Water Conservation and Energy Efficiency							●							✓	
3.1 New Water Use Targets Based on Strengthened Standards		●				●									✓
3.2 Water Shortage Contingency Plans						●		●	●						✓
3.3 Drought Planning for Small Systems & Rural Communities										●					✓
3.4 Agricultural Water Management Plans						●					●	●	●		✓

Note: The EO directs the DWR, the Water Board, and CPUC to develop methods to ensure compliance with the provisions of the EO, including technical and financial assistance, agency oversight, and, if necessary, enforcement action by the Water Board to address non-compliant water suppliers.

1.3.4 Organization of this Report

This report describes proposed State actions and recommendations associated with the 13 items included in the EO, as summarized in Table 1-1.

Figure 1-2 illustrates the organization of this report. Chapter 1 provides introductory and background information setting the context for current efforts to improve conservation within the State of California, including a description of the directives in the EO. Chapters 2 and 3 describe how the directives contained in the EO are being and would be implemented. Chapter 4 provides a summary and timeline for implementing the identified actions and recommendations as part of the long-term framework for making conservation a California way of life. Attachment A includes the full language of the EO, and Attachment B summarizes the public outreach and stakeholder engagement conducted to support framework development.

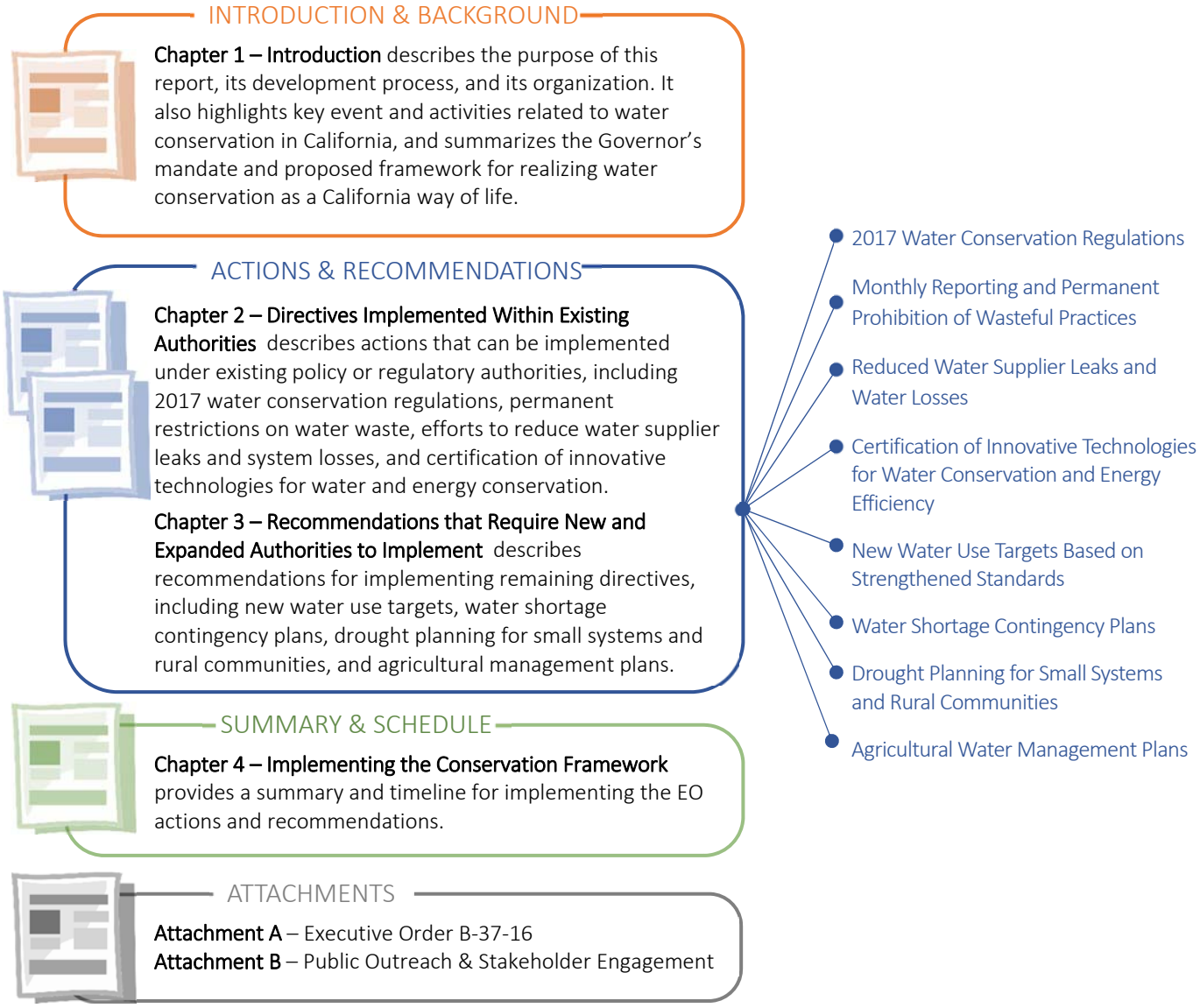
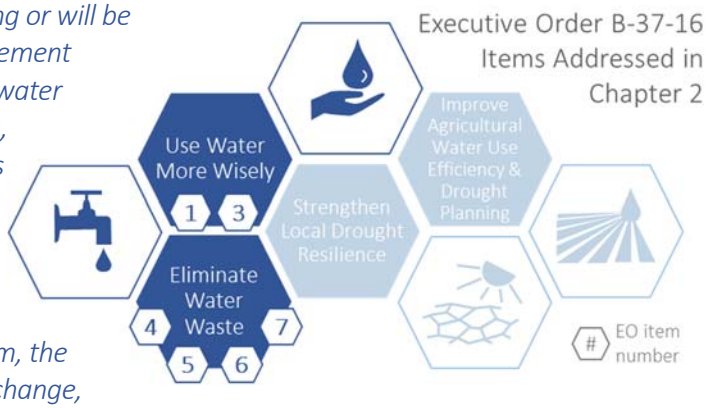


Figure 1-2. Report Organization

Chapter 2 – Directives Implemented Within Existing Authorities

This chapter describes actions that are ongoing or will be undertaken within existing authorities to implement portions of the EO. These include emergency water conservation regulations for 2017 (EO Item 1), monthly reporting and permanent restrictions on water waste (EO Items 3 and 4), efforts to reduce water supplier leaks and system losses (EO Items 5 and 6), and certification of innovative technologies for water and energy conservation (EO Item 7). For each item, the chapter includes descriptions of the need for change, the directive as stated in the EO, and implementation considerations. A summary of implementation activities and schedule are included in Chapter 4.



2.1 Emergency Water Conservation Regulations for 2017

2.1.1 Need for Change

The current emergency regulation for statewide urban water conservation is set to expire on November 25, 2017. However, water supply conditions have markedly changed since the start of the drought. In addition, the Water Board was further directed to permanently maintain reporting requirements and certain types of water use prohibitions as part of the EO.

2.1.2 EO Directive

Water conservation regulations for 2017 address EO Item 1 that states:

> *The State Water Resources Control Board (Water Board) shall, as soon as practicable, adjust emergency water conservation regulations through the end of January 2017 in recognition of the differing water supply conditions across the state. To prepare for the possibility of another dry winter, the Water Board shall also develop, by January 2017, a proposal to achieve a mandatory reduction in potable urban water usage that builds off the mandatory 25% reduction called for in Executive Order B-29-15 and lessons learned through 2016.*

2.1.3 Implementation

Recognizing persistent yet less severe drought conditions due to precipitation near historical averages, the Water Board extended the emergency water conservation regulation on May 18, 2016. Although water conditions had improved by the middle of the 2016/2017 water year, final supply conditions were still uncertain. The Water Board extended the emergency conservation regulations on February 8, 2017 given uncertainty over continued precipitation levels during the late winter and spring of 2017. The current regulation requires locally developed conservation standards based upon each local water agency's specific circumstances. It replaces the prior percentage reduction-based water conservation standard with a localized "stress test" approach. These standards require local water agencies to ensure a three-year supply assuming three more dry years like the ones the State experienced from 2012 to 2015. Water agencies that would face shortages under three additional dry years are required to meet a state-mandated conservation standard equal to the

amount of shortage. A majority of urban water suppliers determined that they have sufficient potable water supplies using the supply reliability test from the May 2016 regulation.

As the precipitation season draws to a close in 2017, reservoirs are near peak capacity and the snow pack is well above average, and the drought emergency has been lifted for most of the state. As a result of improved water supply conditions, the Water Board will rescind the emergency requirement for a water supply stress test or mandatory conservation standard for urban water agencies, but, to provide a bridge to permanent requirements, it will continue to require monthly reporting and to prohibit wasteful practices (see below).

2.1.4 Reporting, Compliance Assistance, and Enforcement

Under the existing emergency regulations, urban water suppliers submit monthly reports to the Water Board on water production, program implementation, and local enforcement activities. The Water Board tracks progress and works with water suppliers to achieve compliance and enforce as needed. The Water Board shares supplier reports and water savings information on its website. These emergency reporting requirements and enforcement activities will cease when the emergency requirements are rescinded.

2.2 Monthly Reporting and Permanent Prohibition of Wasteful Practices

2.2.1 Need for Change

California faces decreasing water supplies through a combination of climate change, increasing population, and economic growth. To thrive as a state and make conservation a way of life in California, we must use our water resources efficiently and stop wasteful practices. Regular and consistent supplier reports have been in place for several years and are an invaluable tool for understanding urban water supplier responses to policy changes and for statewide water management. EO items 3 and 4 direct DWR and the Water Board to extend some provisions in the emergency regulations to become permanent practices.

2.2.2 EO Directive

EO Item 3 establishes continued reporting and data collection requirements by urban water suppliers, and it states:

> *The Department and the Water Board shall permanently require urban water suppliers to issue a monthly report on their water usage, amount of conservation achieved, and any enforcement efforts.*

EO Item 4 focuses on prohibiting waste of potable water:

> *The Water Board shall permanently prohibit practices that waste potable water, such as:*
>
> - *Hosing off sidewalks, driveways and other hardscapes;*
> - *Washing automobiles with hoses not equipped with a shut-off nozzle;*
> - *Using non-recirculated water in a fountain or other decorative water feature;*
> - *Watering lawns in a manner that causes runoff, or within 48 hours after measureable precipitation; and*
> - *Irrigating ornamental turf on public street medians.*

2.2.3 Implementation

The Water Board will be conducting a rulemaking process to establish permanent monthly reporting requirements and prohibitions on wasteful water practices, building on what currently exists in the emergency regulations. This process will run through 2017. The Water Board plans to hold

public workshops to solicit public comments during the rulemaking process.

The Water Board will implement these EO items using its rulemaking process with the following basic steps:

- Water Board staff gather data on potential impacts of the proposed prohibitions and prepare draft regulatory documents.
- The Water Board solicits stakeholder input through workshops and comment periods, responds to stakeholder input, and revises draft regulations as needed. There may be multiple iterations of this step.
- The Water Board adopts the final regulatory package of documents, including final regulations and conformance to California Environmental Quality Act requirements and submits to the Office of Administrative Law for approval.

2.2.4 Reporting, Compliance Assistance, and Enforcement

With permanent monthly reporting requirements in place, urban water suppliers will continue to submit monthly reports to the Water Board on water production, program implementation, and local enforcement activities. The Water Board will continue to track progress and work with water suppliers to achieve compliance, and enforce as needed. The Water Board will continue to post this information publicly on its website.

2.3 Reduce Water Supplier Leaks and Water Losses

2.3.1 Need for Change

Existing studies suggest that water losses, including leaks and breaks in water systems, account for about 10 percent of total urban water production, and in some cases 30 percent or more. DWR estimated almost 700,000 acre-feet per year of water lost at the utility level. Cost-effective water loss reduction represents a potentially significant source of conservation savings.

Water Loss

There are two types of water loss – real (physical losses such as leaks or breaks) and apparent (nonphysical losses such meter errors, and unauthorized consumption such as theft).

2.3.2 EO Directive

EO Items 5 and 6 address minimizing system leaks and losses as well as accelerating data collection:

5. *The Water Board and the Department shall direct actions to minimize system leaks that waste large amounts of water. The Water Board, after funding projects to address health and safety, shall use loans from the Drinking Water State Revolving Fund to prioritize local projects that reduce leaks and other water system losses.*
6. *The Water Board and the Department shall direct urban and agricultural water suppliers to accelerate their data collection, improve water system management, and prioritize capital projects to reduce water waste. The California Public Utilities Commission shall order investor-owned water utilities to accelerate work to minimize leaks.*

2.3.3 Implementation

The EO Agencies will meet the requirements of EO Items 5 and 6 through implementation of SB 555, and additional actions to satisfy the EOs directives related to reducing water supplier leaks. Signed in October 2015, SB 555 focuses on identifying real and apparent losses in urban retail water suppliers' distribution systems. It requires the following:

- Annual reporting by urban retail water suppliers

- DWR to perform rulemaking for validated water loss audits
- DWR and the Water Board to provide assistance to retail water suppliers
- The Water Board to set water loss standards between 2019 and 2020

Implementing the water loss audit program as required by SB 555 is a first step towards minimizing system leaks that waste water. As urban retail water suppliers evaluate and identify distribution system water losses, steps can be taken to address those losses.

The SB 555 regulations for water loss audit standards validation and reporting are scheduled to be adopted by the California Water Commission in 2017.

Requirements Related to Urban Water Suppliers

DWR. DWR is preparing rules for water suppliers to follow in preparation of their validated water loss audits. Setting audit standards will improve the reliability of water loss audit data.

By January 1, 2017, DWR must adopt rules for:

- Conduct of standardized water loss audits
- Process for validating a water loss audit prior to submission to DWR
- Technical qualifications and certification requirements for validators
- Method of submitting a validated audit report
- Audit review

DWR must also provide technical assistance to guide water loss detection programs, and update adopted rules within 6 months of the release of subsequent editions of the American Water Works Association's Water Audits and Loss Control Programs, Manual M36.

DWR will identify urban retail water suppliers with high water losses, based on evaluation of the water loss audits submitted in October 2017. Suppliers ranked with high losses will be prioritized for technical assistance. Beginning in 2018, DWR will offer either workshops or one-on-one meetings to these suppliers. The aim of these interactions will be to assist the suppliers in preparing and implementing water loss reduction plans. DWR will provide guidance to suppliers on prioritizing their investments in water loss repair.

DWR will serve as a public information source for water loss data received with UWMPs and the annual water loss audit reporting. A public portal has been established,[5] and in 2017 this website will be enhanced to make the water loss audit reporting data accessible.

Water Board. No earlier than January 1, 2019, and no later than July 1, 2020, the Water Board must adopt rules requiring urban retail water suppliers to meet performance standards for water loss volumes. In adopting these rules, the Water Board will employ life-cycle cost accounting to evaluate the costs of meeting the performance standards. The Water Board will identify compliance and enforcement mechanisms for water loss standards when the standards are adopted. These standards will be utilized for calculating the water targets discussed in Section 3.1 of this report.

As part of implementing SB 555, the Water Board is funding the California Water Loss Control Collaborative' s Technical Assistance Program through the California-Nevada Section of the American Water Works Association to further the preparation of consistent and high quality water loss audits. The program has held several technical assistance workshops in 2016 and will continue to offer technical assistance on water loss audits in 2017.

[5] https://wuedata.water.ca.gov/

The Water Board will also evaluate whether to require urban water suppliers to conduct component analyses[6] to identify cost-effective investments in water loss control ahead of the standards' rulemaking in 2019.

The Water Board will make water loss data available publicly.

CPUC. The CPUC will comply with EO Item 6 by ordering its investor-owned water utilities to accelerate work to minimize leaks to further the EO goal of eliminating water waste.

Since the CPUC requires reporting of water loss by investor-owned utilities, the CPUC will use this data to identify how reductions in non-revenue water can be made. The CPUC adopted Resolution W-5119 on December 1, 2016 acknowledging the progress Class A[7] investor-owned water utilities have made in keeping non-revenue water percentages stable since the Rate Case Plan Decision[8] was adopted. The CPUC in Resolution W-5119 also encourages further work to accelerate actions to minimize leaks, recognizing that system leaks are one component of non-revenue water.

Class A Water Utilities have been reporting non-revenue water metrics through each of their General Rate Case (GRC) Applications in accordance with the prescribed American Water Works Association (AWWA) methodology. This non-revenue water metric can be broken down further, as defined by AWWA in Table 2-1.

As evidenced in Table 2-1, non-revenue water is made up of multiple components, with system leaks being one component. Not all of the Class A Water Utilities currently have the capability to break down their non-revenue water number into the components as defined by AWWA[9], instead reporting this number as a total percentage using AWWA's water loss audit software. However, Class A Water Utilities provide several additional metrics related to system leaks in their GRC applications, including the following:

- Identifying non-revenue water in centum cubic feet (CCF) and percentage of total water production for the last authorized test year, last five years recorded data, and proposed test year amounts.
- Submitting the results of a water loss audit performed no more than 60 days in advance of the submission of the application. The audit report will be prepared using the free Audit Software developed by the AWWA and available on the AWWA website.
- In connection with the water loss audit described above, the utility shall conduct and submit the results of a cost/benefit analysis for reducing the level of non-revenue water reported in the water loss audit. If non-revenue water is more than approximately seven percent for each district or service area, the utility shall submit a plan to reduce non-revenue water to a specific amount.

[6] A leakage component analysis disaggregates the total volume of real losses calculated in a water audit into its three base components: background leakage, unreported leakage, and reported leakage. Water suppliers can use the component analysis, in combination with an evaluation of least cost loss reduction strategies, to identify the most economical means of reducing leakages in their systems.

[7] Class A Water Utilities are defined as utilities having greater than 10,000 service connections.

[8] The Rate Case Plan Decision adopted a schedule for the investor-owned utilities to file General Rate Case applications with the CPUC. The Decision also ordered the utilities to submit Minimum Data Requirements as part of their applications including information on efforts to reduce non-revenue water for the previous five years; a water loss audit in accordance with American Water Works Association; information on number of leaks in the last five years; a description of a utility's leak detection program; and various other metrics for supply and distribution infrastructure status and planning.

[9] Based on the Governor's Executive Order B-37-16 Information Request Response from the Class A Water Utilities to Terence Shia, CPUC, dated September 15, 2016.

Table 2-1. AWWA Water Balance

System Input Volume (corrected for known errors)	Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption (including water exported)	Revenue Water
			Billed Unmetered consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water
			Unbilled Unmetered Consumption	
	Water Losses	Apparent Losses	Unauthorized Consumption	
			Customer Metering Inaccuracies	
			Systematic Data Handling Errors	
		Real Losses	Leakage on Transmission and Distribution Mains	
			Leakage and Overflows at Utility's Storage Tanks	
			Leakage on Service Connections up to point of Customer Metering	

Note: All data in volume for the period of reference, typically one year.

- Identifying specific measures taken to reduce non-revenue water in the last five years and proposed test year of the GRC application.
- Identifying the number of leaks in the last five years.
- Describing its leak detection program.
- Providing leak repair time and cost statistics for the last five years.
- Identifying specific measures taken to reduce number of leaks in the last five years and proposed test year.

This information expands on the efforts the CPUC's Class A Water Utilities have spent on minimizing leaks and keeping non-revenue water percentages stable.

The CPUC's Water Division has compiled[6] statistics on non-revenue water percentages from each Class A Water Utility since the Rate Case Plan Decision was adopted in 2008. This data indicates that Class A Water Utilities generally maintain non-revenue water percentages below 10 percent, with some averaging around 4 to 7 percent. Given these numbers, the CPUC acknowledges the work the Class A Water Utilities have done in keeping non-revenue water percentages stable and encourages further work to accelerate actions to minimize leaks. Actions that may be proposed by investor-owned utilities to reduce non-revenue water and minimize leaks include, but are not limited to: water loss audits; accelerated meter and main replacement programs; increased inspections of service connection meters and mains; installation of leak-detection sensors in the distribution system; timely and efficient pipeline repairs; pressure management; and deployment of advanced meter infrastructure.

Although the CPUC's Class B Water Utilities[7] do not have a defined Rate Case Plan and are not under the same reporting requirements as Class A utilities, these utilities shall propose methods to accelerate actions to minimize leaks in their next General Rate Case filings in order to comply with the EO. Class B Water Utilities provide metrics on

[6] Ibid.

[7] Class B Water Utilities are defined as utilities having greater than 2,000 but less than 10,000 service connections.

water loss in Schedule D of their annual reports. Testing data and the number of meters tested is provided in Schedule D-6 of the annual report, and total water delivered to metered customers is provided in Schedule D-7 of the annual report. With the focus on minimizing leaks and reducing water loss, Class B Water Utilities shall continue to track this valuable information and provide the CPUC with this data in annual reports. In addition, the CPUC recommends that these utilities propose methods to accelerate actions to minimize leaks in each of their next General Rate Case filings, where a cost/benefit analysis for reducing water loss can be conducted.

Urban Retail Water Suppliers. By October 1, 2017, and annually thereafter, urban retail water suppliers must submit validated water loss audit reports to DWR. These reports will be made available for public viewing. Performing regular audits will help inform water suppliers about the extent of water losses in their service areas.

Financial Assistance. To incentivize urban retail water suppliers to comply with the requirement to submit validated water loss audit reports, DWR will revise its funding guidelines to state that water suppliers that do not submit reports are ineligible for DWR grants and loans.

The Water Board will offer financial assistance in 2017 to small water systems that have faced water shortages and required emergency assistance during the drought through the Drinking Water State Revolving Fund.

Other financial assistance programs that can be utilized for water loss reduction include the California Infrastructure and Economic Development Bank's revolving loan fund programs and the California Lending for Energy and Environmental Need Center's Program that offers low interest loans of $500,000 to $30 million for water conservation projects. The program is available to non-profit water agencies such as municipalities.

In addition, the CPUC may grant financial incentives for minimizing leaks during the review of each investor-owned utility's upcoming general rate case or by separate applications where further scrutiny can be conducted by interested parties considering the cost/benefit analysis of reducing the levels of non-revenue water.

Requirements Related to Agricultural Water Suppliers

Reducing water waste for agricultural water suppliers will be addressed through new AWMP requirements that include quantifying measures to increase efficiency, developing a water balance that can identify and prioritize water loss, identifying ways to improve water system management, and drought planning (see Section 3.4).

2.3.4 Reporting, Compliance Assistance, and Enforcement

Beginning in 2017, urban retail water suppliers must submit validated water loss audit reports to DWR. Those not in compliance will not be eligible for State grant and loan funding.

Upon completion of the Water Board's rulemaking related to SB 555 water loss standards in 2020, reporting, compliance assistance, and enforcement information will be available (see Section 3.1 for further detail).

2.4 Certification of Innovative Technologies for Water Conservation and Energy Efficiency

2.4.1 Need for Change

Reducing the amount of water used by appliances can result in water savings. Setting water efficiency standards can help reduce the level of water use across the State. In addition, technologies are in various states of development and deployment that aim to find underground leaks and leaks past the utility meter. As leak detection and reduction technologies advance, water loss control measures may become more cost-effective.

2.4.2 EO Directive

EO Item 7 focuses on water conservation and energy efficiency technologies, and states:

> *The California Energy Commission shall certify innovative water conservation and water loss detection and control technologies that also increase energy efficiency.*

2.4.3 Implementation

EO Item 7 builds on Executive Order B-29-15 that incentivizes promising new technology to make California more water efficient. This item directed the CEC to:

- Implement an appliance rebate program to replace inefficient household devices jointly with DWR and the Water Board.
- Adopt emergency regulations establishing standards to improve the efficiency of water appliances.
- Implement a Water Energy Technology (WET) Program to deploy innovative water management technologies.
- Expedite applications or petitions for power plant certifications to secure alternate water supply necessary for continued power plant operation by delegating, as appropriate, approval to the Executive Director.

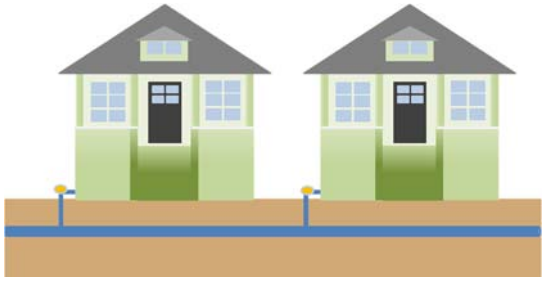
Approaches to Water Conservation and Water Loss Detection and Control Technologies

Various options for water loss detection and control are described briefly below.

Utility Level. Utility level technologies discover leaks in water distribution infrastructure prior to delivery to the customer. Some utilities have devised approaches varying from listening for the sounds from leaks to surveys from aircraft or satellites. Some utilities have begun monitoring and controlling a system's water pressure in an effort to prevent the formation of leaks and minimize water loss.

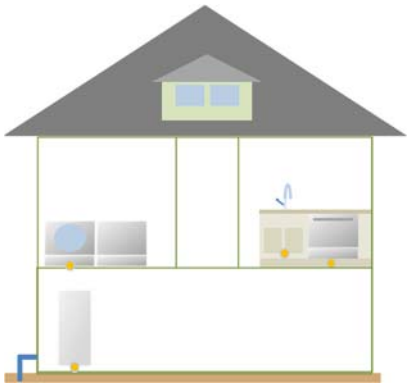
Distribution level loss detection.

House Level. Several companies are developing devices intended to monitor whole house water usage and report leaks. A typical device clamps to a house's main water supply and identifies the type of water usage by the signature of the water flow. These devices provide information to occupants via the internet.



Household level loss detection.

Appliance Level. Consumers may place a device near an appliance such as a faucet, clothes washer, water heater or dishwasher to detect leaking water. The device may alert the user through an audible alert or through a message sent to their internet connected device.



Appliance level loss detection.

CEC Research and Development Division Activities

The CEC's Electric Program Investment Charge (EPIC) Program follows an energy innovation pipeline program design, funding applied research and development, technology demonstration and deployment, and market facilitation to create new energy solutions, foster regional innovation, and bring clean energy ideas to the marketplace.

EPIC-Funded Utility Level Leak Prevention and Water Loss Detection Study. The EPIC Program is currently funding studies that will demonstrate correlating continuous acoustic monitoring, satellite imagery leak detection, district metered areas, and flow-sensitive pressure reducing valve technologies to reduce the formation of leaks and aid in the detection of leaks at four California municipal utilities. The goal is to demonstrate and improve the technologies to move them closer to commercial adoption.

CEC Efficiency Standards

Section 25402(c)(1) of the California Public Resources Code mandates that the CEC reduce the inefficient consumption of energy and water on a statewide basis by prescribing efficiency standards and other cost-effective measures for appliances that require a significant amount of energy and water to operate. Such standards must be technologically feasible and attainable and must not result in any added total cost to the consumer over the designed life of the appliance. Manufacturers must certify to the CEC that their appliances meet or exceed the applicable minimum efficiency standards.

The CEC assesses the technical feasibility of proposed standards as part of the appliance rulemaking process. Technical feasibility means determining whether technologies currently exist or will exist that can achieve the efficiency goals of the proposed standard.

In determining cost-effectiveness, the CEC considers the value of the water or energy saved, the effect on product efficacy for the consumer, and the life-cycle cost of complying with the standard to the consumer. The CEC assesses the cost effectiveness of a proposed appliance standard by surveying and comparing the cost and operation of compliant and non-compliant appliances. Any increased costs must be offset by water and energy savings due to the increase in appliance efficiency.

The CEC recently concluded a rulemaking to increase the efficiency of toilets, urinals, faucets, and showerheads that will result in saving over 150 billion gallons of water per year after full replacement. The CEC looks to further water savings by exploring appliance standards for landscape emitters and landscape irrigation controllers.

The CEC maintains a database of appliances certified by manufacturers as meeting the Appliance Efficiency Standards. The public may search the database for compliant products and use the performance data to identify appliances that use water and energy most efficiently.

Informational Proceeding Workshop. In early October 2016, the CEC conducted a public workshop to gather information on innovative water conservation and water loss detection and control technologies from industry, stakeholders, and the public.

The workshop included presentations from the Efficiency Division, the Research and Development Division, DWR, and the Water Board. The comments gathered provided viewpoints and proposed solutions related to the Commission's direction specifically, and the drought generally. Comments may be viewed at the Energy Commission Docket 16-OII-01.[8] In attendance were the California investor-owned utilities, water utilities, Plumbing Manufacturers International, and developers of water loss and leak detection

[8] Energy Commission Docket 16-0II-01, located at https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=16-OII-01.

and control technologies. The comment period closed in late October 2016.

At the workshop and in written comments, the CEC received information about a variety of water loss and leak detection and control technologies. These technologies were generally applicable at the utility level, such as automated water meters, data analytics to find apparent system losses and meter inaccuracies, acoustic monitoring systems, scanning technologies to pinpoint distribution system losses, and aerial imaging for agricultural water distribution.

The CEC will continue to evaluate technologies for water loss detection and control. To date, existing technologies are tailored for specific uses. The CEC will continue to work with EO agencies and stakeholders to provide information about innovative water loss control technologies as technologies mature and more information about their performance and use becomes available. Water loss detection and control technologies are available in both commercial and pilot forms, and different technologies may be appropriate for different systems or issues, depending on the needs and programs in place for each water district.

The CEC recommends continuing the WET program and guidance to begin investments based on workshop results and feedback. Research would support the development of test methods and device testing and could highlight successful case studies in the application of water loss and control technologies. Research could also advance innovative pre-commercial technologies that would result in water and energy savings and overcome barriers to large scale deployment.

The CEC recommends continuing to study landscape irrigation controllers and emitters for possible efficiency standards to capture significant water savings through cost-effective and technologically feasible improvements in these products. This would continue the CEC's work on drought efficiency measures to save water that the CEC began with its toilet, faucet, urinal, and showerhead standards. These standards are expected to save Californians 150 billion gallons of water each year after all inefficient products are replaced with ones that meet the standards.

The CEC recommends that it continue to have manufacturers certify and add their toilets, faucets, urinals, and showerheads to the Modernized Appliance Efficiency Database System which will help the CEC to ensure compliance with the applicable water efficiency standards while also providing a tool for individuals and businesses to search for and compare water-conserving products.

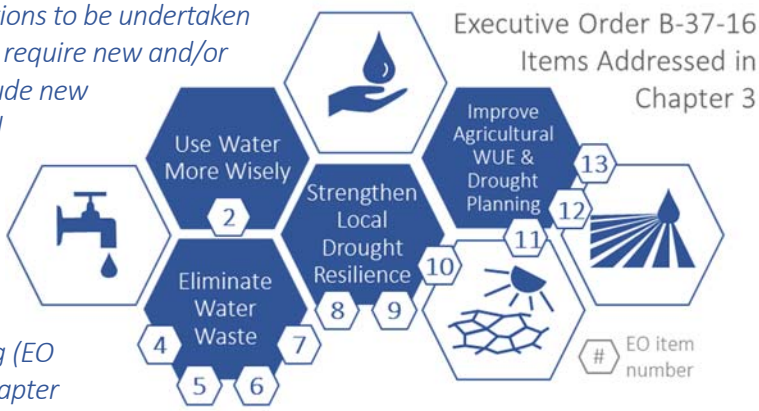
WET Program. The CEC, jointly with DWR and the Water Board, plans to implement the WET Program to provide funding to accelerate the deployment of innovative water and energy saving technologies and reduce greenhouse gas emissions.

2.4.4 Reporting, Compliance Assistance, and Enforcement

Reporting, compliance assistance, and enforcement do not apply to the actions associated with certification of innovative technologies for water conservation and energy efficiency.

Chapter 3 – Recommendations that Require New and Expanded Authorities to Implement

This chapter describes recommended actions to be undertaken to implement portions of the EO but that require new and/or expanded statutory authority. These include new water use targets based on strengthened standards (EO Items 2 and 6), water shortage contingency planning (EO Items 6, 8, and 9), drought planning for small water suppliers and rural communities (EO Item 10), and agricultural water management planning (EO Items 6, 11, 12, and 13). For each, the chapter includes: a description of the current status and need for change; the directive as stated in the EO; and a description of reporting, compliance assistance, and enforcement. A summary of implementation activities and their schedules are included in Chapter 4.



3.1 New Water Use Targets Based on Strengthened Standards

3.1.1 Current Status and Need for Change

Urban water conservation and efficiency has been a key California water management strategy over the past 25 years starting with programs implemented during or shortly after the 1988 to 1992 drought, including MWELO and plumbing code and appliance standards. In 1991, 120 urban water suppliers[9], environmental groups and other interested parties signed a historic Memorandum of Understanding (MOU) agreeing to develop and implement comprehensive water conservation Best Management Practices (BMP). The MOU called for the creation of the California Urban Water Conservation Council (CUWCC) to oversee the implementation of the BMPs. Roughly half of urban water suppliers voluntarily joined the CUWCC in 1993, and more followed since then.

The CUWCC has played a key role in the history of urban water conservation in California, successfully creating a collaborative forum for water suppliers and the environmental community to work together to advance urban water conservation throughout the State. This voluntary documentation of conservation efforts by reporting on BMPs by water suppliers has continued through 2016. In 2009, the State conditioned grant funding eligibility for urban water suppliers on compliance with demand management measures which were defined as the CUWCC's 14 BMPs. This requirement was in place until July 1, 2016 when retail urban water suppliers' eligibility for State loan and grant funding changed to compliance with the 20x2020 urban water use targets (California Water Code (CWC) Section 10608.56).

At the end of the 2007 to 2009 drought and as part of a package of legislation relating to Sacramento-San Joaquin Delta management, the State set a

[9] Urban water suppliers are defined by CWC Section 10617 as a "supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually."

statewide goal of reducing urban per capita water use by 20 percent by 2020, with a 10 percent interim goal in 2015. Known as the Water Conservation Act of 2009, SB X7-7 required urban water suppliers to calculate baseline water use and set water use targets for 2020, with interim targets by 2015. Suppliers were required to report on target compliance in their UWMPs. Urban water suppliers reported a statewide average baseline water use of 199 gallons per capita per day (GPCD) for the ten-year period from 1996 to 2005, with baseline water use amongst individual suppliers showing significant variation. The statewide interim target was 179 GPCD and the final statewide 2020 target was 159 GPCD.

SB X7-7 provided several options for how suppliers could achieve higher levels of water conservation by allowing each water supplier to choose one of four methods[10] for determining their own water use target for 2020 (and interim targets for 2015). These options were designed to address regional diversity use practices, climate, history of investment in water conservation and reductions in urban water use. SB X7-7 also permitted water suppliers to join with others to meet the targets regionally. Finally, it permitted urban water suppliers to increase the use of recycled water to meet their targets.

SB X7-7 directed DWR to develop technical methodologies and criteria to ensure the consistent implementation of the Act and to provide guidance to urban water suppliers in developing baseline and compliance water use.[11]

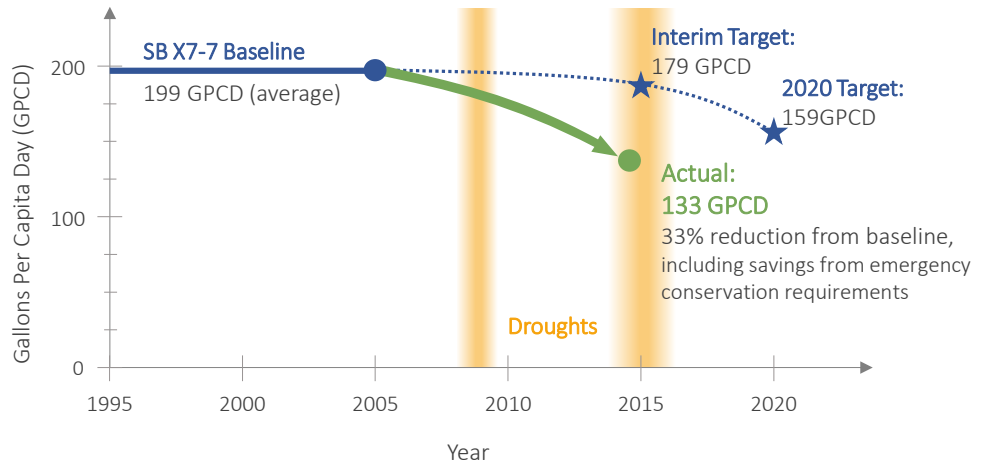
The current historical drought (2013 – 2017) has placed an even greater emphasis on urban water conservation and efficiency. In January 2014, Governor Brown issued an emergency drought proclamation, and on April 1, 2015, the Governor issued an Executive Order directing the Water Board, for the first time, to enact statewide mandatory conservation requirements to achieve a 25 percent reduction in statewide urban water use. As a result of these mandatory conservation requirements, urban water suppliers reported an average per capita water use of 133 GPCD in 2015, a 33 percent reduction from the baseline conditions for SB X7-7 implementation of 199 GPCD (see Figure 3-1). In 2013, prior to the imposition of statewide mandatory conservation requirements, DWR estimated that average statewide per capita use had already declined to about 160 GPCD, an 18 percent reduction from the SB X7-7 baseline.

The current drought has accelerated urban water conservation, exceeding 20x2020 goals well in advance of 2020. To build on the conservation and efficiency momentum achieved during the current drought, and to "make water conservation a California way of life" on a permanent basis, the EO directs the EO Agencies to develop new water use targets that go beyond the "20x2020" targets based on strengthened water use efficiency standards.

[10] As outlined in DWR's *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use* (2010, & updated in 2016), the four methods to set 2020 per capita water use targets are as follows:

- *Method 1*: Eighty percent of the water supplier's baseline per capita water use.
- *Method 2*: Per capita daily water use estimated using the sum of performance standards applied to indoor residential use; landscaped area water use based on MWELO; and a 10% reduction in CII water use.
- *Method 3*: Ninety-five percent of the applicable State hydrologic region target as stated in the State's April 30, 2009, draft 20x2020 Plan.
- *Method 4:* An approach developed by DWR and reported to the Legislature in February 2011 that identifies per capita targets that cumulatively result in a statewide 20-percent reduction in urban daily per capita water use by December 31, 2020.

[11] DWR developed methodologies for calculating base daily per capita water use, baseline commercial, industrial, and institutional water use, compliance daily per capita water use, gross water use, service area population, indoor residential water use, and landscaped area water use. These are published in *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use* (DWR 2010, updated in 2016).



Urban water suppliers reported an average per capita water use of 133 GPCD in 2015, a 33 percent reduction from the baseline conditions set for SB X7-7 and well below the interim target of 179 GPCD and the final target of 159 GPCD.

Figure 3-1. Conservation Targets under SB X7-7 Compared with Actual Conservation

The EO calls for new water use targets based on strengthened water use efficiency standards, rather than a percentage reduction in urban water use. This approach builds off one of the four SB X7-7 methods urban water suppliers could use to achieve their 2020 targets (Method 2). A water use efficiency standards-based approach provides several advantages when compared with other previously used percent reduction approaches in SB X7-7. Mandatory percentage reductions may be more difficult for suppliers that have already achieved a high level of efficiency and conservation, as their overall water use may be low. Further, an efficiency approach removes negative incentives for consumers to use more water than needed during normal (non-drought) conditions such that, if required to conserve due to an emergency, it would be easier to achieve reduction targets. An efficiency-based approach also recognizes supplier efforts to reduce overall water use, including indoor water use efficiency and turf-replacement programs and development of more drought resilient water supplies, such as recycled water. An efficiency standards-based approach eliminates uncertainty or inequity associated with percent reduction from a baseline.

While the Water Boards' mandatory conservation requirements were effective in reducing urban water use, those requirements function best as a short-term, interim solution. A long-term transition to conservation as a way of life must take into account the climatic, landscape, and demographic conditions unique to each supplier in a more precise manner. The approach described in this Framework will recognize the unique geographies of the State by incorporating supplier-specific climate, population, and other settings.

3.1.2 EO Directive

New water use targets based on strengthened standards address EO Item 2, which states:

> *The Department of Water Resources (Department) shall work with the Water Board to develop new water use targets as part of a permanent framework for urban water agencies. These new water use targets shall build upon the existing state law requirements that the state achieve a 20% reduction in urban water usage by 2020. (Senate Bill No. 7 (7th Extraordinary Session, 2009-2010)). These water use targets shall be customized to the unique conditions of each water agency, shall generate more statewide conservation than existing requirements, and shall be based on strengthened standards for:*
>
> *a. Indoor residential per capita water use;*

b. Outdoor irrigation, in a manner that incorporates landscape area, local climate, and new satellite imagery data;

c. Commercial, industrial and institutional water use; and

d. Water lost through leaks.

The Department [DWR] and Water Board shall consult with urban water suppliers, local governments, environmental groups, and other partners to develop these water use targets and shall publicly issue a proposed draft framework by January 10, 2017.

EO Item 6, which addresses data collection and improved water system management, also relates to the implementation of new targets and standards directed in EO Item 2. EO Item 6 states:

The Water Board and the Department [DWR] shall direct urban and agricultural water suppliers to accelerate their data collection, improve water system management, and prioritize capital projects to reduce water waste.

See also Table 1-1 in Chapter 1 for a summary of the relationship between the EO items described in this chapter.

3.1.3 Recommendations

The EO Agencies recognize that improved water use efficiency on a statewide scale will take time, and recommend setting interim targets until refined standards are adopted no later than 2021, with a path of increasing progress toward achieving final compliance in 2025. This will allow time for the EO Agencies to collect data sufficient for establishing new standards, and allow water suppliers and users to plan for and adjust to the change in approach. The EO Agencies will identify and formally adopt (revised) final standards no later than 2021. Retail urban water suppliers would then calculate new water use targets, with the goal of achieving full compliance with the final standards by 2025.

The standards recommended by the EO Agencies encompass residential indoor water use, outdoor irrigation water use, water system losses, and commercial, industrial and institutional uses. The EO Agencies anticipate that the greatest water efficiency savings will be achieved through changes in outdoor landscape water use, due to the relatively high use of water in this sector compared with others.

The following describes the standards framework, and the processes needed to implement the water use target directive. The discussion is divided into three parts: (1) the process for setting a water use target, (2) the process for setting standards (including provisional outdoor and indoor water use, water loss, and commercial and industrial measures), and (3) a summary of the anticipated schedule for water use standards development.

In support of water conservation, the legislature has, through CWC Section 1011, deemed reductions in water use due to conservation as equivalent to reasonable beneficial use of that water. The proposals in this report are not intended to affect or otherwise limit any rights to water conserved under applicable law, including without limitation, water conserved consistent with CWC Section 1011.

In addition, the California Water Action Plan calls for increasing the use of recycled water as part of the State's larger strategy to develop a more resilient water supply and increase regional self-reliance. It is therefore imperative that new water use targets be compatible with the goal of expanding recycled water supplies. The proposed efficiency standards would allow higher water application volumes for outdoor use of non-potable recycled water to provide an incentive for its use. The EO agencies are proposing that water suppliers that utilize recycled, for either potable or non-potable uses, continue to be incentivized within the targets or through their implementation.

Setting a Water Use Target

Under the EO Agencies' proposed framework, each retail urban water supplier will be required to annually calculate an overall water use target and implement commercial, industrial, and institutional (CII) performance-based measures. The proposed target framework recommendations are specific to retail urban water suppliers and the recommendations are not intended to apply to wholesale urban water suppliers.

The EO Agencies' proposed framework improves on the SB X7-7 Method 2 approach, but differs in several respects. First, under SB X7-7 Method 2, the water use target was the sum of an indoor and outdoor performance based standard and a 10 percent reduction in CII water use, and water loss was not addressed. Under the proposed framework, water loss is now included as part of the supplier's Water Use Target. Given the substantial diversity in businesses and institutions throughout California, a better approach to the CII sector would be to institute performance measures rather than a volumetric standard or budget, at this time. Data collection associated with the CII performance measures may support industry standards and volumetric approaches in the future.

The water use targets will be calculated as the sum of a retail supplier's residential indoor, outdoor irrigation, and distribution system water loss budgets. Each of these budgets is calculated through the application of a water use efficiency standard, described later in this section.

Indoor Water Use Budget + Outdoor Water Use Budget + Water Loss Budget = Supplier Water Use Target

Compliance will be based on the supplier's total water use target, rather than on the individual budgets. Interim targets based on residential indoor and outdoor standards will be set by water suppliers in 2018, and final targets based on indoor, outdoor and water loss standards will set by water suppliers in 2021. The interim targets will be gradually reduced over time to create a path of increasing progress toward achieving final compliance in 2025. Water suppliers that are not on track to meet interim or final standards-based targets may be provided with additional compliance assistance and/or face enforcement actions from the Water Board.

The following provides an example water use target calculation using hypothetical budgets for residential indoor water use, outdoor irrigation water use, and distribution system water loss. For illustrative purposes, the budgets are presented in three units: gallons per capita per day (GPCD), acre-feet, and centrum cubic feet (CCF).

Example Water Use Target Calculation

Sector	Budget[1] (GPCD)	Budget Volume (acre-feet)	Budget Volume (CCF)
Residential Indoor Water Use	55	10,492	4,570,315
Outdoor Irrigation Water Use	45	8,584	3,739,190
Water Loss	6	1,144	498,326
Target	**106**	**20,220**	**8,830,380**

Notes:
1. Budget calculations based on the following:
   Service area population = 170,319
   Days per year = 365

Water suppliers will also calculate compliance volume by subtracting water delivered to the CII sector from total water production:

Compliance Volume = Total Water Production - CII Deliveries

On the following page is an example compliance volume calculation for a hypothetical water supplier. To be in full compliance, (1) the water supplier's compliance volume must be less than or equal to the water use target, and (2) the supplier must document full implementation of the CII

performance measures (as described more fully later in this section).

Example Compliance Volume Calculation

Supplier's Water Use:

Total water production:	26,136 acre-feet
CII deliveries:	7,240 acre-feet
Target (see prior example):	20,220 acre-feet

Compliance volume = *total production – CII deliveries*

= *26,136 – 7,240*

= *18,896 acre-feet*

The supplier is in compliance because the compliance volume of 18,896 acre-feet is less than the water use target of 20,220 acre-feet.

A supplier's water use target will change each year because, although the standards are set, the targets are based on variable metrics (population, landscape area, evapotranspiration) that change from year to year. Consequently, post-submittal changes or adjustments will not be needed to account for weather or other factors. The process and methodology for setting the standards is described in the following section.

Setting Water Use Efficiency Standards

The following describes the recommended provisional standards for residential indoor water use, outdoor irrigation, and distribution system water loss, and the performance measures standard for CII water use.

Residential Indoor Water Use Standard

This standard is defined as the volume of residential indoor water used by each person per day, expressed in GPCD. The indoor residential standard will be used to calculate the residential indoor budget of a supplier's water use target, which is a function of the total service area population.

For example:

Residential Indoor Water Use Budget = (Service area population) x (residential indoor standard) x (number of days in a year)

Until the 2025 standard for residential indoor water use is established, the existing 55 GPCD standard based on SB X7-7[12] will apply.

A recent national study[13] conducted by the Water Research Foundation suggests that the national residential indoor water use average is about 59 GPCD. Many experts believe California's average residential indoor use to be lower. DWR is currently conducting a study to estimate average statewide residential indoor GPCD. A DWR-commissioned study[14] to support the standard development suggests that compliance with the provisional residential indoor water use standards could likely be facilitated through plumbing code changes and continued appliance replacements with higher efficiency units. This study suggests that the effects of toilet replacement through SB 407[15] and continued enforcement of federal clothes washing machine water use efficiency standards would lower residential indoor water use by roughly 6 GPCD by 2030 and by 9 GPCD by 2040. This estimated level of reduction is generally consistent across all counties in California.

DWR and the Water Board will continue gathering additional data on current indoor water use to support future revisions of the existing standard downward to reflect the increased use of efficient fixtures and appliances. The updated standards will be available in 2018, with a timeline for interim and final compliance by 2025. Afterward, the EO

[12] SB X7-7 defined 55 GPCD as a provisional standard for residential indoor water use. See CWC Section 19608.20(b)(2)(A).
[13] Water Research Foundation (2016). Residential End Uses of Water Study, Version 2: Executive Report.
[14] Mitchell, D., 2016. Projected Statewide and County-Level Effects of Plumbing Codes and Appliance Standards on Indoor GPCD, for Department of Water Resources, August.
[15] California Civil Code Section 1101 et seq.

Agencies will reevaluate the standard for potential revision every five years, beginning in 2025.

Outdoor Irrigation Standard

The proposed outdoor irrigation water use standard will be defined as percentage of reference evapotranspiration (ETo). ETo is an estimate of the evapotranspiration[16] of well-watered cool season grass and is expressed in inches of water per day, month, or year. ETo will vary across the State based on climatic factors such as solar radiation, temperature, humidity and wind. Landscape water requirements are expressed as a percentage of ETo and encompass the plant water requirements and the irrigation system efficiency. Lawns and recreational fields can require 100% of ETo or greater while low water use landscapes can require 20 to 30% of ETo. The outdoor irrigation standard will be a fraction of ETo.

Table 3-1 shows the existing SB X7-7 standards (Method 2[17]) for outdoor water use. These existing, provisional standards will guide and assist water suppliers in their outdoor water use planning efforts until such time as the EO Agencies identify and adopt final standards (as described later in this section).

Table 3-1 Existing SB X7-7 Standards for Outdoor Water Use

Category		% of ETo
Residential Landscape by Parcel Development Date	Before 2010	0.8
	Between 2010 and 2015	0.7
	After 2015	0.55
Commercial Landscape		0.45
Landscapes Irrigated by Recycled Water		1.0
Special Landscape Areas (e.g., Parks and Fields)		1.0

Note that irrigation use for commercial properties without a dedicated account or meter will be subject to the CII performance measures, as described later.

For the purpose of the provisional standards displayed in Table 3-1, areas irrigated with recycled water are considered special landscape areas and assigned an Evapotranspiration Adjustment Factor (ETAF) of 1.0, recognizing the higher salinity levels of recycled water. The EO Agencies will review local community characteristics and consider how the proposed efficiency standards can best reflect local variances in geography and climate when developing the permanent standards by 2021. The EO Agencies' consideration will be based on lessons learned from the land use pilot project and on data received following implementation of interim targets in 2018.

[16] Evapotranspiration is the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants.

[17] In describing Method 2, CWC Section 10608.2 (b)(2) specifies that the 2020 per capita water use target is, "The per capita daily water use that is estimated using the sum of the following performance standards:

(A) For indoor residential water use, 55 gallons per capita daily water use as a provisional standard. Upon completion of the department's 2016 report to the Legislature pursuant to Section 10608.42, this standard may be adjusted by the Legislature by statute.

(B) For landscape irrigated through dedicated or residential meters or connections, water efficiency equivalent to the standards of the Model Water Efficiency Landscape Ordinance set forth in Chapter 2.7 (commencing with Section 490) of Division 2 of Title 23 of the California Code of Regulations, as in effect the later of, the year of the landscape's installation or 1992. An urban retail water supplier using the approach specified in this subparagraph shall use satellite imagery, site visits, or other best available technology to develop an accurate estimate of landscaped areas.

(C) For CII uses, a 10-percent reduction in water use from the baseline CII water use by 2020."

The total outdoor water use budget for a water supplier is calculated as the sum of the individual budgets for all categories of outdoor water use within its service area. Because ETo and landscape area can change from year to year, the resulting outdoor water use budget also changes.

As described previously, the outdoor irrigation budget is calculated based on the landscape area within a water supplier's service area. Currently, few water suppliers have measured or collected data on the landscape area within their service area. To facilitate the transition to the new standards-based approach, the EO Agencies will develop landscape area estimates for each urban retail water supplier in the State. The State's landscape area measurement project will focus on the water supplier service aggregate landscape area. Suppliers may contract with the vendors individually to obtain parcel level landscape area measurements.

The EO Agencies will develop landscape area data in several steps. First, the EO Agencies will form an urban landscape area workgroup to provide technical guidance and input on this project. This work will include developing definitions for irrigated and irrigable landscape area. Next, pilot projects will be conducted to ensure that the process used for measuring landscape area is accurate. The landscape area workgroup will also provide input and guidance in reviewing the pilot projects' results. Accuracy assessments will be conducted for each of the pilot projects.

Based on lessons learned from the pilot projects, the EO Agencies will measure the landscape area for the remaining urban retail water suppliers. It is anticipated that this statewide landscape area measurement project will be completed in 2018. At the end of the project, in 2018, the service area landscape area data will be made available to water suppliers.

Using both the supplier service area landscape area data measured in the pilot and statewide projects and water suppliers' aggregate water delivery data, the EO Agencies will estimate service area, regional, and State average applied irrigation water levels. There will be ample opportunity for public input and workgroups to help shape this implementation going forward, and DWR will also consider data provided by water agencies.

In 2018, using the statewide estimates of applied irrigation water use, DWR and/or the Water Board will evaluate the existing SB X7-7 outdoor water use standards (Table 3-1) and develop final recommended standards that would begin to be phased in starting in 2018 and need to be fully applied by 2025. At this time, in setting the landscape standards the EO Agencies will determine whether the irrigated landscape area or the irrigable (developed landscape area that could be irrigated) landscape area is used as the basis for the standard. The EO Agencies will also reevaluate the inclusion of recycled water in the outdoor water use standard. The final outdoor standards will be set to increase the efficiency of outdoor water use and achieve water savings beyond SB X7-7 implementation.

By 2021 the EO Agencies will adopt the final outdoor landscape standards. Starting with 2021 (reported on in 2022), urban water suppliers must start showing sufficient progress towards meeting the water use targets based on the 2025 standards. Water suppliers will be required to meet their water use targets by 2025.

Every five years thereafter, the EO Agencies will review the outdoor water use standard; at these times, they may consider further reducing the ETAFs for some or all categories, or making other adjustments to the standard and budget calculation. Landscape area data will also be updated periodically.

Distribution System Water Loss Standard

The standard for water system loss will be established through the SB 555 process[18] and may be expressed as volume per capita or volume per connection, accounting for relevant factors such as infrastructure age and condition. The water loss standards will include system losses and leaks, as well as other non-revenue water used for system maintenance and public safety purposes.

Per SB 555, the Water Board will establish the water loss standard by 2020 for compliance in 2025. The Water Board will reevaluate the water loss standard for potential update every five years, beginning in 2025.

Commercial, Industrial, and Institutional Performance Measures

There is substantial diversity in businesses and institutions throughout California, resulting in a wide range of water use within the commercial, industrial, and institutional sector. Consequently, the EO Agencies will not establish a volumetric standard and budget for CII water use at this time. Instead, CII water suppliers will be required to implement the following three performance measures:

1. Convert all landscapes over a specified size threshold that are served by a mixed-meter CII account to dedicated irrigation accounts, either through the installation of a separate landscape meter or the use of equivalent technology.

2. Classify all CII accounts using the North American Industry Classification System (or another similar classification system selected by the EO Agencies). Where feasible, CII subsector benchmarks will be developed to assist water suppliers in identifying CII accounts with the potential for water use efficiency improvements.

3. Conduct water use audits or prepare water management plans for CII accounts over a specified size, volume, or percentage threshold.

By December of 2018, the EO Agencies would develop regulations and guidelines for the implementation of the CII performance measures. This guidance will include methods for classifying CII accounts, landscape size thresholds for dedicated metering, direction on implementing CII water audits, and guidance for preparing water management plans. The regulation and guidelines will be established through a public process, with the advice and input of a new CII workgroup to be established by the EO Agencies. Every five years, the EO Agencies will review the outcomes of performance measure implementation and consider updates, if appropriate. In the future, the EO Agencies may consider establishing industry-specific benchmarks or other means to improve water use efficiency in the CII sector.

Schedule for Water Use Standards Development, Review and Revision

The timeline on the following page summarizes anticipated EO Agencies actions and schedule for developing, reviewing, applying, and revising the water use standards.

[18] See Section 4.3 of this report for information on SB 555, water loss audits, and water loss standards.

Water Use Standards Development Timeline

2017 DWR completes pilot projects on landscape area measurements

2018 DWR completes statewide landscape area measurements to support development of outdoor landscape standard

EO Agencies estimates service area, regional, and State average applied irrigation levels

EO Agencies recommend final 2025 compliance standards for indoor and outdoor water use

EO Agencies set provisional indoor and outdoor residential standards, and water suppliers set interim targets

EO Agencies develop regulations and guidelines for the implementation of CII performance measures

DWR provides urban water suppliers with the service area landscape area data

2019 EO Agencies provide guidance and methodologies for all standards

2020 EO Agencies complete rulemaking and adopt final 2025 water loss standards

2021 EO Agencies complete rulemaking and adopt final 2025 indoor and outdoor standards

2025 EO Agencies review and consider updates to the standards, starting in 2025 and every five years thereafter; revisions will follow the requirements for rulemaking and provide opportunity for public comment and input

3.1.4 Reporting, Compliance Assistance, and Enforcement

Specific reporting and compliance dates are subject to EO Agencies requisite actions as described above. Compliance dates would be extended as necessary to accommodate any serious delays in completion of those actions.

Reporting

Beginning in 2019, water suppliers must submit annual progress reports for residential water use, and implementation of the recommended CII performance measures.

Starting in 2022, the annual progress report for the prior year will address all water use standards and will include the following three elements:

1. Calculation of progress towards meeting the water use standards based on prior year target developed using 2025 standards and annual production data.
2. Documentation of CII performance measures implementation.
3. A narrative description of refined actions to be taken by the supplier to ensure compliance by 2025.

Water suppliers will submit annual progress reports every year from 2022 through 2025, documenting annual water production relative to the water use targets and CII performance measure implementation for the previous year. In 2026, water suppliers will submit a concluding annual compliance report documenting accomplishments and outcomes in complying with the 2025 water use targets.

Suppliers will continue to submit annual compliance reports in 2026 and thereafter, repeating the 5-year reporting cycle and using updated standards adopted by the EO Agencies, as applicable. Additionally, suppliers will continue to submit monthly and annual water use data, per existing requirements.

The 5-year cycle for water suppliers to update their UWMPs is similar to the 5-year cycle for the EO Agencies to update the water use standards; it is expected that updated standards will be available six months to a year prior to the July deadline for submitting UWMPs. Reporting in future UWMP updates will, therefore, incorporate the water use efficiency standards and supplier accomplishments in meeting them.

Assistance and Compliance

The EO Agencies propose that compliance will be assessed on total water use in comparison to a supplier's total water use target, rather than on the individual water budgets by sector (indoor, outdoor, and water loss). Full compliance will be met when the supplier's total water use is less than or equal to the standard, and the supplier has implemented the CII performance measures.

The EO Agencies will review the monthly and annual reports and data submitted by water suppliers for completeness and progress in achieving interim targets starting in 2018 and compliance with final targets by 2025. Where necessary, DWR or the Water Board may provide feedback, direction, or suggestions for water suppliers to improve their compliance and progress. The Water Board may also issue formal Enforcement or Informational Orders to suppliers not on track to meet interim or final targets, as explained below under *Enforcement*.

DWR will provide technical assistance to suppliers in preparing their annual progress reports and will continue to revise UWMP guidance, as needed, to reflect updated standards and water use compliance requirements. The EO Agencies will actively communicate the need for the water use standards and their implementation through public outreach and engagement, sharing the responsibility for public education with water suppliers.

Water suppliers must be in compliance with the new standards-based water use targets by 2025 to be eligible for State grant and loan funding.

Enforcement

Water suppliers that are not in compliance with the new standards-based water use targets by 2025 may be provided with additional compliance assistance and/or face enforcement actions from the Water Board. This could include:

- Informational orders
- Conservation orders
- Cease and desist orders
- Administrative civil liability penalties (such as fines)

The EO Agencies will conduct enforcement only at the retail supplier level, not at the individual customer level, based on compliance with the total water use target for the entire service area and associated performance measures for CII water use. Water suppliers may implement discretionary actions of their choosing on individual water accounts or users to ensure that their overall water use efficiency targets are met.

Water suppliers are required to continue submitting monthly water use reports to the Water Board for their water use, amount of conservation achieved, and any enforcement efforts, as directed in EO Item 3.

Water suppliers failing to submit annual reports for standard compliance, UWMPs, or monthly reports for water use per the schedule will be subject to earlier enforcement action.

MWELO Updates and Standards

DWR may consider updating the MWELO to better align the model ordinance language with the water use efficiency standards. Better alignment will provide land use agencies with tools to implement complementary actions that assist water suppliers in complying with the standards.

3.2 Water Shortage Contingency Plans

3.2.1 Current Status and Need for Change

Current Status

Current statutes direct urban suppliers[19] to provide a water shortage contingency analysis as a component of their UWMPs, which are updated every five years. Some urban water suppliers have exceeded the existing shortage contingency analysis requirements, documenting them in official WSCPs; these plans are used to satisfy the UWMP requirements submitted to DWR. However, this is not a requirement under current guidance[20], and suppliers have used varying assumptions in their analyses. Consequently, WSCPs are varied in their form, approach, and functionality, in part due to the lack of statewide standards.

Need for Change

During the on-going historical drought, some water suppliers that had inadequately assessed the risk of water shortage were unprepared to effectively respond to the realized supply shortages. However, many other suppliers showed high levels of resiliency due to their adequate planning and well-defined contingency actions.

Supplier experiences during the current drought have prompted the need to elevate water shortage contingency planning for urban water suppliers throughout the State. Water shortage contingency planning is important because water shortages can affect the basic health and safety of California residents. It can also be very costly for both the State and local communities to engage in last minute, emergency efforts to alleviate water supply crises when they happen.

Urban water suppliers should evaluate the potential impacts on their water supplies considering the full range of plausible water supply and demand conditions in order to properly assess their potential risk and exposure to shortage in frequency, severity, and potential consequences. Each water supplier establishes its accepted tolerance for risk that varies based on many intertwined technical, legal, economic, and political considerations. It is critical that water suppliers inform their customers of the accepted risk and potential consequences.

As these factors are often changing, a supplier must diligently assess them in a manner that allows confident management in accordance with its risk tolerance.

3.2.2 EO Directive

The water shortage contingency planning discussed in this section focuses on the requirements for DWR to develop measures to strengthen local drought resilience. Specifically, EO Items 8 and 9 state:

8. *The Department [DWR] shall strengthen requirements for urban Water Shortage Contingency Plans, which urban water agencies are required to maintain. These updated requirements shall include adequate actions to respond to droughts lasting at least five years, as well as more frequent and severe periods of drought. While remaining customized according to local conditions, the updated requirements shall also create common statewide standards so that these plans can be quickly utilized during this and any future droughts.*

9. *The Department [DWR] shall consult with urban water suppliers, local governments, environmental groups, and other partners*

[19] UWMPs are only prepared by urban water suppliers, defined as a "supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually" (CWC Section 10617). According to DWR, there are approximately 440 wholesale and retail urban water suppliers in the State that must prepare UWMPs.

[20] 2015 Urban Water Management Plan: Guidebook for Urban Water Suppliers, DWR, January 2016.

to update requirements for Water Shortage Contingency Plans. The updated draft requirements shall be publicly released by January 10, 2017.

EO Item 6, which relates to accelerated data collection for urban water suppliers, also has ties to EO Items 8 and 9, above. See also Table 1.1 in Chapter 1.

3.2.3 Recommendations

DWR recommends strengthening local drought resilience through improved planning and annual assessments. In addition, the proposed planning and assessment methods will allow for local control in defining the risk tolerance, with improvements in information dissemination to both customers and the State during drought conditions. This could lead to reductions in long-term impacts on customers in the wake of more frequent and severe drought conditions under climate change.

The EO Agencies established the following primary objectives in the design of the recommendations:

- Assure that an urban water supplier has adequately planned for, and can quickly respond with adequate, pre-determined actions, to droughts lasting at least five years, as well as during more frequent and severe periods of drought; and
- Provide DWR with information necessary to evaluate specific urban supplier responses throughout the State to drought conditions, to allow focused attention where necessary and forestall overarching mandates that may conflict with existing adequate local plans and responses.

To achieve these objectives, DWR recommends the following requirements for urban water suppliers and EO Agencies:

Wholesale and Retail Urban Water Suppliers

Each wholesale and retail urban water supplier will prepare a Drought Risk Assessment that evaluates plausible worst-case supply conditions for a period of at least five years. These will be reported in the UWMP.

Updated Contents of the Urban Water Management Plans

Updated contents for suppliers' UWMPs include the following:

1. 5-Year Drought Risk Assessment – Define the methodology, data requirements, and basis for one or more plausible supply shortage conditions necessary to conduct a 5–year drought risk assessment that examines shortage risks for the next five or more consecutive years. Drought resilient, hydrologically independent supplies such as potable reuse, recycled water, and desalination are considered fully reliable under all historical drought hydrology and plausible climate change effects, and should be considered.

2. Evaluation Criteria – Define a set of evaluation criteria that will be used to conduct the 5-year drought risk assessment. The evaluation criteria will be locally applicable and include, but not be limited to, the following factors:

    a) Historical drought hydrology

    b) Plausible climate change effects for existing supplies and demands (e.g. precipitation or ETo changes)

    c) Plausible regulatory changes that can affect existing supplies and demands (e.g., Water Use Efficiency emergency regulations)

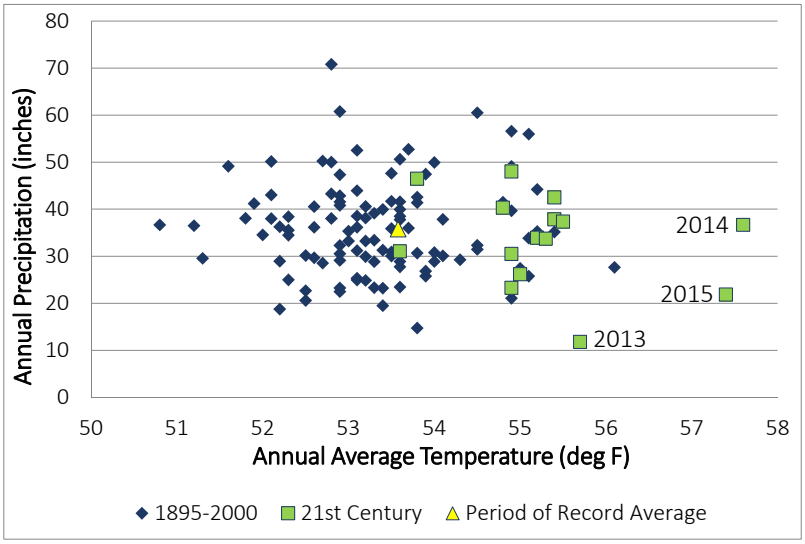
    d) Demand projections

3. Conduct a Drought Risk Assessment – Suppliers will conduct a drought risk assessment at a minimum of every five years, per the procedures set forth in the urban water management plan.

Each urban water supplier will prepare and adopt an updated WSCP and submit it to DWR for review as part of the UWMP. A key component of the

WSCP will be establishing the methodologies, data requirements, and policy considerations for an annual assessment of shortage risks in the current year plus one or more dry years. Following the procedures detailed in the adopted WSCP, the supplier will annually assess its actual or potential water shortage condition, respond accordingly, and report pertinent information to DWR.

When developing a WSCP, water suppliers should consider the potential risks associated with climate conditions that are outside of the historical norm. As evidenced in the graphic below for the Sacramento River Basin, the recent drought (shown in data points for 2013, 2014, and 2015) is unusually warm and dry relative to other data in the period of record.



Source: NOAA Climate Division Site Calendar Year Data, compiled by Michael Anderson, DWR Climatologist

Contents of the Water Shortage Contingency Plan

The supplier's WSCP must provide details for each of the following standard sections:

1. Annual Water Budget Forecast Procedures – Define the process, data inputs, and water year schedule to generate the Annual Water Budget Forecast.

2. Annual Water Budget Assessment Methodology – Define the methodology necessary to conduct an Annual Water Budget Forecast assessing shortage risks for the current year and one or more dry year(s), assuming a dry year triggers Shortage Response Actions.

3. Annual Water Budget Evaluation Criteria – Define a set of evaluation criteria that will be used to conduct the Water Budget Forecast. The evaluation criteria will be locally applicable and include, but not be limited to these factors:

   a) Current year unconstrained demand, considering weather, growth or other influencing factors, such as policies to manage current supplies to meet demand objectives in future years, as applicable.

   b) Current year available supply, considering hydrologic and regulatory conditions in the current year and an additional dry year, as appropriate for the current supply sources.

   c) Existing infrastructure and operational capabilities and plausible constraints.

4. Shortage Levels – WSCPs must include six standard shortage levels, representing the actual shortage, or predicted shortage determined by the Annual Water Budget Forecast, defined as:

   - Shortage Level 1: Up to 10 percent shortage
   - Shortage Level 2: Up to 20 percent shortage
   - Shortage Level 3: Up to 30 percent shortage
   - Shortage Level 4: Up to 40 percent shortage
   - Shortage Level 5: Up to 50 percent shortage
   - Shortage Level 6: Greater than 50 percent shortage

5. Shortage Response Actions (SRA) – For each Shortage Level, define a progressive series of SRAs that include a locally appropriate mix of short-term water efficiency and/or demand reduction actions, supply augmentation, and/or operational changes necessary to respond to actual or predicted shortage conditions. The SRAs must include actions necessary to respond to shortages.

6. Communication Plan – Describe the planned communications approach and anticipated actions intended to quickly inform customers, the public, and regional and State interests, about current shortages or predicted shortages as determined by the Water Budget Forecast, expected implementation of SRAs, and other necessary communications.

7. Customer Compliance, Enforcement, and Appeal/Exemption Procedures – Describe methods and procedures in place to (1) gain customer compliance with triggered SRAs – especially with actions requiring mandatory demand reductions, (2) enable enforcement to assure compliance, and (3) enable a customer appeal/exemption process that allows unique circumstances to be accommodated.

8. Implementation Authorities – Demonstrate that necessary authorities are in place to quickly implement SRAs. Identify specific ordinances, resolutions, or other authorities, and address compliance with CWC Section 350 et seq. Should a water supplier enter into Shortage Level 4 or higher, as described herein, there should be a water shortage emergency declaration and all appropriate actions described in CWC Section 350 et seq., must be implemented. Should SRA's be sufficient to effectively move the water supplier out of a shortage condition there may be no need for an emergency declaration.

9. Financial Plan for Drought Conditions – Describe management of revenue and expense variances when SRAs are triggered, including but not limited to, customer rate adjustments, or use of financial reserves. Specifically describe compliance with SB 814 (CWC Section 365 et seq.).

10. Monitoring and Reporting Requirements and Procedures – Outline internal and external monitoring and reporting procedures to assure appropriate data are being collected, tracked, and analyzed for purposes of monitoring customer compliance, and to meet DWR reporting requirements.

11. Re-evaluation and Improvement Process – Identify procedures for monitoring and systematically evaluating the functionality of a WSCP to assure shortage risk tolerance is adequate, and appropriate mitigation strategies are available.

Implementing Water Shortage Contingency Plans

As articulated in the WSCP, the supplier will follow its prescribed procedures to assess current year and one or more dry year water supply reliability conditions. Specifically, the supplier will:

1. Annually conduct a Water Budget Forecast per the procedures set forth in the WSCP.

2. Depending on the results of the Water Budget Forecast, appropriate SRAs will be triggered corresponding to the projected Shortage Level.

EO Agencies

The EO Agencies will set forth planning and reporting criteria, evaluate submitted data, support compliance and enforcement, and provide technical assistance. The EO Agencies anticipate that suppliers that conduct thorough shortage planning will continue to do so under the new requirements, while those that do not will be prompted to improve their planning to levels that limit or eliminate the need for State intervention in drought response.

DWR would take the following types of actions:

1. Prepare Compliance Criteria – DWR would prepare necessary documents (and regulations, if necessary) detailing the WSCP and annual assessment compliance criteria that must be met by water suppliers. The criteria will include articulating the necessary data and information that must be submitted by suppliers (1) every five years, and (2) annually. Failure to comply will result in to-be-defined enforcement measures.

2. Develop Information Submittal Tools – DWR would prepare new or augment existing reporting procedures and websites to facilitate supplier reporting. Existing requirements for data and information reporting will be utilized where feasible in order to minimize additional reporting burdens on suppliers.

3. Evaluate Statewide Water Supply Conditions – On an as-needed basis, DWR would assess regional and statewide water supply conditions – such as those created by prolonged or severe hydrologic drought – to understand the likelihood and degree that urban suppliers would be implementing SRAs.

4. Review and Assess Supplier-Reported Information – DWR would review supplier-specific data and information submitted for compliance with stated criteria. The review will also allow DWR to evaluate local shortage conditions compared to the statewide water supply conditions, and prepare necessary reports for the Governor's Office and the Legislature.

5. Compliance and Enforcement – A key factor to strengthen local drought resilience is to hold suppliers accountable for being prepared to quickly respond to long-lasting and potentially more frequent and severe supply shortages. By requiring suppliers to submit adopted WSCPs and perform and submit annual assessments, the EO Agencies will have supplier-specific information that can be used to assess compliance with overall objectives. As part of recommendations, the State would define the compliance assistance and enforcement protocols.

6. Technical and Financial Assistance – To facilitate improved drought planning for all urban water suppliers, the EO Agencies would continue to offer technical and financial assistance through various existing programs and seek additional funding. Additionally, DWR would update its 2008 Drought Guidebook to incorporate the strengthened WSCP recommendations, provide further details for the recommended components and definitions, provide example drought risk assessment methods and supply shortage scenarios, and suggest various SRAs.

3.2.4 Reporting, Compliance Assistance, and Enforcement

The reporting and compliance processes described in this section will result in transparent communication of effective planning by local water suppliers and will provide the EO Agencies with an effective monitoring tool. The end result of data reporting and collection should be in a data exchange system with a public-facing GIS application that allows policy makers, water managers, and the public to view actual or predicted shortage conditions and SRAs in any part of the State.

The water supplier will follow the reporting procedures set forth in its WSCP and UWMP. The following reporting cycle is anticipated:

- Every five years
  - Submit the adopted WSCP to DWR, including the associated Drought Risk Assessment in the UWMP and supporting data.
  - Make the WSCP available to customers (website, hardcopy at desk).

- Annually
  - Submit Water Budget Forecast results and selected SRAs to DWR in May of each year, including an indication of the shortage reduction anticipated to occur with the selected SRAs.
  - Communicate Water Budget Forecast results and selected SRAs to customers (website, hardcopy at desk).

DWR would review submitted data for completeness and adequacy, using criteria to be developed by DWR, in consultation with the Water Board and CPUC, for further assistance and potential enforcement actions, where applicable. The Water Board may need expanded authority for full compliance actions. DWR will receive the WSCPs and the associated reports and make them available to the public.

3.3 Drought Planning for Small Water Suppliers and Rural Communities

3.3.1 Current Status and Need for Change

Current Status

Small water suppliers and rural communities are not covered by established water shortage planning requirements, which apply to large urban water suppliers and larger agricultural suppliers (see sections 3.2 and 3.4). Often, small suppliers and rural communities lack resources and mechanisms to compel drought planning efforts. Drought planning helps to identify potential shortage conditions and justify local expenditures and measures to provide sufficient safe water.

Counties have legal and fiduciary responsibilities to assist with the general well-being of their citizens and provide for the health and safety of their citizens; they are, however, limited in enforcing any water curtailment or conservation policies. Currently most counties do not address water shortages or do so minimally in their General Plan or the Hazard Mitigation Plan. Since a water shortage is an emergency, a drought plan should be contained in a Hazard Mitigation Plan.

Many State agencies have regulatory responsibilities and technical and financial assistance programs targeting rural communities and small water suppliers. Examples include the Water Board's Division of Drinking Water and their requirements for safety consideration of public water systems, and CPUC's jurisdiction over small investor-owned utilities on their operation and maintenance.

In addition, SGMA could have significant effects on management and long-term water supply reliability. SGMA applies to 127 high and medium-priority groundwater basins (as defined by DWR's California Statewide Groundwater Elevation Monitoring, or CASGEM, program). Any local agency that has water supply, water management, or land use responsibilities within a groundwater basin may elect to be a "groundwater sustainability agency" (GSA) for that basin. However, if a basin (or portion thereof) is not within the management area of a GSA, the county within which the basin is located will be presumed to be the GSA for that basin or portion. The county, when preparing a water shortage or drought plan, should work with applicable GSA(s) to coordinate appropriate drought planning and response measures. If the county declines its SGMA responsibilities, leaving unmanaged areas in a high or medium-priority basins, the State may be required to intervene and directly manage groundwater resources in the basin.

Need for Change

The ongoing drought has brought attention to the reality that many small water suppliers and rural communities are struggling to meet demands with significantly reduced water supplies – or even running out of water altogether.

The fundamental difference in customer relationships and access to resources between large and small water suppliers, self-supplied

systems and counties requires unique approaches to facilitating improved drought planning.

California became the first state to legally recognize the human right to water with the signing of AB 685 in September 2012. This law aims to ensure universal access to safe, clean, affordable, and accessible water. When communities run out of water, State and local emergency measures must be taken and these measures are expensive to implement.

Recent policy and legislative efforts have focused on trying to assure sustainable potable water supplies exists to meet the health and safety needs of the citizens. In conjunction with these efforts, the EO directs DWR to work with counties throughout the State to facilitate improved drought planning for rural communities and small water suppliers.

3.3.2 EO Directive

EO Item 10 focuses on improved drought resiliency to small water suppliers and rural communities. The State's primary intent of this directive is to assure the availability and reliability of potable water supplies to meet the health and safety needs of citizens not otherwise receiving water from designated urban water suppliers. EO Item 10 states:

> *For areas not covered by a Water Shortage Contingency Plan, the Department [DWR] shall work with counties to facilitate improved drought planning for small water suppliers and rural communities.*

3.3.3 Recommendations

Recommendations in this section focus on improved drought planning for small water suppliers and rural communities throughout every county in California.

EO Agencies are considering various actions to satisfy EO Item 10. The recommendations described below are intended to illustrate options currently under consideration and to describe the types of activities underway. This process to develop recommendations will continue into 2017.

The intent of these recommendations is for the EO Agencies and counties to collectively:

- Improve assessment of drought vulnerability to understand relative risks and prioritize actions.
- Take proactive actions to reduce drought vulnerability when and where appropriate.
- Improve availability and readiness of appropriate responses for when drought impacts do occur, including financing when and where appropriate.
- Recognize the existence of established small water system drought planning and work to develop flexibility for the incorporation of these plans into the county drought planning process.

The EO Agencies recommend the following efforts as a pathway to developing recommendations:

1. Improve engagement with cities and counties, as well as stakeholders such as the League of California Cities, the California State Association of Counties, the Rural County Representatives of California, the Community Water Center, tribal governments, and others.
2. Demonstrate commitments from the EO Agencies for continued engagement, for initial data collection and analysis, and for improved communications and outreach.
3. Continued engagement by the EO Agencies to work with stakeholders through a public process in 2017 to develop a countywide drought plan and recommendations.
4. All counties incorporate drought planning into their Hazard Mitigation Plans.

Although conversations and work among EO Agencies, counties, and interested and affected parties have been preliminary, the EO Agencies anticipate more specific, functional recommendations would address the following:

1. Reporting and Data Recording – Improved data collection, management, analysis, sharing, and transparency at all levels is foundational to the ability to plan. Data analysis will allow for better coordination among stakeholders and improve on both long-term actions as well as immediate responses to drought risks, especially in rural communities.

2. Communications Planning – Improved monitoring and communications among stakeholders, from the State, through the counties, and to the water suppliers and citizens.

3. County Demonstration of Drought Planning – While some portion of a county's citizenry may be covered by an urban supplier's WSCP or a small suppliers' drought plan (not required), there is nothing currently available to demonstrate that drought risk is being addressed for all county citizens. To address this need, counties may submit drought planning information to the EO Agencies through documents such as:

    a) Drought-specific protocols defined in a county (or multi-jurisdictional) Hazard Mitigation Plan.

    b) A County Drought Plan.

4. Roles and Responsibilities – Defined State Agency and county roles, responsibilities, and funding mechanisms.

5. Coordination – The EO Agencies and the county, working with stakeholders, should coordinate with SGMA efforts to assure drought planning and responses are reflected in Groundwater Sustainability Plans (where applicable).

3.3.4 Reporting, Compliance Assistance, and Enforcement

As the recommendations for satisfying EO Item 10 are still under development, no reporting, compliance assistance, or enforcement actions have been identified at this time but will be considered as development progresses.

3.4 Agricultural Water Management Plans

3.4.1 Current Status and Need for Change

Current Status

SB X7-7 requires agricultural water suppliers that provide water to more than 25,000 irrigated acres[21] to (1) adopt and submit AWMPs to DWR, and (2) implement Efficient Water Management Practices (EWMP) including the measurement and volumetric pricing of water deliveries, both on or before December 31, 2012. AWMPs must be updated on December 31, 2015, and every five years thereafter (CWC Section 10820 (a)).

Agricultural water suppliers that provide water to 10,000 and up to 25,000 irrigated acres[22] are currently not required to prepare and submit plans unless State funds are available to support the planning efforts (CWC Section 10853). SB X7-7 permits water suppliers that are contractors under the Reclamation Reform Act or Central Valley Project Improvement Act requirements to submit their federal plans in lieu of a plan meeting the SB X7-7 criteria. Those suppliers must also provide additional information on water measurement and pricing to meet the SB X7-7 requirements of CWC Section 10608.48 and California Code of Regulations (CCR) Section 597. DWR's *Guidebook to Assist Agricultural Water Suppliers to Prepare a 2015 Agricultural Water management Plan* (June 2015) describes how federal plans can be

[21] Excluding acreage irrigated with recycled water.
[22] Excluding acreage irrigated with recycled water.

supplemented to satisfy the CWC and CCR requirements.

Agricultural water suppliers are required to describe certain elements such as service area and infrastructure, the quantity and quality of water resources, water uses, previous water management activities and planned implementation of EWMPs, and an analysis on the effect of climate change under SB X7-7.

CWC Section 10608.48(d) requires that an agricultural water supplier include in its AWMP:

> *...a report on which EWMPs have been implemented or are planned to be implemented, an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and ten years in the future. If a supplier determines that a EWMP is not locally cost-effective or technically feasible, the supplier shall submit information documenting that determination.*

CWC Section 10608.48(a) requires that agricultural water suppliers implement EWMPs pursuant to CWC Sections 10608.48(b) and (c). Two critical EWMPs must be implemented by the agricultural water supplier serving 25,000 or more irrigated acres (CWC Section 10608.48(b)):

1. Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section CCR Section 531.1016.

2. Adopt a pricing structure for water customers based at least in part on quantity delivered.

CWC Section10608.48(c) requires implementation of 14 EWMPs if locally cost-effective and technically-feasible. Agricultural water suppliers must adopt the plan by December 31, 2012, and update it by December 31, 2015, and every five years thereafter, and submit the plan to DWR within 30 days of adoption (CWC Section 10820 (a)). Since July 1, 2013, an agricultural water supplier subject to the SB X7-7 requirements must submit an AWMP and implement applicable EWMPs to be eligible for a water grant or loan awarded or administered by the State (CWC Section 10608.56(b) and 10852). Agricultural water suppliers not implementing all of the applicable EWMPs may become eligible for State grants and loans if agricultural water suppliers provide a schedule, financing plan, and budget for the implementation of the required EWMPs (CWC Section 10608.56(d)). Grant or loan funds may be requested to implement EWMPs to the extent the grant or loan proposal is consistent with the water fund eligibility requirements (CWC Section 10608.56(d)).

AWMPs adopted by agricultural water suppliers and updated every five years are meant to be planning documents to better manage water provided for irrigation and increase the efficiency of water use in agriculture. To make AWMPs better planning documents, EO B-29-15 of April 1, 2015, required that the 2015 AWMPs include a detailed drought management plan and quantification of water supplies and demands in 2013, 2014, and 2015, to the extent that data is available. EO B-29-15 also required that agricultural water suppliers that supply water to 10,000 to 25,000 acres of irrigated lands develop AWMPs and submit their plans to DWR by July 1, 2016.

Need for Change

The EO recognizes that further improving water conservation in California will require progress in all sectors, including agriculture, and that there is a fundamental need for updating existing agricultural water management planning requirements to help advance the efficiency of agricultural water use and better prepare for periods of limited supply. This would entail updating AWMP requirements to include a drought planning component, as well as quantifiable measures to increase agricultural water use efficiency. To promote adequate drought planning across the agricultural sector, the EO

requires more agricultural water suppliers to comply with the requirements by lowering the threshold of application to water suppliers with 10,000 acres of irrigated land. The EO Agencies also recognize the strong nexus of adequate agricultural water management strategies and implementation of SGMA, and propose a consistent methodology focusing on a supplier's overall water budget that can contribute to compliance for both purposes.

3.4.2 EO Directive

EO Items 11, 12, and 13 state:

11. *The Department [DWR] shall work with the California Department of Food and Agriculture to update existing requirements for Agricultural Water Management Plans to ensure that these plans identify and quantify measures to increase water efficiency in their service area and to adequately plan for periods of limited water supply.*

12. *The Department [DWR] shall permanently require the completion of Agricultural Water Management Plans by water suppliers with over 10,000 irrigated acres of land.*

13. *The Department [DWR], together with the California Department of Food and Agriculture, shall consult with agricultural water suppliers, local governments, agricultural producers, environmental groups, and other partners to update requirements for Agricultural Water Management Plans. The update draft requirements shall be publicly released by January 10, 2017.*

EO Item 6 requires EO Agencies to accelerate data collection and improve water system management and prioritize capital projects to reduce water waste. This applies to agricultural water suppliers as well and is covered in this section.

3.4.3 Recommendations

To satisfy the EO directive, DWR recommends that water suppliers comply with the following: (1) develop annual water budget for the agricultural water supplier's service area, (2) identify agricultural water supplier's water management objectives and implementation plan, (3) quantify measures to increase water use efficiency, (4) develop an adequate drought plan for periods of limited supply, and (5) extend the updated requirements to more water suppliers. The following discussion provides additional details in these five recommendation areas. This information would be included as components of a supplier's AWMP.

Develop Annual Water Budget for the Agricultural Water Supplier's Service Area

To make AWMPs more effective as planning tools and to help water suppliers identify areas where water efficiency improvements can be made, the proposed updated AWMP requirements would require suppliers to include in their plans annual water budgets that account for inflows to and outflows from the water supplier's service area. Including water budgets as part of the AWMP provides the following benefits:

- Better quantifies the flows and uses of water within the supplier's service area and better estimates unmeasurable flows, such as deep percolation.
- Provides the data necessary to quantify water management efficiency within the service area.
- Helps identify and prioritize water loss.
- Aligns AWMP reporting with implementation of SGMA.

As a part of estimating water budget, water suppliers would be required to report all water inflow and outflow components from their service area. The water budget includes two components:

- **Water Budget Inflow.** This includes surface inflow, groundwater pumping in the service

area (including private groundwater pumping), and effective precipitation.

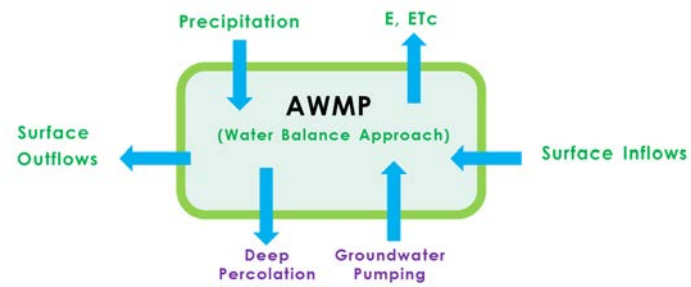
- **Water Budget Outflow.** This includes surface outflow, deep percolation and evapotranspiration (E and ETc).[23]

Agricultural water suppliers are currently required (CWC Section 10826) to describe the quantity and quality of their water resources, water uses within the agricultural water supplier's service area, overall water budget, and water use efficiency information. However, the CWC does not currently require actual quantification of all components sufficient to develop a water budget.

To develop a service area water budget, the proposed revisions to the AWMP requirements would require agricultural water suppliers to quantify all currently reported components and to report on the quantity of two additional components: precipitation and private groundwater pumping.

The annual water budgets for the five year AWMP planning cycle would be reported in the supplier's AWMP on a water year basis (beginning October 1 and ending September 31) to align with SGMA reporting requirements (CCR Section 350 et seq.).

The State, through the Agricultural Water Management Program or the Sustainable Groundwater Management program, may provide tools and resources to assist suppliers in developing and quantifying existing and new components.



The proposed water budget approach with major components covering the needed information for adequate agricultural water management planning and is consistent with the needs for SGMA compliance.

Identify Water Management Objectives and Implementation Plan

The EO Agencies recommend an objective-based planning approach as part of the AWMP, in which water management objectives are identified along with actions to meet these objectives. From the water budget, agricultural water suppliers would identify and select supplier-specific water management objectives to improve water use efficiency or to meet other water management objectives. The proposed water budget approach would help agricultural water suppliers identify and prioritize water loss and identify ways to improve water system management.

In the AWMP, the supplier's objectives or intended results are identified (e.g., decrease percolation to saline ground, provide greater flexibility in irrigation deliveries), then specific efficient water management practices or measures are selected and implemented to achieve the results. Practices implemented to reduce water losses, improve water use efficiency, and attain other water management objectives would be included in an implementation plan as part of the overall AWMP.

Quantify Measures to Increase Water Use Efficiency

The proposed updates to the AWMP requirements would also require agricultural water suppliers to quantify the efficiency of agricultural water use within their service area. Agricultural water suppliers would choose the appropriate method(s) from amongst four efficiency quantification methods provided in the 2012 DWR report to the Legislature titled, "A Proposed Methodology for Quantifying the Efficiency of Agricultural Water Use." These methods can be used to calculate the ratio of beneficial water uses to amount of applied water and include the Crop Consumptive Use Fraction (CCUF), the Agronomic Water

Use Fraction (AWUF), the Total Water Use Fraction (TWUF), and the Water Management Fraction (WMF). While having the flexibility to choose the appropriate water use fraction to determine water use efficiency, the agricultural water supplier needs to ensure that all water uses are taken into account including crop water use, agronomic water use, environmental water use, groundwater recharge, and recoverable surface flows.

The proposed water use fractions (described below) are practical methods for quantifying the efficiency of agricultural water use by irrigated agriculture and other beneficial uses that can help agricultural water suppliers evaluate current conditions and strategies for improving agricultural water management. All four methods described below are applicable for use at the basin- and supplier-scale. At the field-scale, only the first three methods are applicable.

i. Crop Consumptive Use Fraction

CCUF= ETAW/AW

Evapotranspiration of Applied Water (ETAW) is crop evapotranspiration minus the amount of precipitation evapotranspired by the crop.

Applied Water (AW) is the total volume of water that is applied within a boundary (e.g., field, supplier service area, or basin) in order to meet the crop evapotranspiration, agronomic, and environmental uses from any source such as surface water (including tailwater[24] reuse), groundwater (public or private), and the initial soil moisture in the soil profile that is not from precipitation.

ii. Agronomic Water Use Fraction

AWUF = (ETAW + AU)/AW

Agronomic Use (AU) is the portion of applied water used for water management applications essential for crop production. Examples of essential water management applications include salinity management, frost control, and winter flooding for straw decomposition.

iii. Total Water Use Fraction

TWUF = (ETAW + AU + EU)/AW

Environmental Use (EU) is the portion of applied water directed to environmental purposes, including water to produce and/or maintain wetlands, riparian, or terrestrial habitats.

iv. Water Management Fraction

WMF = (ETAW + RF)/AW

Recoverable Flows (RF) is the amount of water leaving a given area as surface flows to non-saline bodies or percolation to usable groundwater that is available for supply or reuse.

Components of these fractions may be empirical (measured or observed), modeled (calculated or estimated), or a combination, based on data availability and system complexity.

Develop a Drought Plan for Periods of Limited Supply

The proposed updates to the AWMP requirements would also require agricultural water suppliers to include a Drought Plan. The Drought Plan should detail how the water supplier would prepare for droughts and manage water supplies and allocations during drought conditions. Some components or actions may require detailed review of conditions, policy changes, or long-term capital improvements. Additionally, as conditions change and new technology and knowledge becomes available, opportunities and constraints will change.

[24] Tailwater refers to surface water runoff from a boundary. Tailwater may be captured and reused within (returned to) the boundary.

The Drought Plan should be prepared to provide adaptive management for and during periods of water shortages. Agricultural water suppliers would consider all items under each component and include a description of applicable items in their Drought Plan.

The Drought Plan would include a resilience component and an action plan, described below.

Resilience Component

The resilience component of the Drought Plan will include the following:

1. A description of what hydraulic levels or conditions (reservoir levels, stream flows, groundwater, snowpack etc.) are or should be monitored and measured to determine the water supply available and to identify levels of drought severity.

2. The supplier's policy or process for declaring a water shortage and for implementing the water shortage allocations and related actions.

3. A description and analysis of the agricultural water supplier's customers' vulnerability to drought (e.g., potential for crop idling, availability of multiple water sources and resilience of each source, existing water storage options).

4. A description of potential opportunities and constraints to improve drought resilience (e.g., improved groundwater or surface water storage potential, acres of permanent crops, environmental use requirements, overdrafted groundwater basin).

5. A description of actions implemented or planned for implementation to improve drought resilience (e.g., potential for improved on-farm water use efficiency measures, groundwater and surface water conjunctive use management, crop idling, and development of alternative supplies such as recycled water or tailwater reuse).

6. Discussion of the potential, if possible, for the supplier to obtain or use additional water supplies during drought conditions. These supplies could include transfers from another water agency or supplier, the use of recycled water and desalination of brackish groundwater or drainage water.

7. A description of the cost for implementing the resilience plan.

Action Plan

The Action Plan will include the following:

1. Allocation Policies – A description of the water shortage allocation policies as required by the Water Code. Water suppliers would describe their program or process for how water is allocated during a water shortage in the Drought Plan or attach a copy of their water shortage allocation policy to their AWMP.

2. Operational Adjustments – Changes in supplier water management and operations to respond to drought, including canal and reservoir operations and groundwater management.

3. Demand Management – Policies and incentives in addition to the water shortage allocation plan to lower on-farm water use.

4. Coordination and Collaboration – Include a description on how coordination and collaboration with other local suppliers, water agencies, or regional groups will be used in drought response.

5. Revenues and Expenditures – Describe how the drought and lower water allocations will affect the supplier's revenues and expenditures.

Extend Requirements to More Agricultural Water Suppliers

The proposed updates to the AWMP requirements would extend the requirement for AWMPs to include agricultural water suppliers supplying water

to more than 10,000 acres of irrigated land, excluding recycled water.

3.4.4 Reporting, Compliance Assistance, and Enforcement

Reporting

All agricultural water suppliers providing water supplies to 10,000 or more irrigated acres, excluding recycled water, would be required to prepare and adopt an AWMP on or before April 1, 2021, and every five years thereafter. Agricultural water suppliers would continue to be required to submit their plans to DWR within 30 days of adoption. A water supplier that provides both urban and agricultural supplies, and is subject to both UWMP and AWMP reporting, may satisfy the AWMP requirements by adopting an UWMP that accounts for its agricultural water use and meets both requirements.

Reclamation Reform Act and Central Valley Project water suppliers that submit water conservation plans to Reclamation may still submit those plans to DWR, along with supplemental information, including: a Drought Plan for all suppliers, and water measurement and volumetric pricing for those water suppliers providing water to 25,000 irrigated acres or more, excluding recycled water (CCR Section 597.1(a) and CWC Section 10608.48(b)).

AB 1404 (Statutes of 2007, Chapter 675) requires that all agricultural water suppliers supplying 2,000 acre-feet or more of surface water annually for agricultural purposes or serving 2,000 or more acres of agricultural land must submit an annual aggregated farm-gate delivery report to DWR. Per AB 1404, an agricultural water supplier will:

- Provide DWR with monthly or bimonthly aggregated farm-gate deliveries on an annual basis, along with information on their farm-gate measurement program or practices to document that they are using "Best Professional Practices;" or
- Provide DWR with information that documents that the implementation of a program or practices to measure farm-gate deliveries using Best Professional Practices is not locally cost effective.

For the purpose of aligning agricultural water supplier annual reporting with SGMA reporting requirements, EO Agencies recommend that the annual aggregated farm-gate delivery reporting requirements for agricultural water suppliers providing water to over 10,000 irrigated acres only, be detailed by groundwater basin within the supplier's service area, if applicable.

Compliance Assistance

DWR would assist agricultural water suppliers in several ways:

1. AWMP Guidebook – DWR would update the AWMP Guidebook and provide an updated AWMP template to help agricultural water suppliers better understand the CWC AWMP requirements and assist them in developing an AWMP. The Guidebook would also describe how water conservation plans submitted to Reclamation can be supplemented to satisfy the CWC and Agricultural Water Measurement Regulation requirements.
2. AWMP Workshops – Prior to finalizing the AWMP Guidebook, DWR would release a draft and hold public workshops to give opportunity for stakeholders to comment on the draft guidelines. Additional workshops would be conducted after releasing the final Guidebook.
3. California Irrigation Management Information System – DWR would continue to support and update the California Irrigation Management Information System (CIMIS) to provide climate data and resources (e.g., precipitation, crop use coefficients) necessary for calculating components of the water budget and water use efficiency fractions.

4. Water Use Efficiency Calculator – DWR would make available the water use efficiency calculator being developed and tested by the University of California through Proposition 50 and Proposition 1 grants.

The EO Agencies further recommend that DWR, through the Agricultural Water Management Program or the Sustainable Groundwater Management Program, consider providing additional tools and resources to assist suppliers in quantifying water budget components pertaining to evapotranspiration of applied water and private groundwater pumping. Examples of these tools and resources include remote sensing for measurement of actual evapotranspiration, and models or tools for calculating deep percolation to groundwater.

DWR would lead the compliance review for submitted plans, data, and information, which are due by April 1 starting in 2021. The compliance schedule is outlined below:

1. DWR would provide an updated list of agricultural water suppliers required to submit plans to CDFA and the Water Board by March 1, 2021, and every five years thereafter.

2. DWR would continue to review each plan for meeting the requirements, including the updated and new components, as they are received. However, DWR will expedite the review if an agricultural water supplier is seeking a State grant or loan with a specific deadline. DWR may coordinate with the Water Board and CDFA on the review.

3. DWR would inform the Water Board and CDFA of the plan submittal status and review status, and post the information on DWR's website for public reference.

4. If a plan has not been submitted by July 1, 2021, and every five years thereafter or is incomplete following review, DWR would notify the agricultural water supplier, and would work with the supplier to develop a plan for corrective actions and completing the plan.

5. If the agricultural water supplier fails to submit a plan by October 31, 2021, and every five years thereafter or does not submit a plan within the negotiated plan and schedule for completion, DWR would notify the Water Board and CDFA of non-compliance for enforcement actions.

Enforcement

Water suppliers would continue to be required to have a current AWMP that has been reviewed by DWR and found to have addressed all the required elements to be eligible for State grant and loan funding.

The Water Board, in addressing agricultural suppliers that have not submitted AWMPs or have not revised AWMPs to correct identified deficiencies, may consider further enforcement actions including potential fines and civil penalties.

Chapter 4 – Implementing the Conservation Framework

The heightened awareness of water scarcity and the severity of our current drought have prompted Californians to achieve new levels of conservation and resiliency. When implemented along with necessary statutory authorities and resources, the proposed conservation framework will provide the foundation needed to transform these emergency accomplishments into a long-term, sustainable water use practice for all Californians. The Administration is proposing legislation for water conservation standards and reporting, urban water shortage contingency planning, and agricultural water management planning.

4.1 Conservation as an Integral Part of Water Management

Conservation alone cannot ensure a long-term sustainable water supply and drought protection for all Californians; however, a deep-rooted conservation ethos is fundamental to changing individual and societal behaviors and making progress toward these desired outcomes.

The framework presented in this report is designed to be part of the broader, multi-faceted implementation of the Water Action Plan. Conservation and drought protection are but two of the focus areas of the Water Action Plan, along with integrated water management, Sacramento-San Joaquin Delta management, ecosystem restoration, storage, and flood protection. The Water Action Plan also calls for increasing operational and regulatory efficiencies and identifying sustainable, integrated financing opportunities.

The EO Agencies will continue to work collaboratively, while maintaining open and transparent dialogue and technical exchange throughout implementation.

4.2 Support for Framework Implementation

As described below, several components are critical to enabling implementation of the recommended framework outlined herein.

4.2.1 Legislation and Regulatory Rulemaking

Many recommendations of the EO Agencies will require new and/or expanded authorities to execute. For those recommendations that fall within the existing authorities of the EO Agencies, rulemaking processes may still be needed to formalize requirements.

For recommendations related to existing authorities, the EO Agencies will conduct rulemaking processes that provide opportunities for input and comment from stakeholders, interested parties, and the public.

For recommendations requiring new and expanded authorities, the EO Agencies will coordinate with the Governor's Office and the Legislature in seeking amendments to existing codes. Code amendments to support framework implementation may include the following:

- **Establish New Water Use Standards and Targets:** CWC sections 10610-10656 for UWMPs; a new section added to CWC to establish and implement standards and water use targets, with associated changes in

CWC Section 10608 related to existing conservation requirements.

- **Strengthening Water Shortage Contingency Planning:** CWC sections 350-359 regarding emergency declaration; CWC sections 10631, 10632, and 10635 for required information reporting.
- **Improve Drought Planning for Small Water Suppliers and Rural Communities:** To be determined through continued collaboration of the EO Agencies and stakeholders, potentially requiring new language in the CWC.
- **Strengthening Requirements for Agricultural Water Management**: CWC sections 10800-10845 for AWMPs; CCR sections 597-597.4 and CWC sections 531-531.10 for aggregated farm-gate delivery reporting.

4.2.2 Continued Collaboration on Water Use Standard Development

The EO Agencies are committed to continued collaboration with stakeholders on water use standard development and implementation of the actions discussed below.

In implementing this proposed conservation framework, the EO Agencies will establish water standards for implementation by 2021. The EO Agencies have proposed the roles and responsibilities described below.

Data Collection and Management

DWR and the Water Board are committed to streamlined reporting, elimination of redundant data submittals, and open access to data collected by each agency. Furthermore, each agency relies on data collected by the other to conduct important regulatory and planning efforts, including development of the California Water Plan, Urban Water Management Plan review, Division of Drinking Water information, and urban conservation data. To facilitate better data management, DWR and the Water Board will jointly develop an approach each agency could take to streamline the data submittal and collection processes. The approach will include key data needs, describe how agency coordination could reduce regulatory overlap.

Data on monthly water usage, amount of conservation achieved, and enforcement efforts will be submitted to the Water Board. The Water Board will update monthly reporting requirements and to make those reporting requirements permanent.

DWR will collect data related to UWMPs, WSCPs, and AWMPs. DWR would also receive annual reports on water use target progress and compliance, beginning in 2019.

Setting Standards

DWR would lead technical work related to setting standards, methodologies, and protocols, working in conjunction with the Water Board.

DWR and Water Board staff will propose standards to the Water Board for adoption, and will base the proposed standards on the technical research and outreach efforts. The Water Board will be responsible for adopting the standards through a regulatory proceeding.

Enforcement

DWR will refer compliance issues related to submittals and requirements for UWMPs, WSCPs, and AWMPs to the Water Board for enforcement.

DWR and the Water Board will work together to develop compliance criteria and review target compliance. DWR would provide technical assistance to suppliers to help them reach compliance. The Water Board will retain independent enforcement discretion. The Water Board will identify and determine enforcement measures for suppliers that are not meeting their water targets. Between 2022 and 2025, the Water Board may issue Informational Orders or Conservation Orders to assist water suppliers with compliance. Beginning in 2026, the Water Board may also issue Administrative Civil Liability or Cease

and Desist Orders to water suppliers that have failed to meet their targets. Water suppliers not meeting targets may not be eligible for state funding programs.

Recognizing that water use efficiency is one component of sustainable water management, the EO Agencies will seek to balance the need for conservation with the need for water suppliers to continue investing in water supply portfolio diversification, including direct and indirect water reuse, storage and conjunctive use, stormwater capture and reuse, sustainable groundwater use, and desalination, where appropriate.

Public Input, Processes, and Feedback

Upon direction to develop standards from the Legislature, the EO Agencies will continue to collaborate with stakeholders and subject matter experts to ensure adequate progress is made in standard development and that the resulting standards will be reasonable and fair. Additionally, there will be numerous opportunities for public and stakeholder input as the standards are developed. Opportunities for public and stakeholder input may include, but are not limited to, the following:

- Stakeholder meetings and public workshops to report progress and solicit input on development of indoor and outdoor efficiency standards, including specific activities like the landscape area pilot project.
- Continued Urban Advisory Group engagement, at least twice a year through 2021.
- A CII Technical Workgroup to assist with development of appropriate CII classifications and corresponding performance measures.

In addition, any rulemaking process resulting from implementation of the proposed framework would include the following:

- Public written comment on draft regulations
- A public workshop
- Public adoption meeting

EO Agency staff typically hold scoping meetings throughout the regulatory development process in order to receive stakeholder feedback before going forward with draft regulatory language.

4.3 Implementation Considerations

The EO Agencies appreciate the long-term commitment and investment required by water suppliers throughout California to implement the proposed long-term framework. To facilitate successful implementation, the EO Agencies recognize the importance of the following considerations when necessary authority and resources are provided.

- **Coordination, Collaboration, Messaging, and Outreach:** The EO Agencies recognize the importance of continued coordination and collaboration to ensure that the framework is implemented as envisioned, providing improved drought protection for all communities and embodying water conservation in every aspect of our daily lives.

  The extraordinary conservation accomplished during the current drought was attributable in part to a strong, persistent, and active campaign and outreach led by the EO Agencies to promote conservation, combined with mandatory conservation requirements imposed by the Water Board. Active messaging and outreach efforts on conservation by the EO Agencies and suppliers will provide strong support to water suppliers in their efforts to promote conservation. Water use education and conservation programs must continue after the drought emergency is lifted.

- **Water Rates and Proposition 218:** The EO Agencies recognize that State financial assistance, when available, will never be sufficient for water suppliers to implement all necessary actions to comply with the requirements outlined in the framework. It will be important that water suppliers have the ability to generate funding for their investment needs and stable revenue for steady improvements.

  The EO Agencies acknowledge the challenges water suppliers face in generating sufficient local funding to support continued conservation efforts and other needed investments due to Proposition 218. While the framework does not contain requirements on rate structures, the EO Agencies encourage water suppliers to consider the effect of drought on revenue generation and incorporate measures for rate stabilization. Each water supplier should customize its rate structure with full consideration of its cost of service and with long-term financial sustainability as the goal.

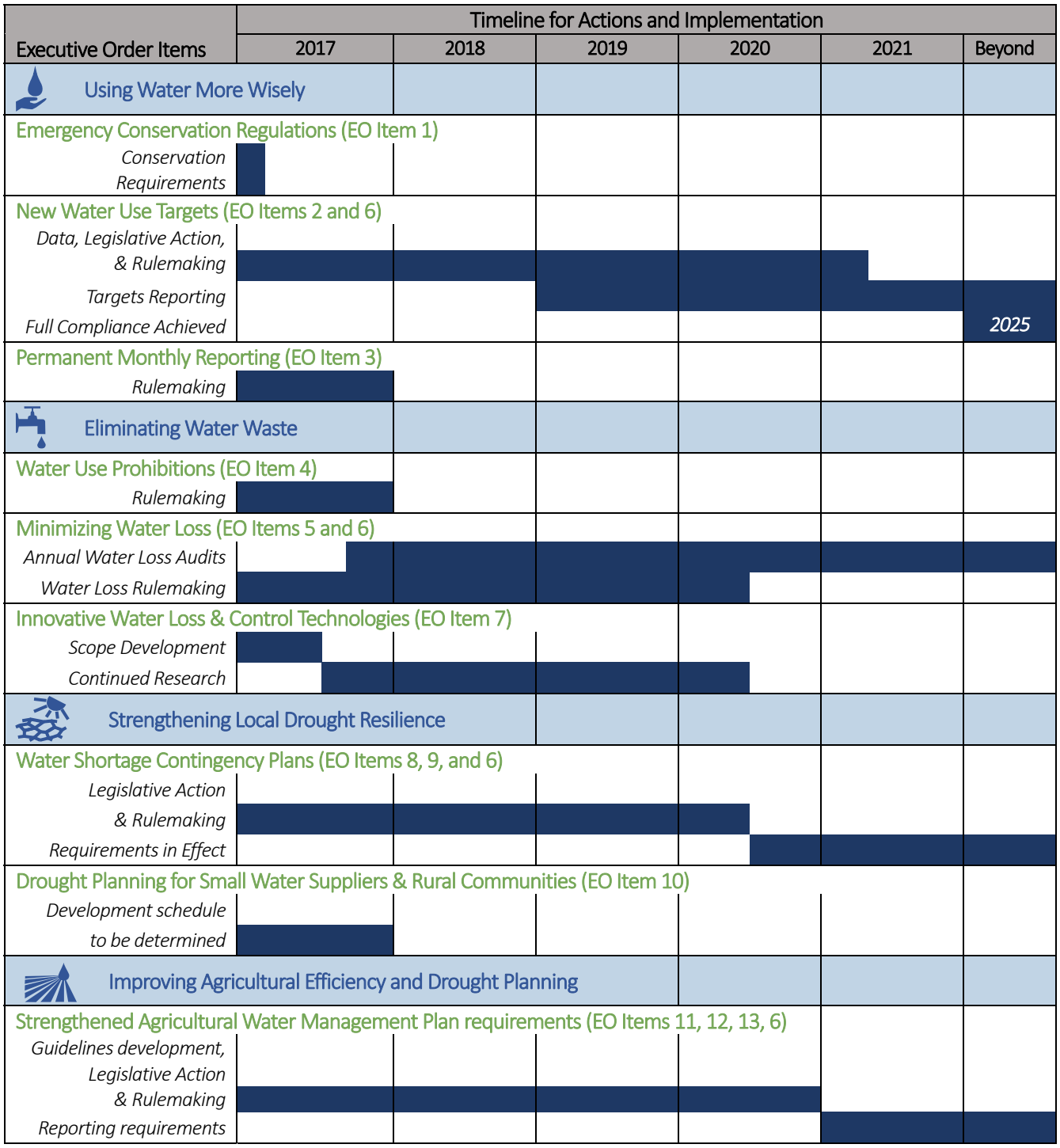
- **Coordination with Land Use Agencies and Other Jurisdictions:** The EO Agencies recognize that land use agencies (i.e., cities and counties) have direct responsibilities and jurisdictions over zoning and land development, landscape requirements, and various ministerial and discretionary permits that can positively influence direct conservation and efficiency actions. Where appropriate, the EO Agencies may facilitate communications and collaboration with local governments throughout implementation.

4.4 Implementation Schedule

The schedule for implementation of the proposed actions and recommendations identified in Chapters 2 and 3 is summarized in Figure 4-1.

Any new and/or expanded authorities required for framework implementation may be addressed during the 2017 and 2018 legislative sessions. Note that the implementation process outlined in the proposed framework is subject to change based on updated information, or subsequent legislation and rulemaking.

Figure 4-1. Anticipated Implementation Timeline for EO Directives



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ATTACHMENT A:
Executive Order B-37-16

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Executive Department

State of California

EXECUTIVE ORDER B-37-16
MAKING WATER CONSERVATION A CALIFORNIA WAY OF LIFE

WHEREAS California has suffered through a severe multi-year drought that has threatened the water supplies of communities and residents, devastated agricultural production in many areas, and harmed fish, animals and their environmental habitats; and

WHEREAS Californians responded to the drought by conserving water at unprecedented levels, reducing water use in communities by 23.9% between June 2015 and March 2016 and saving enough water during this period to provide 6.5 million Californians with water for one year; and

WHEREAS severe drought conditions persist in many areas of the state despite recent winter precipitation, with limited drinking water supplies in some communities, diminished water for agricultural production and environmental habitat, and severely-depleted groundwater basins; and

WHEREAS drought conditions may persist in some parts of the state into 2017 and beyond, as warmer winter temperatures driven by climate change reduce water supply held in mountain snowpack and result in drier soil conditions; and

WHEREAS these ongoing drought conditions and our changing climate require California to move beyond temporary emergency drought measures and adopt permanent changes to use water more wisely and to prepare for more frequent and persistent periods of limited water supply; and

WHEREAS increasing long-term water conservation among Californians, improving water use efficiency within the state's communities and agricultural production, and strengthening local and regional drought planning are critical to California's resilience to drought and climate change; and

WHEREAS these activities are prioritized in the California Water Action Plan, which calls for concrete, measurable actions that "Make Conservation a California Way of Life" and "Manage and Prepare for Dry Periods" in order to improve use of water in our state.

NOW, THEREFORE, I, EDMUND G. BROWN JR., Governor of the State of California, in accordance with the authority vested in me by the Constitution and statutes of the State of California, in particular California Government Code sections 8567 and 8571, do hereby issue this Executive Order, effective immediately.

IT IS HEREBY ORDERED THAT:

The orders and provisions contained in my January 17, 2014 Emergency Proclamation, my April 25, 2014 Emergency Proclamation, Executive Orders B-26-14, B-28-14, B-29-15, and B-36-15 remain in full force and in effect except as modified herein.

State agencies shall update temporary emergency water restrictions and transition to permanent, long-term improvements in water use by taking the following actions.

USE WATER MORE WISELY

1. The State Water Resources Control Board (Water Board) shall, as soon as practicable, adjust emergency water conservation regulations through the end of January 2017 in recognition of the differing water supply conditions across the state. To prepare for the possibility of another dry winter, the Water Board shall also develop, by January 2017, a proposal to achieve a mandatory reduction in potable urban water usage that builds off of the mandatory 25% reduction called for in Executive Order B-29-15 and lessons learned through 2016.

2. The Department of Water Resources (Department) shall work with the Water Board to develop new water use targets as part of a permanent framework for urban water agencies. These new water use targets shall build upon the existing state law requirements that the state achieve a 20% reduction in urban water usage by 2020. (Senate Bill No. 7 (7th Extraordinary Session, 2009-2010).) These water use targets shall be customized to the unique conditions of each water agency, shall generate more statewide water conservation than existing requirements, and shall be based on strengthened standards for:

    a. Indoor residential per capita water use;
    b. Outdoor irrigation, in a manner that incorporates landscape area, local climate, and new satellite imagery data;
    c. Commercial, industrial, and institutional water use; and
    d. Water lost through leaks.

    The Department and Water Board shall consult with urban water suppliers, local governments, environmental groups, and other partners to develop these water use targets and shall publicly issue a proposed draft framework by January 10, 2017.

3. The Department and the Water Board shall permanently require urban water suppliers to issue a monthly report on their water usage, amount of conservation achieved, and any enforcement efforts.

ELIMINATE WATER WASTE

4. The Water Board shall permanently prohibit practices that waste potable water, such as:

    - Hosing off sidewalks, driveways and other hardscapes;
    - Washing automobiles with hoses not equipped with a shut-off nozzle;
    - Using non-recirculated water in a fountain or other decorative water feature;
    - Watering lawns in a manner that causes runoff, or within 48 hours after measurable precipitation; and
    - Irrigating ornamental turf on public street medians.

5. The Water Board and the Department shall direct actions to minimize water system leaks that waste large amounts of water. The Water Board, after funding projects to address health and safety, shall use loans from the Drinking Water State Revolving Fund to prioritize local projects that reduce leaks and other water system losses.

6. The Water Board and the Department shall direct urban and agricultural water suppliers to accelerate their data collection, improve water system management, and prioritize capital projects to reduce water waste. The California Public Utilities Commission shall order investor-owned water utilities to accelerate work to minimize leaks.

7. The California Energy Commission shall certify innovative water conservation and water loss detection and control technologies that also increase energy efficiency.

STRENGTHEN LOCAL DROUGHT RESILIENCE

8. The Department shall strengthen requirements for urban Water Shortage Contingency Plans, which urban water agencies are required to maintain. These updated requirements shall include adequate actions to respond to droughts lasting at least five years, as well as more frequent and severe periods of drought. While remaining customized according to local conditions, the updated requirements shall also create common statewide standards so that these plans can be quickly utilized during this and any future droughts.

9. The Department shall consult with urban water suppliers, local governments, environmental groups, and other partners to update requirements for Water Shortage Contingency Plans. The updated draft requirements shall be publicly released by January 10, 2017.

10. For areas not covered by a Water Shortage Contingency Plan, the Department shall work with counties to facilitate improved drought planning for small water suppliers and rural communities.

IMPROVE AGRICULTURAL WATER USE EFFICIENCY AND DROUGHT PLANNING

11. The Department shall work with the California Department of Food and Agriculture to update existing requirements for Agricultural Water Management Plans to ensure that these plans identify and quantify measures to increase water efficiency in their service area and to adequately plan for periods of limited water supply.

12. The Department shall permanently require the completion of Agricultural Water Management Plans by water suppliers with over 10,000 irrigated acres of land.

13. The Department, together with the California Department of Food and Agriculture, shall consult with agricultural water suppliers, local governments, agricultural producers, environmental groups, and other partners to update requirements for Agricultural Water Management Plans. The updated draft requirements shall be publicly released by January 10, 2017.

The Department, Water Board and California Public Utilities Commission shall develop methods to ensure compliance with the provisions of this Executive Order, including technical and financial assistance, agency oversight, and, if necessary, enforcement action by the Water Board to address non-compliant water suppliers.

This Executive Order is not intended to, and does not, create any rights or benefits, substantive or procedural, enforceable at law or in equity, against the State of California, its agencies, departments, entities, officers, employees, or any other person.

I FURTHER DIRECT that as soon as hereafter possible, this order be filed in the Office of the Secretary of State and that widespread publicity and notice be given of this order.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 9th day of May 2016.

EDMUND G. BROWN JR.
Governor of California

ATTEST:

ALEX PADILLA
Secretary of State

ATTACHMENT B:
Public Outreach and Stakeholder Engagement

On May 9, 2016 Governor Edmund G. Brown Jr. issued Executive Order B-37-16 directing State Agencies to establish a long-term framework for water conservation and drought planning that builds on the conservation accomplished during the historical drought and implementation of the Governor's Water Action Plan. The named agencies include DWR, Water Board, CPUC, CDFA, and CEC (collectively, the EO Agencies). The full text of the EO can be found at the Governor's Office Website, https://www.gov.ca.gov/docs/5.9.16_Attested_Drought_Order.pdf, or in Attachment A to this report.

The EO Agencies have developed a collaborative program to formulate the long-term framework for water conservation and drought planning called for by the EO with extensive public outreach and stakeholder engagement. In addition to public input throughout the process, the EO Agencies formed the Urban Advisory Group and Agricultural Advisory Group to provide input into the framework development. These advisory groups represent urban and agricultural water suppliers, local governments, professional associations, academics, environmental advocacy groups, and other interested parties. The framework development, associated public outreach and stakeholder engagement process, and public comments received are available at DWR's website, http://www.water.ca.gov/wateruseefficiency/conservation/.

The following provides a list of public outreach and stakeholder engagement meetings throughout the process in developing the report (in chronological order) after the issuance of the EO on May 9, 2016.

Date	Event	Location
June 3, 2016	Listening Session #1 for the Directives of Executive Order B-37-16	Sacramento, CA
June 6, 2016	Listening Session #2 for the Urban Directives of Executive Order B-37-16	Los Angeles, CA
June 7, 2016	Listening Session #3 for the Listening Session Agricultural and County Drought Planning Directives of Executive Order B-37-16	Tulare, CA
August 15, 2016	EO B-37-16 Urban Advisory Group Meeting #1	Sacramento, CA
August 25, 2016	EO B-37-16 Agricultural Advisory Group Meeting #1	Sacramento, CA
August 31, 2016	EO B-37-16 Water Shortage Contingency Planning Workshop #1	Sacramento, CA
September 1, 2016	EO B-37-16 Water Shortage Contingency Planning Workshop #2	Fountain Valley, CA
September 6, 2016	EO B-37-16 Long-Term Water Use Targets Workshop #1	Oakland, CA
September 8, 2016	EO B-37-16 Long-Term Water Use Targets Workshop #2	Los Angeles, CA
September 19 and 20, 2016	EO B-37-16 Urban Advisory Group Meeting #2	Los Angeles, CA
September 26, 2016	EO B-37-16 Agricultural Advisory Group Meeting #2	Madera, CA

Date	Event	Location
October 3, 2016	EO B-37-16 Water Shortage Contingency Planning Technical Workshop #2	Sacramento, CA
October 5, 2016	State Water Resources Control Board Workshop on EO B-37-16 and Implementation	Sacramento, CA
October 11, 2016	CEC Staff Workshop Innovative Water Conservation and Water Loss Detection and Control Technologies	Sacramento, CA
October 13, 2016	EO B-37-16 Water Shortage Contingency Planning Workshop – Focus on Drought Planning for Small Water Suppliers and Rural Communities	Sacramento, CA
October 18, 2016	EO B-37-16 Agricultural Advisory Group Meeting #3	Sacramento, CA
October 20, 2016	EO B-37-16 Urban Advisory Group Meeting #3	Sacramento, CA
December 7, 2016	EO B -37-16 Agricultural Advisory Group and Urban Advisory Group Public Draft Report Meeting	Sacramento, CA
January 6, 2017	EO B -37-16 Agricultural Advisory Group Meeting #4	Sacramento, CA

Public meeting at California Department of Food and Agriculture, December 7, 2016.

Attachment 8

Exhibit Identification Index

California WaterFix Hearing
California Department of Water Resources and U.S. Bureau of Reclamation

Date: ____November 30, 2017_____

PARTICIPANT: _____Restore the Delta_____

Exhibit Identification Number	Exhibit Filename	Exhibit Description	Status of Evidence (for Hearing Team use Only)		
			Introduced	Accepted	By Official Notice
RTD-12	RTD_12	Tim Stroshane's Part 2 Testimony			
RTD-13	RTD_13	Tim Stroshane's Part 2 Presentation			
RTD-151	RTD_151	Brown, L., J.K. Thompson, K. Higgins and L.J. Lucas, 2007. Population Density, Biomass, and Age-Class Structure of the Invasive Clam *Corbicula fluminea* in rivers of the Lower San Joaquin River watershed, California, Western North American Naturalist 67(4): 572-586.			
RTD-155	RTD_155	Not in use.			
RTD-156	RTD_156	Restore the Delta charts and data table summarizing and comparing results from RTD-155			
RTD-157	RTD_157	Monsen, N.E., Cloern, J.E., and Burau, J.R. 2007. Effects of Flow Diversions on Water and Habitat Quality: Examples from California's Highly Manipulated Sacramento-San Joaquin Delta. San Francisco Estuary & Watershed Science 5(3): July.			
RTD-158	RTD_158	Environmental Water Caucus, 2014, Comments on Bay Delta Conservation Plan Draft EIR/Draft EIS, June 11.			
RTD-159	RTD_159	T. Presser & S. Luoma, 2006. Forecasting Selenium Discharges to the San Francisco Bay-Delta Estuary: Ecological Effects of a Proposed San Luis Drain Extension, USGS Professional Paper 1646.			
RTD-160	RTD_160	T. Presser & S. Luoma, 2010. A Methodology for Ecosystem-Scale Modeling of Selenium. *Integrated Environmental Assessment and Management* 6(4): 685-710.			
RTD-161	RTD_161	California Water Impact Network, 2012. Testimony on Recent Salinity and Selenium Science and Modeling for the Bay-Delta Estuary, submitted by Tim Stroshane, August 17, 2012 for Workshop #1, Ecosystem Changes and the Low Salinity Zone.			
RTD-162	RTD_162	S. Luoma & T. Presser, 2009. Emerging Opportunities in Management of Selenium Contamination. *Environmental Science & Technology* 43(22): 8483-8487, November 15.			
RTD-163	RTD_163	A.R. Stewart, et al, 2013. Influence of estuarine processes on spatiotemporal variation in bioavailable selenium, *Marine Ecology Progress Series* 492: 41-56.			
RTD-164	RTD_164	T. Presser & S. Luoma, 2010. Ecosystem-Scale Modeling in Support of a Fish & Wildlife Criteria Development for the San Francisco Bay-Delta Estuary, Administrative Report for USEPA by the U.S. Geological Survey.			
RTD-165	RTD_165	CalFED Science Program, 2008. The State of Bay-Delta Science.			
RTD-166	RTD_166	Nichols & Permatmat, 1988. The Ecology of the Soft-Bottom Benthos of San Francisco Bay: A Community Profile.			
RTD-167	RTD_167	Nichols, Thompson & Schemel, 1990. Remarkable invasion of San Francisco Bay by the Asian clam, Potamocorbula amurensis: of a former community. *Marine Ecology Progress Series* 66: 95-101.			
RTD-168	RTD_168	National Research Council, 2012. *Sustainable Water and Environmental Management in the California Bay-Delta.*			
RTD-169	RTD_169	R.R. Tidball, et al, 1986. Distribution of Selenium, Mercury and Other Elements in Soils of the San Joaquin Valley and Parts of the San Luis Drain Service Area. *Symposium III: Selenium and Agricultural Drainage*.			
RTD-170	RTD_170	R.J. Gilliom, 1989. Geologic Source of Selenium and Its Distribution in Soil, in *Preliminary of Sources, Distribution, and Mobility of Selenium in the San Joaquin Valley, California*, USGS Water Resources Investigation Report 88-4186.			
RTD-171	RTD_171	San Joaquin Valley Drainage Program, 1990. *A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside, San Joaquin Valley* (the "Rainbow Report").			
RTD-172	RTD_172	T. Presser & S. Schwarzbach, 2008. *Technical Analysis of In-Valley Drainage Management Strategies for the Western San Joaquin Valley*, USGS Open File Report 2008-1210.			
RTD-173	RTD_173	J. Carlton, Thompson, Schemel, and Nichols, 1990. Remarkable Invasion of San Francisco Bay by *Potamocorbula amurensis*: I: Introduction and Dispersal. *Marine Ecology Progress Series* 66: 81-94.			

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			Introduced	Accepted	By Official Notice
RTD-174	RTD_174	*The Exotics Guide: Corbula amurensis*, accessible 18 October 2017 at http://www.exoticsguide.org/corbula_amurensis.			
RTD-175	RTD_175	R.G. Linville et al, 2002. Increased selenium threat as a result of invasion of the exotic bivalve, *P. amurensis. Aquatic Toxicology* 57: 51-64.			
RTD-176	RTD_176	A.R. Stewart, et al, 2004. Food Web Pathway Determines How Selenium Affects Aquatic Ecosystems. *Environmental Science & Technology* 38(17): 4519-1426.			
RTD-177	RTD_177	I. Werner & J.T. Hollibaugh, 1993. *P. amurensis:* Comparison of Clearance Rates and Assimilation Efficiencies for Phytoplankton and Bacterioplankton. *Limnology & Oceanography* 38(5): 949-964.			
RTD-178	RTD_178	T. Presser, 1999. Selenium Pollution. *Encyclopedia of Environmental Science* ed. D.E. Alexander & R.W. Fairbridge, pp. 554-556.			
RTD-179	RTD_179	American Rivers and the Nature Conservancy, 2013. Independent Panel Review of the Bay Delta Conservation Plan. September 19.			
RTD-180	RTD_180	L. Lucas & J. Thompson, 2012. Changing Restoration Rules: Exotic bivalves interact with residence time and depth to control phytoplankton productivity. *Ecosphere* 3(12): Article 117.			
RTD-181	RTD_181	California Department of Water Resources, 2015. *San Joaquin Valley Drainage Monitoring Program for 2011-2012.* Accessible at http://www.water.ca.gov/pubs/drainage/2011-2012_drainage_monitoring_report__san_joaquin_valley/2011_12dmr.pdf			
RTD-182	RTD_182	Restore the Delta charts and data table summarizing and comparing results from RTD-181 with selenium toxicity thresholds for Central Area of San Joaquin Valley.			
RTD-183	RTD_183	J. York, et al, 2014. Trophic Links in the Plankton in the Low Salinity Zone of a Large, Temperate Estuary: Top-down Effects of Introduced Copepods. *Estuaries and Coasts* 37: 576-588.			
RTD-184	RTD_184	W. Kimmerer & J. Thompson, 2014. Phytoplankton Growth Balanced by Clam and Zooplankton Grazing and Net Transport into the Low Salinity Zone of the San Francisco Estuary. *Estuaries and Coasts,* January 7.			
RTD-185	RTD_185	A. Jassby, 2008. Phytoplankton in the Upper San Francisco Estuary: Recent Biomass Trends, Their Causes, and the Trophic Significance, *San Francisco Estuary & Watershed Science* 6(1): February 29.			
RTD-186	RTD_186	A. Alpine & J. Cloern, 1992. Trophic Interactions and Direct Physical Effects Control Biomass and Production in an Estuary, *Limnology & Oceanography* 37(5): 946-955.			
RTD-187	RTD_187	M.H. Nicolini & D.L. Penry, 2000. Spawning, Fertilization, and Larval Development of *Potamocorbula amurensis* from San Francisco Bay, California. *Pacific Science* 54(4): 377-388.			
RTD-188	RTD_188	H.A. Peterson & M. Veyssierres, 2010. Benthic Assemblage Variability in the Upper San Francisco Estuary. *San Francisco Estuary & Watershed Science* 8(1).			
RTD-189	RTD_189	J. Durand, 2008. DRERIP Delta Conceptual Model: Delta Aquatic Food Web.			
RTD-190	RTD_190	J. Thompson & F. Parchaso, 2012. Delta Regional Ecosystem Restoration Implementation Plan Conceptual Model for *Potamocorbula amurensis*, peer reviewed and approved by editor, August 2012.			
RTD-191	RTD_191	Central Valley Regional Water Quality Control Board, 2000. *Selenium TMDL for Grassland Marshes.*			
RTD-192	RTD_192	Central Valley Regional Water Quality Control Board, 2001. Total Maximum Daily Load for Selenium in the Lower San Joaquin River.			
RTD-193	RTD_193	L. Brown et al, 2016. Food Webs of the Delta, Suisun Bay, and Suisun Marsh. *San Francisco Estuary & Watershed Science* 14(1).			
RTD-194	RTD_194	San Luis Delta Mendota Water Authority and U.S. Bureau of Reclamation, 2009. *Grassland Bypass Project Extension EIR/EIS*, Appendix E2, "Selenium Ecological Risk Assessment."			
RTD-195	RTD_195	Not in use.			

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			Introduced	Accepted	By Official Notice
RTD-196	RTD_196	U.S. Department of the Interior, Fish and Wildlife Service, 50 CFR 17, Determination of Threatened Status for the Giant Garter Snake, Final Rule, Federal Register 58(201): October 20, 1993.			
RTD-197	RTD_197	California Department of Fish and Wildlife, DATE, Reptile Species Accounts, accessed DATE.			
RTD-198	RTD_198	U.S. Department of the Interior, Fish and Wildlife Service, 2017. Recovery Plan for the Giant Garter Snake (Thamnophis gigas), approved September 28.			
RTD-199	RTD_199	Halsted, B.J., Wylie, G.D., and Casazza, M.L., 2015. Literature Review of giant garter snake (Thamnophis gigas), US Geological Survey Open File Report, 2015-1150.			
RTD-1000	RTD_1000	United States Fish and Wildlife Service, 2012. Giant Garter Snake (Thamnophis gigas) 5-Year Review: Summary and Evaluation, June.			
RTD-1001	RTD_1001	Photograph of a giant garter snake taken on Bradford Island, the Delta, May 2015,			
RTD-1002	RTD_1002	Presentation of Barbara Barrigan-Parrilla, Restore the Delta, to State Water Resources Control Board, 2015. "Impacts of Drought Emergency Measures on the Ground in the Delta," May 20.			
RTD-1003	RTD_1003	Video record of Barbara Barrigan-Parrilla, Restore the Delta, 2015, "Impacts of Drought Emergency Measures on the Ground in the Delta," May 20, part 6. Time window: 22:23 to 30:15. URL: https://www.waterboards.ca.gov/board_info/video.shtml.			
RTD-1004	RTD_1004	Not in use.			
RTD-1005	RTD_1005	California Department of Fish and Game (Wildlife), 2010. Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta. Final Report, November 23.			
RTD-1006	RTD_1006	Metropolitan Water District of Southern California, 2017. Modernizing the System 1: California WaterFix Infrastructure, July.			
RTD-1007	RTD_1007	Metropolitan Water District of Southern California, 2017. Modernizing the System 2: California WaterFix Operations, July.			
RTD-1008	RTD_1008	Metropolitan Water District of Southern California, 2017. Modernizing the System 3: California WaterFix Finance and Cost Allocation, August.			
RTD-1009	RTD_1009	Metropolitan Water District of Southern California, 2017.A California WaterFix Dialogue: Questions and Answers, September.			
RTD-1010	RTD_1010	Alameda County Zone 7 Water Agency, 2017. Staff Memorandum, Support for California WaterFix. September 20, 2017.			
RTD-1011	RTD_1011	California Department of Water Resources, 2017. Water Available for Replenishment Report, January.			
RTD-1012	RTD_1012	Westlands Water District, 2017. Staff Report: Item 9, Meeting of September 19.			
RTD-1013	RTD_1013	Thomas W. Birmingham, 2017. Statement of the Westlands Water District General Manager on California WaterFix. October 26.			
RTD-1014	RTD_1014	Kern County Water Agency, 2017. Policy Regarding Adminstration of California WaterFix Yield Within Kern County. October 11.			
RTD-1015	RTD_1015	Kern County Water Agency, n.d. (about September 2017). Draft California WaterFix Overview: Materials for Discussion and Decision Compiled by the Kern County Water Agency.			
RTD-1016	RTD_1016	Agreement Between the Department of Water Resources and the Department of Fish and Game To Offset Fish Losses in Relation to the Harvey O. Banks Pumping Plant, Executed December 30, 1986.			
RTD-1017	RTD_1017	Letter of Virginia Cahill, Deputy Attorney General, for Edmund G. Brown, Jr., Attorney General, to John Kirlin, Executive Director of Delta Vision, regarding reallocation of water under specified conditions, July 9, 2008.			
RTD-1018	RTD_1018	State Water Resources Control Board, 2008. Water Rights within the Bay/Delta Watershed. Presented to the Delta Vision Task Force, September 26.			

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			Introduced	Accepted	By Official Notice
RTD-1019	RTD_1019	Letter of Virginia Cahill, Deputy Attorney General, for Edmund G. Brown, Jr., Attorney General, to John Kirlin, Executive Director of Delta Vision, regarding Summary of *United States v. State Water Resources Control Board [and seven other cases]* (1986) 182 Cal.App.3d 82, ("Racanelli" decision), November 16, 2007.			
RTD-1020	RTD_1020	California Department of Water Resources, 2015. Engineering Solutions to Further Reduce Diversion of Emigrating Juvenile Salmonids to the Interior and Souther Delta and Reduce Exposure to CVP and SWP Export Facilities, Draft Phase II - Recommended Solutions Report, prepared in response to the National Marine Fisheries Service 2009 Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project, Reasonable and Prudent Alternative IV.1.3, February.			
RTD-1021	RTD_1021	California Department of Fish and Wildlife, 2000 and 2013. Fish Screening Criteria. Web site as of 2013, PDF as of 2000.			
RTD-1022	RTD_1022	National Marine Fisheries Service, Southwest Region, 1997. Fish Screening Criteria for Anadromous Salmonids.			
RTD-1023	RTD_1023	Restore the Delta table summarizing and comparing fish screen criteria of California Department of Fish and Wildlife, National Marine Fisheries Service, and Bay Delta Conservation Plan.			
RTD-1024	RTD_1024	Delta Independent Science Board, 2015. Review of environmental documents for California WaterFix. September 30.			
RTD-1025	RTD_1025	California WaterFix, 2015. Securing Solutions for the Sacramento-San Joaquin Delta's Native Fish, September.			
RTD-22	RTD_22	Barbara Barrigan-Parrilla's Part 2 Testimony			
RTD-23	RTD_23	Barbara Barrigan-Parrilla's Presentation			
RTD-122	RTD_122	U.S. Bureau of Reclamation, et al, Planning Agreement regarding the Bay Delta Conservation Plan, October 6, 2006.			
RTD-123	RTD_123	Delta Stewardship Council, "Considering Delta Conveyance and Ecosystem Restoration without the Bay Delta Conservation Plan," staff report, June 25, 2015, Item 11.			
RTD-124	RTD_124	Delta Stewardship Council, Meeting Summary, June 25, 2015.			
RTD-125	RTD_125	Delta Stewardship Council, "Conveyance, Storage, and Water Project Operations," staff report, July 23-24, 2015, Item 10.			
RTD-126	RTD_126	Delta Stewardship Council, Meeting Summary, July 23-24, 2015.			
RTD-127	RTD_127	Maven's Notebook, "The truth be told: The Delta, the tunnels, and the tributaries, part 1," October 28, 2015.			
RTD-133	RTD_133	California Natural Resources Agency, California Water Action Plan, 2016 Update.			
RTD-134	RTD_134	California Department of Water Resources, Agreement in Principle for Water Supply Contract Extension, July 8, 2014 memorandum.			
RTD-135	RTD_135	City of Antioch letter to California Department of Water Resources, December 16, 2014, regarding DWR/SWP Contractors Contract Amendment Negotiations.			
RTD-136	RTD_136	Santa Barbara County letter to California Department of Water Resources, December 15, 2014, regarding Public Comment - Bay Delta Conservation Plan Negotiations.			
RTD-137	RTD_137	California Department of Water Resources, preliminary official statement dated April 26, 2016, Central Valley Project Water System Revenue Bonds, Series AV.			
RTD-141	RTD_141	California Department of Water Resources web site, "State Water Project Amendments for the Proposed BDCP, Project Purpose," and "Announcements," accessed July 10, 2016.			
RTD-247	RTD_247	Dan Morain, “Jerry Brown sends a message to water agencies on the Delta tunnels—and it’s direct,” Sacramento Bee May 31, 2017. Accessible September 29, 2017, at http://www.sacbee.com/opinion/opn-columns-blogs/dan-morain/article153697209.html.			

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			Introduced	Accepted	By Official Notice
RTD-248	RTD_248	California Natural Resources Agency, California Department of Food and Agriculture, California Environmental Protection Agency, 2016. California Water Action Plan Implementation Report: 2015 Summary of Accomplishments, January 13.			
RTD-249	RTD_249	U.S. Department of the Interior, Office of Inspector General, 2017. The Bureau of Reclamation Was Not Transparent In Its Financial Participation in the Bay Delta Conservation Plan, September, Report No. 2016-WR-040.			
RTD-250	RTD_250	California State Auditor, 2017. Department of Water Resources: The Unexpected Compleity of the California WaterFix Project Has Resulted in Significant Cost Increases and Delays, Report 2016-132, October.			
RTD-251	RTD_251	Letter of David Murillo, Regional Director, Mid-Pacific Region, U.S. Bureau of Reclamation, to Norma Camacho, Chief Executive Officer, Santa Clara Valley Water District, Subject: Participating Central Valley Project Contractors in the State of California WaterFix--Central Valley Project, California, September 15.			
RTD-252	RTD_252	Restore the Delta, media release, 2016. "Delta Tunnels: State Auditor to Audit CA "WaterFix" funding, August 10.			
RTD-253	RTD_253	California Department of Water Resources, 2016. Bond Prospectus, Series AW, October 3.			
RTD-254	RTD_254	California Department of Water Resources, 2008. Economic Analysis Guidebook, January.			
RTD-255	RTD_255	Jeff Michael, 2017. "WaterFix declining trend," Valley Economy, August 28. Accessed 22 November 2017 at http://valleyecon.blogspot.com/2017/08/waterfix-declining-trend.html.			
RTD-256	RTD_256	The Brattle Group, 2015. California WaterFix Economic Analysis, Draft. November 15.			
RTD-257	RTD_257	Dr. Jeffrey Michael, 2016. Benefit-Cost Analysis of the California WaterFix. August.			
RTD-258	RTD_258	Santa Clara Valley Water District Board Resolution 17-68 For California WaterFix, Adopted October 17, 2017.			
RTD-259	RTD_259	Video record of Santa Clara Valley Water District Board discussion of resolution concerning general principles for California WaterFix negotiation, October 17, 2017, online at http://scvwd.granicus.com/MediaPlayer.php?view_id=3&clip_id=1482, Item 2.5, Special Board Work Study on California WaterFix, time period 2:15:45 to 3:23:00.			
RTD-260	RTD_260	E. Knickmeyer and S. Smith, 2017. "AP NewsBreak: Water Agencies push bigger role in Tunnel plan," June 2. Accessed November 24, 2017, at https://www.apnews.com/b7fa6805efa54340a576b55c598c8593/APNewsBreak:-Water-agencies-push-bigger-role-in-tunnel-plan.			
RTD-261	RTD_261	Alistair Bland, 2017. "As Water Agencies Cast Votes, the Future of Delta Tunnels Remains Unclear," Water Deeply, October 16. Accessed November 24, 2017, at https://www.newsdeeply.com/water/articles/2017/10/16/as-water-agencies-cast-votes-future-of-delta-tunnels-remains-unclear.			
RTD-262	RTD_262	Metropolitan Water District of Southern California, 2017. "CA WaterFix: What Comes Next?" email dated October 26.			
RTD-263	RTD_263	Bettina Boxall, 2017. "Kern County agency votes to help fund de3lta water delivery system," Los Angeles Times, October 12. Accessed November 24, at http://www.latimes.com/local/lanow/la-me-kern-tunnels-20171012-story.html.			
RTD-264	RTD_264	Not in use.			
RTD-265	RTD_265	Paul Rogers, “Santa Clara Valley Water District Rejects Jerry Brown’s Twin Delta Tunnels Plan,” San Jose Mercury News, October 17, 2017. http://www.mercurynews.com/2017/10/17/santa-clara-valley-water-district-rejects-jerry-browns-twin-delta-tunnels-plan/			
RTD-266	RTD_266	Metropolitan Water District of Southern California, 2017. Official vote by director on California WaterFix resolution. October 10.			

Exhibit Identification Index

California WaterFix Hearing
California Department of Water Resources and U.S. Bureau of Reclamation

Date: ____November 30, 2017_____

PARTICIPANT: _____Restore the Delta_____

Exhibit Identification Number	Exhibit Filename	Exhibit Description	Status of Evidence (for Hearing Team use Only)		
			Introduced	Accepted	By Official Notice
RTD-267	RTD_267	Alameda County Zone 7 Water Agency, 2017. Resolution No. 17-75, adopted September 20.			
RTD-268	RTD_268	Jeff Michael, 2017. "Can $3 per month really pay for the Delta tunnels?" Valley Economy, August 28. Accessed 22 November 2017 at http://valleyecon.blogspot.com/2017/08/can-3-per-month-really-pay-for-delta.html			
RTD-269	RTD_269	California WaterFix, 2017. Project Implementation Considerations for California WaterFix, presentation slides to Westlands Water District, August 9 and also presented August 22.			
RTD-270	RTD_270	Complaint for Validation, California Department of Water Resources v. All Persons Interested in the Matter of the Authorization of California WaterFix Revenue Bonds, etc., Sacramento County Superior Court, Case No. 34-2017-00215965, July 21, 2017.			
RTD-271	RTD_271	Cross Complaint of Westlands Water District, in California Department of Water Resources v. All Persons Interested in the Matter of the Authorization of California WaterFix Revenue Bonds, etc., Case No. 34-2017-00215965, November 9, 2017.			
RTD-272	RTD_272	California State Legislature, Senate Local Government Committee. 2007. Governments Working Together: A Citizen's Guide to Joint Powers Agreements. August. sgf.senate.ca.gov/sites/sgf.senate.ca.gov/files/GWTFinalversion2.pdf.			
RTD-273	RTD_273	League of California Cities. n.d. Joint Powers Authorities: Opportunities & Challenges. Prepared by Joan L. Cassman and Jean B. Savaree. www.cacities.org/getattachment/5768b027-71a7-4bc5.../LR-Cassman,-Savaree.aspx.			
RTD-274	RTD_274	Metropolitan Water District of Southern California, n.d. DCE CM1 Property Acquisition Management Plan.			
RTD-275	RTD_275	Delta Water Tunnels Alt. 4A/Delta Wetlands Properties, Bacon Island Assessor Parcel Numbers, September 2015.			
RTD-276	RTD_276	Delta Water Tunnels Alt. 4A/Delta Wetlands Properties, Bouldin Island Assessor Parcel Numbers, September 2015.			
RTD-277	RTD_277	Delta Water Tunnels Alt. 4A/Delta Wetlands Properties, Webb Tract Assessor Parcel Numbers, September 2015.			
RTD-278	RTD_278	Delta Water Tunnels Alt. 4A/Delta Wetlands Properties, (Summary Map) September 2015.			
RTD-279	RTD_279	Letter dated August 9, 2017 of Mark J. Hattam, General Counsel, San Diego County Water Authority, to Marcia Scully, Esq., General Counsel, Metropolitan Water District of Southern California, regarding PRA Request of October 6, 2016, with attachments.			
RTD-280	RTD_280	Central Basin Municipal Water District, 2016. Final Urban Water Management Plan, June.			
RTD-281	RTD_281	W. Kahrl, 1982. Excerpt of Chapters 7 and 8 from *Water and Power: The Conflict over Los Angeles' Water Supply in the Owens Valley*, Berkeley, CA: University of California Press.			
RTD-282	RTD_282	Video record, City of Glendale Council Meeting, September 19, 2017 URL: http://glendale.granicus.com/MediaPlayer.php?view_id=12&clip_id=6399			
RTD-283	RTD_283	Video record, Metropolitan Water District of Southern California, Special Board Meeting on California WaterFix, September 26, 2017, URL: http://mwdh2o.granicus.com/MediaPlayer.php?view_id=21&clip_id=6321			
RTD-284	RTD_284	B. Flyvbjerg, M. Garbuio, D. Lovallo, 2009. Delusion and Deception in Large Infrastructure Projects: Two Models for Explaining and Preventing Executive Disaster. California Management Review 51(2): 170-193. Winter.			

Exhibit Identification Index

California WaterFix Hearing
California Department of Water Resources and U.S. Bureau of Reclamation

Date: ____November 30, 2017_____

PARTICIPANT: _____Restore the Delta_____

Exhibit Identification Number	Exhibit Filename	Exhibit Description	Status of Evidence (for Hearing Team use Only)		
			Introduced	Accepted	By Official Notice
RTD-285	RTD_285	Letter of Michael T. Hogan, Director, San Diego County Water Authority, to Randy Record, Chair, and Jeff Kightlinger, General Manager, Metropolitan Water District of Southern California, regarding California WaterFix--Request for Documents, September 30, 2017.			
RTD-286	RTD_286	Fairbank, Maslin, Mauillin, Metz & Associates, 2017. Soutner California Water Committee/California WaterFix Survey--Key Findings. July 19, 5 pages.			
RTD-287	RTD_287	U.S. Geological Survey, 2016. Central Basin Groundwater Contamination Study. December 29. URL: https://ca.water.usgs.gov/projects/2009-02.html			
RTD-288	RTD_288	R-G. Lin and P. Krishnakumar, 2015. "Groundwater contamination a growing problem in L.A. County wells." *Los Angeles Times* May 23			
RTD-289	RTD_289	University of California at Los Angeles, Institute of the Environment and Sustainability, "Practicum Project: Assessing Groundwater Contamination in Maywood, California." Accessed November 29, 2017, at https://www.ioes.ucla.edu/project/assessing-groundwater-contamination-in-maywood-california/.			
RTD-290	RTD_290	T. Barboza, 2016. Agencies were urged to address Paramount metal emissions years before air toxics scare. *Los Angeles Times,* December 4.			
RTD-291	RTD_291	Video record, Santa Clara Valley Water District Board of Directors Meeting, September 12, 2017. http://scvwd.granicus.com/MediaPlayer.php?view_id=3&clip_id=1471			
RTD-292	RTD_292	Central Basin Municipal Water District, 2017. Regular Meeting Minutes of the Board of Directors, August 28.			
RTD-293	RTD_293	California Department of Water Resources Mission Statement. Accessed November 30, 2017.			
RTD-5	RTD_5	Qualifications of Gary Mulcahy			
RTD-50	RTD_50	Testimony of Gary Mulcahy			
RTD-501	RTD_501	4th Section Allotments in Redding, California			
RTD-7	RTD_7	Qualifications of Roger Mammon			
RTD-70	RTD_70	Testimony of Roger Mammon			
RTD-71	RTD_71	Presentation slides for Roger Mammon			

Attachment 9

Delta

Regional Opportunity Analysis

By
Chris Benner
Center for Regional Change
UC Davis
ccbenner@ucdavis.edu
http://regionalchange.ucdavis.edu/

With Cassie Hartzog and Sara Watterson

UC DAVIS
CENTER FOR REGIONAL CHANGE

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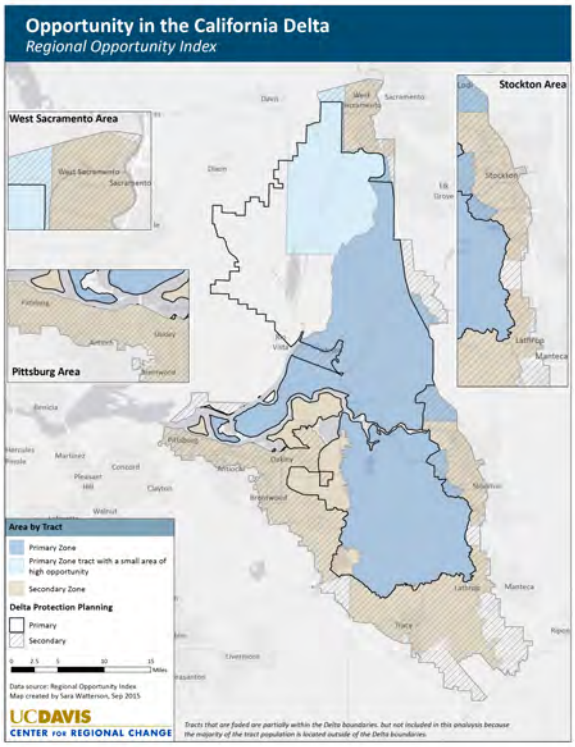
Understanding the socio-economic conditions of residents of the Sacramento-San Joaquin Delta and the communities in which they live is important to the Delta Protection Commission (DPC), especially as the commission is in the process of updating the Economic Sustainability Plan (ESP) and Land Use and Resource Management Plan (LURMP) for the Delta. The goal of this report is to provide an overview of these socio-economic conditions. Our focus was on a comparative analysis of 33 key indicators of community opportunity that are part of the Regional Opportunity Index developed by the Center for Regional Change at UC Davis.[1] These indicators measure relative opportunity for both people and the places in which they live, and focus on six broad domains: education, economy, housing, transportation/mobility, health/environment, and civic engagement. The conclusions presented here are based on a comprehensive analysis of these conditions within the geographic boundaries of the Delta Protection Commission, including both the primary and secondary zone, comparing them to state averages.

We distinguish between three key geographic areas that are shown in Map ES-1:

- The Primary Zone, covering the areas in both dark and light blue, which corresponds to the census tracts which most closely align with the Primary Zone of the Delta
- The Core Primary Zone, covering the areas in dark blue, which is a sub-set of the Primary Zone that excludes one census tract in the northern part of the zone which is mostly inside the Delta, but also includes an area of high opportunity outside of the Delta and thus provides somewhat misleading data.

Map ES-1: Zones of Analysis

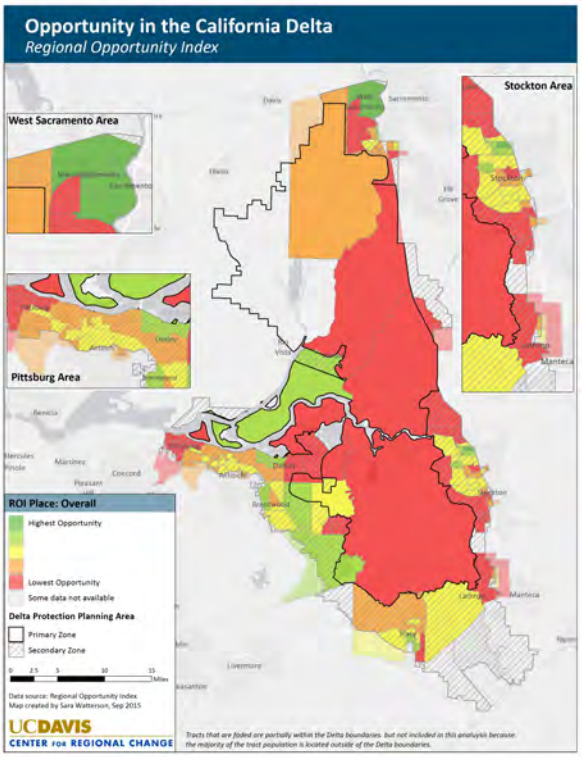


[1] The ROI is available on line here: http://interact.regionalchange.ucdavis.edu/roi/

- The Secondary Zone, covering the area shown in tan, which corresponds to the census tracts which most closely align with the Secondary Zone of the Delta.

For all three zones, we look at both indicators of the places themselves, and the people living in those places.

Map ES-2: Overall Place Opportunity



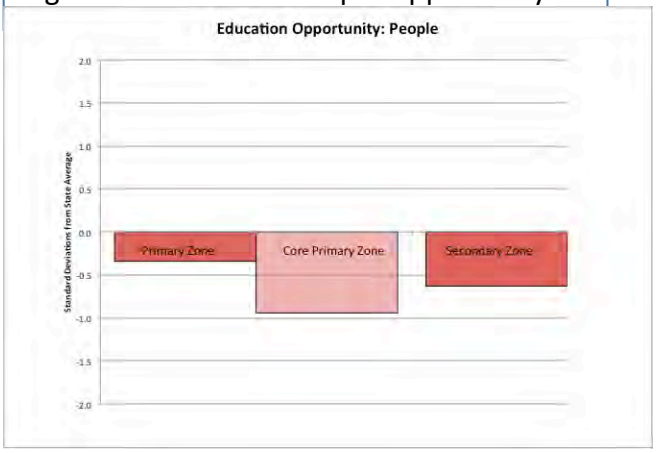
Low Overall Opportunity Levels

Overall, within all three of these zones, socio-economic opportunity for our place indicators is substantially below state averages. As shown in Map ES-2, the Core Primary Zone shows a particularly low overall level of socio-economic opportunity—the color red indicates that those census tracts are in the bottom 20% of all census tracts in the state. There are pockets of much higher-levels of socio-economic opportunity in the Secondary Zone, including portions of West Sacramento, northern Stockton, and parts of the Pittsburg area, but overall, even in the Secondary Zone, opportunity levels are substantially below state averages (see Figure ES-1).

Similarly, the opportunity measures for the people living in the Delta are substantially below state averages as well. Here, the low opportunity levels of people living in the Core Primary Zone are also substantially below that of the Secondary Zone, and the rest of the state (see Figure ES-2).

Figure ES-1: Overall Place Opportunity

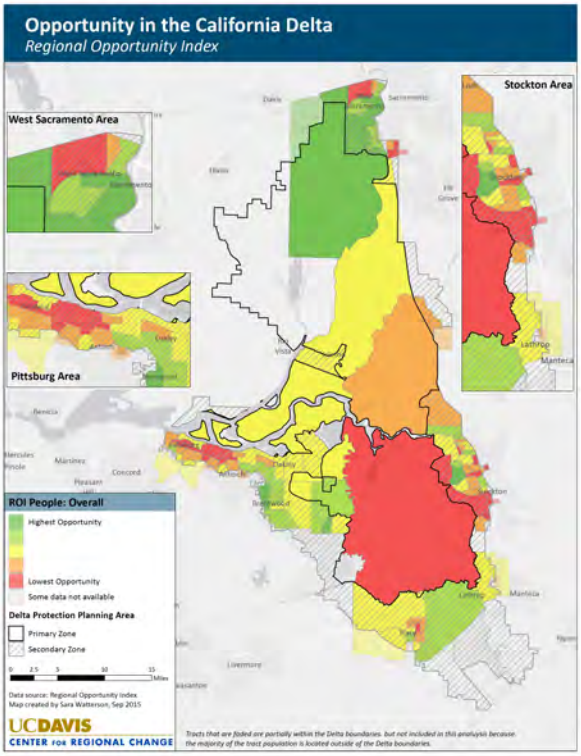
Figure ES- 2: Overall People Opportunity



Since our overall opportunity index combines opportunity scores across six different domains of socio-economic opportunity, it is evidence of quite diverse and multiple forms of deprivation in the region.

Looking at the spatial distribution of these patterns of opportunity show that the lowest levels of opportunity are for people located in the southern portion of the zone, in the area around Holt and Highway 4 (the tract in red in Map ES-3). This is a relatively sparsely populated section of the Delta, but there were still close to 1,800 people living here. This is an area in which, according to the 2013 American Community Survey, nearly 35% of the population are below the official poverty line, including nearly 40% of children living in poverty. The population is 65% Latino, and nearly 52% of the population over 5 years old speak a language other than English at home. More than 40% of the population have less than a high school degree, and the median per capita income was only $17,427 a year, and the median household income was only $32,344 a year.

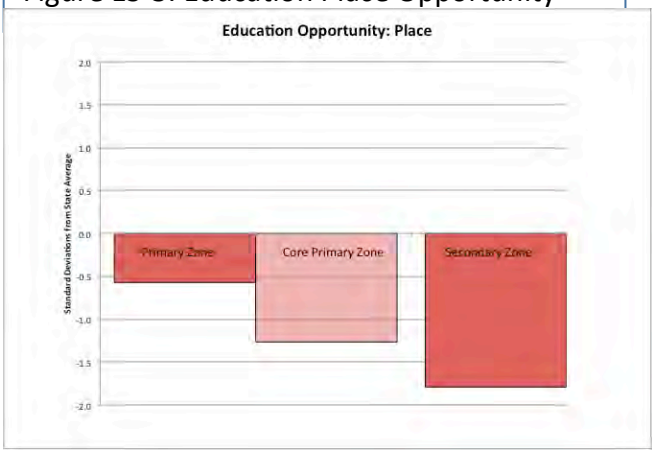
Map ES-3: Overall People Opportunity



Education, Economy and Health Strongest Drivers of Low Opportunity

For both our place and people analysis, the strongest clear drivers of the low opportunity levels are in the education, economy and health domains. In the education domain, our analysis focuses on indicators of the quality of both elementary schools and high schools. Overall, across all three zones, educational opportunity for places in the Delta are below average, with the Core Primary Zone and Secondary Zone showing particularly low opportunity scores. (see Figure ES-3). These low scores are not driven by low high school graduate rates—in fact overall high school graduation rates in the Core Primary Zone are above average, with 86% of the 9th

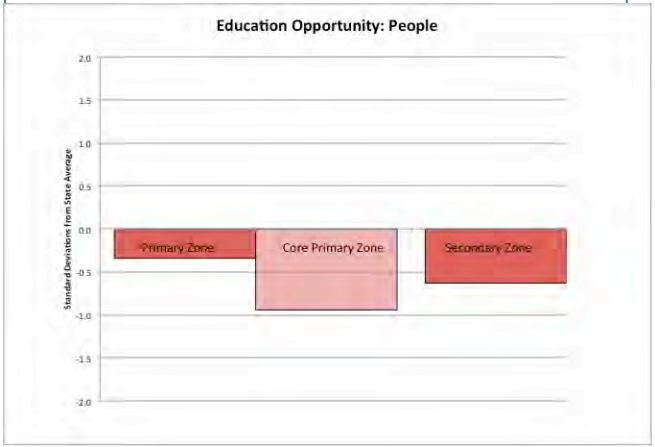
Figure ES-3: Education Place Opportunity



grade cohort graduating four years later (compared to a state average of 81%). But other indicators of the quality of schools in the area—including teacher experience, disciplinary practices, and percent of graduating students meeting course requirements for entry into the UC/CSU system—are all significantly below average.

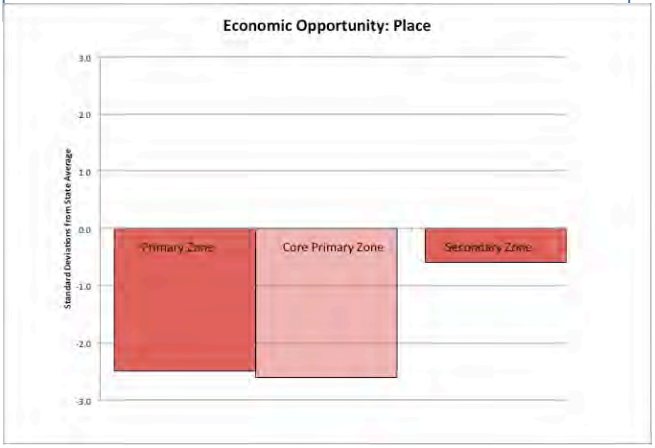
The low educational opportunity is reflected not just in the schools in the area, but in the overall educational attainment of people living in the area as well, particularly in the Core Primary Zone, which is substantially below average (see Figure ES-4). Here, the primary factors driving low opportunity scores for the region are both low levels of early childhood education, as well as low levels of adult educational attainment.

Figure ES-4: Education People Opportunity



Economic indicators for the area are also quite low (see Figure ES-5). The absolute number of jobs, in comparison to the number of people living in the area, is only slightly below state-wide averages in the Core Primary Zone, though it is lower in the Secondary Zone. The more pronounced problem, however, is that the quality of jobs in the area is quite low. Indicators of economic opportunity for people shows that while low levels of employment are a factor, an even stronger factor is the low percentage of income earners who earn a living wage. Overall this suggests an economic development strategy in the area should focus more on improving job quality and attracting high-paying industries to the area, rather than simply increasing jobs. There is also evidence that levels of broadband internet access are quite low in the region, which could be another focus for economic interventions.

Figure ES-5: Economic Place Opportunity



Health care and health conditions of the population in the area also emerges as a key concern. For both our people and place measures, the health index shows scores in the region that are substantially below state-wide averages, again particularly in the Core Primary Zone. There is a clear lack of access to health care services in the region, and health indicators of residents in the area are also significantly below average.

Positive Signs in Housing Conditions and Civic Life

Fortunately, not all indicators of opportunity in the Delta Region are negative. Housing conditions in particular show quite strong opportunities in the region (see Figure ES-6). There are above average levels of home ownership, and housing cost burdens are relatively low for people in the region.

Figure ES-6: Housing People Opportunity

There are also signs of strong civic life in the region. Voting rates are above average in the Primary Zone (including the Core Primary Zone), and there are also relatively high levels of neighborhood stability, an important basis for active civic life.

Conclusions and Recommendations

Overall this analysis of socio-economic conditions in the region presents a picture of a region struggling economically, with significant challenges related to health conditions as well. This is also a region that has a stable population, with good housing conditions and strong civic life. These findings suggest priorities for development in the region might include the following:

- Improve school quality, with a focus on improving teacher skills and capacities in elementary schools, improving college preparedness, and pursuing alternatives to suspension and expulsion for disciplinary practices in area high schools;
- Focus economic development efforts on improving job quality in existing industries in the region, while working to diversify economic opportunities to higher-wage industries;
- Expand access to broadband internet, to help overcome digital isolation in the region, while expanding educational and economic opportunities; and
- Improving the provision of health services and primary health care in the region.

These recommendations, however, are based on a “30,000-foot” level of secondary data, and need to be supplemented by more in-depth analysis incorporating local knowledge and perspectives.

DELTA REGIONAL OPPORTUNITY ANALYSIS

Full Report

Introduction

Understanding the socio-economic conditions of residents of the Sacramento-San Joaquin Delta, and the communities in which they live, is important to the Delta Protection Commission (DPC), especially as the commission is in the process of updating the Economic Sustainability Plan (ESP) and Land Use and Resource Management Plan (LURMP) for the Delta. The Center for Regional Change at UC Davis has developed the Regional Opportunity Index, a sophisticated methodology for understanding and analyzing patterns of socio-economic opportunity in California that recognizes the intersection of the multiple factors that shape opportunity in local communities.[2] This includes the quality of education systems, the strength of the local economy, the adequacy and affordability of housing, adequacy and accessibility of transportation infrastructure, availability and quality of health services, and the strength of civic engagement. Our approach also analyzes the differences in the relative level of resources possessed by individuals, and the relative level of institutional and physical resources. Making this distinction between people and place characteristics is important for identifying promising points of intervention and prioritizing investments.

This report analyzes socio-economic conditions in the Delta, relying in large part on the Regional Opportunity Index to generate data and maps that identify areas in greatest need of investment to build opportunity. Overall we find that the Delta Region, including both the Primary and Secondary Zone, have significantly lower opportunity levels, for both people and the places in which they live, than the state as a whole. The primary factors driving these overall levels of low opportunity include:

- Poor educational characteristics, including signs of poor early childhood learning, low adult educational attainment, and poor quality schools;
- Economic challenges rooted in a dependence on low-wage industries, with large numbers of people in low-income jobs; and
- Low availability of health services and prenatal care, with associated poor health indicators

[2] The ROI is available on line here: http://interact.regionalchange.ucdavis.edu/roi/

The socio-economic conditions in the Delta are not all negative, however. Homeownership rates are above average, a higher than average percent of people have affordable housing costs, and there are signs of a strong civic life in the region.

These findings suggest that priorities for development in the region should include:

- Improve school quality, with a focus on improving teacher skills and capacities in elementary schools, improving college preparedness, and pursuing alternatives to suspension and expulsion for disciplinary practices in area high schools;
- Focus economic development efforts on improving job quality in existing industries in the region, while working to diversify economic opportunities to higher-wage industries;
- Expand access to broadband internet, to help overcome digital isolation in the region, while expanding educational and economic opportunities; and
- Improving the provision of health services and primary health care in the region.

In what follows, we first provide background on the Regional Opportunity Index, and how we have used it to analyze conditions in the Sacramento-San Joaquin Delta. We then turn to an analysis of the overall opportunity conditions in the region, including identifying specific places with particularly challenging conditions. We then investigate in more depth conditions for people and place in each of the sub-domains of the analysis: education, economy, housing, transportation/mobility, health/environment and civic life. We conclude with discussing the implications for development priorities in the region.

Regional Opportunity Index and Its Application to the Delta

The Regional Opportunity Index (ROI) has two broad dimensions. The first, referred to as People Opportunity, combines data about the relative level of resources possessed by individuals in the region. These include people's educational levels, employment status, housing and transportation circumstances, health conditions and civic engagement. The second dimension is called Place Opportunity. This describes the relative level of institutional and physical resources available. This includes the quality of local schools, the state of the local economy, housing stock, environmental quality, availability and quality of health services, and local civic capacities. Overall we provide a comparative analysis of 33 key indicators of community opportunity that cover both people and place in the region (specific indicators and their sources are shown in Appendix A).

There are several features of the ROI that are important to keep in mind in this analysis:

- The ROI uses census tracts as the unit of analysis. Census tracts are designed to be relatively homogenous units with respect to population characteristics, economic status and living conditions, and they average about 4,000 residents in each tract. They thus

are geographically smaller in dense urban areas, and larger in more sparsely populated rural areas.

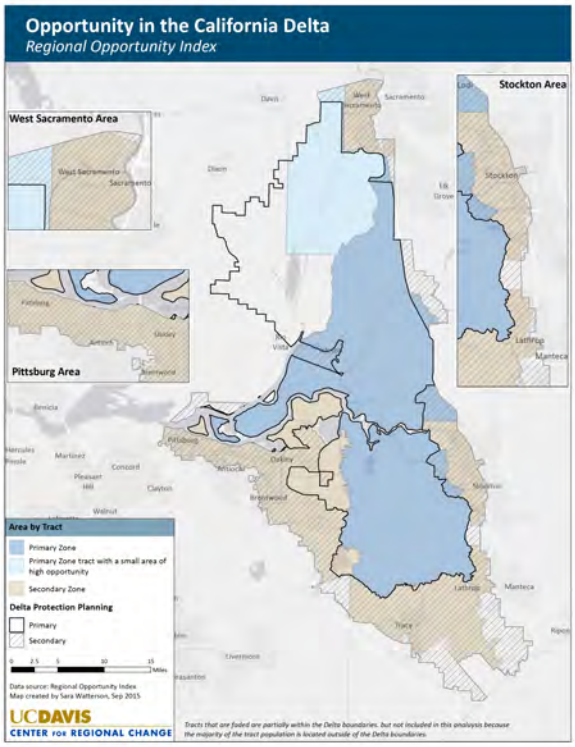
- Opportunity in the Delta region is measured relative to state-wide averages
- The ROI uses the most recent data available, but there is always a time lag. Most data sources are from 2013 in this analysis (Appendix A shows the year of all data sources.)
- The ROI uses secondary data collected by a range of other parties such as the U.S. Census Bureau, and represent a '30,000-foot level' view of the region, and do not take into account more detailed characteristic of local areas. In particular, there are likely to be communities smaller than a census tract with significantly different conditions than tract-wide averages. Additional research to incorporate local knowledge and more detailed community characteristics is necessary to develop a more comprehensive understanding of dynamics in the region.

The specific geography covered by the Delta Protection Commission does not correspond to census tract boundaries, which creates certain challenges for this analysis. Our overall goal was to select census tracts for analysis that most closely correspond to the Primary and Secondary Zones of the Delta. We use the population-weighted centroid of the tract to determine the tract's location, and include the tract in the analysis if this centroid falls within the boundaries of the Primary or Secondary Zone.

Overall we distinguish three key geographic areas that are shown in Map 1:

- The Primary Zone, covering the areas in both dark and light blue, which corresponds to the census tracts which most closely align with the Primary Zone of the Delta
- The Core Primary Zone, covering the areas in dark blue, which is a sub-set of the Primary Zone that excludes one census tract in the northern part of the zone who's centroid falls within the Delta but which also includes an area of high opportunity outside of the Delta (near Davis) and thus provides somewhat misleading data.
- The Secondary Zone, covering the area shown in tan, which corresponds to the census tracts which most closely align with the Secondary Zone of the Delta. Note

Map 1: Zones of Analysis



that there are three tracts in the Stockton/Lathrop area (Tracts 51.27, 51.30, and 7) who's centroid was slightly outside the Secondary zone but that were included because of their functional integration with adjacent tracts that are full within the Secondary Zone).

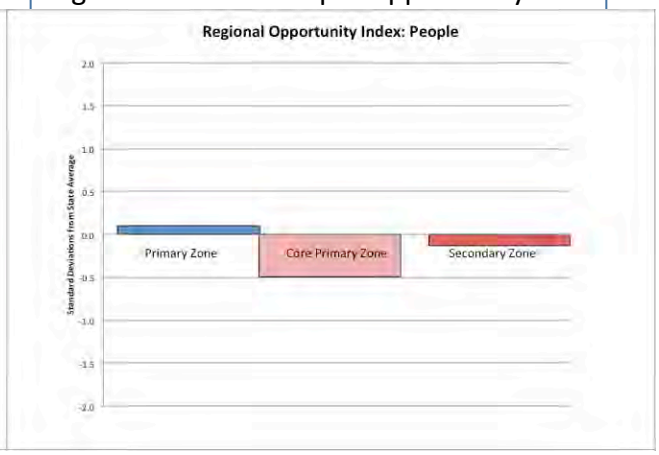
In what follows, we examine patterns of opportunity for both people and place, based on these geographies.

Overall Patterns of Opportunity

Overall, opportunity conditions within the Delta are substantially below state-wide averages. For the Place Opportunity Index, conditions are below average throughout the region, with the Core Primary Zone showing particularly low levels of opportunity (See Figure 1)[3]. For the People Opportunity Index, opportunity in the Secondary Zone overall is about the same as the average for the whole state, and for those living within the Core Primary Zone, only somewhat worse that state-wide averages (See Figure 2). The better People Opportunity Indices suggest that people living in the Delta, particularly in the Core Primary Zone, are taking advantage of opportunities outside of the area, or are choosing to live in the Delta for reasons that are not reflected in the low Place Opportunity scores (such as certain quality of life factors).

Figure 1: Overall Place Opportunity Index

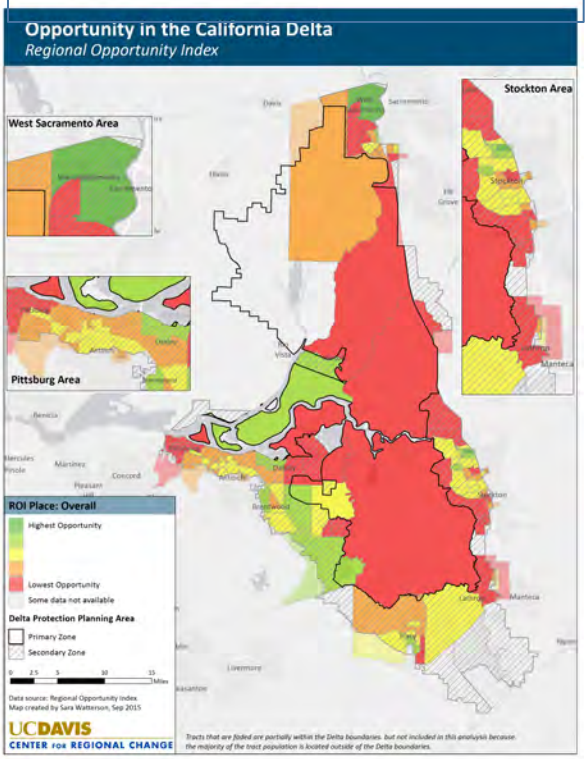
Figure 2: Overall People Opportunity



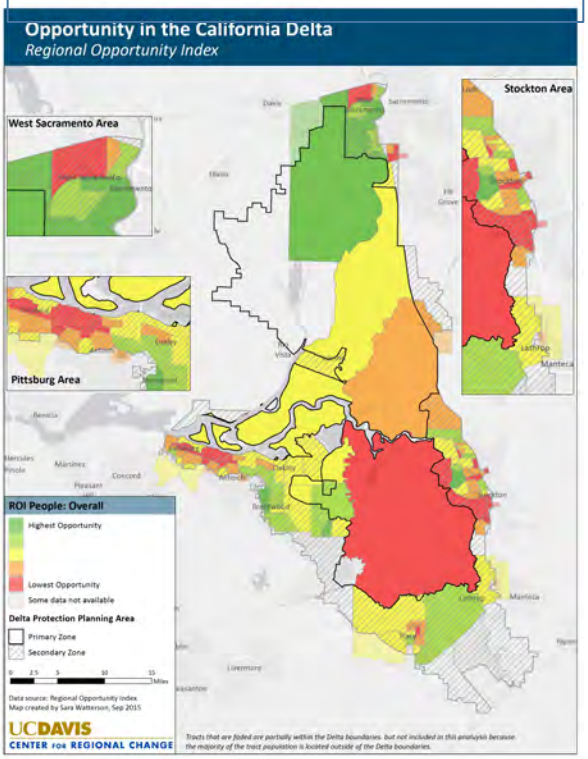
[3] Note that throughout the report in figures like these, red bars indicate below state averages and blue bars indicate above state averages, with the length of the bar related to the number of standard deviations above or below the state average.

There is significant disparity in opportunity across the Delta. Map 2 shows the Place Opportunity index and Map 3 shows the People Opportunity Index. Each of the color schemes in the map represents 20% of all the census tracts in the state on a spectrum from red through yellow to green, with red indicating the 20% of tracts with the lowest opportunity scores, and

Map 2: Overall Place Opportunity Index



Map 3: Overall People Opportunity Index



dark green representing those 20% of tracts with the highest opportunity scores. Note that the Core Primary Zone area, in the eastern and southern part of the Primary Zone, has the lowest levels of opportunity for both people and place. The large tract in the very south of the Primary Zone, in the area around Holt and Highway 4, is an area of particular concern because of the combined low levels of both People and Place Opportunity. This is a relatively sparsely populated section of the Delta, but there were still close to 1,800 people living here. This is an area in which, according to the 2013 American Community Survey, nearly 35% of the population are below the official poverty line, including nearly 40% of children living in poverty. The population is 65% Latino, and nearly 52% of the population over 5 years old speak a language other than English at home. More than 40% of the population have less than a high school degree, and the median per capita income was only $17,427 a year, and the median household income was only $32,344 a year.

It is also important to note that there are pockets of low opportunity in each of the urban centers around the Delta—in south Stockton, portions of West Sacramento, and in central and west Pittsburg. Particularly in Pittsburg and south/central Stockton are neighborhoods with both low People and Place Opportunity scores, that should be a particular focus for attention and investment.

What is Driving Low Opportunity Scores?

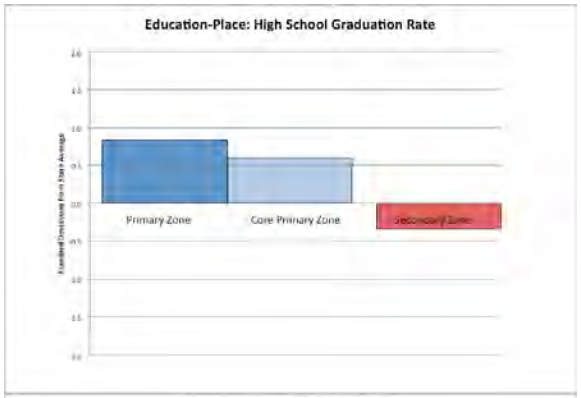
The primary factors driving low opportunity scores in all of these areas are related to poor education, economic and health indicators, as well as signs of a digital divide—lack of access to broadband infrastructure. We'll look in detail at each of these in turn.

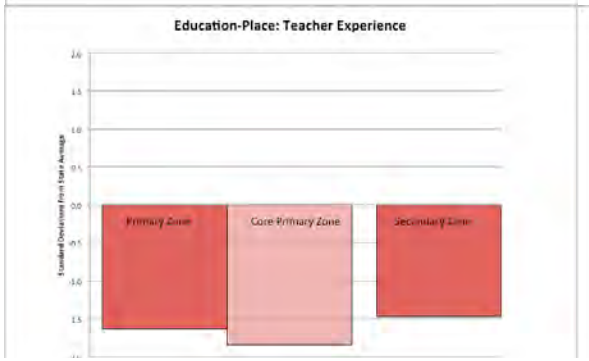
Low Educational Attainment and Poor School Quality

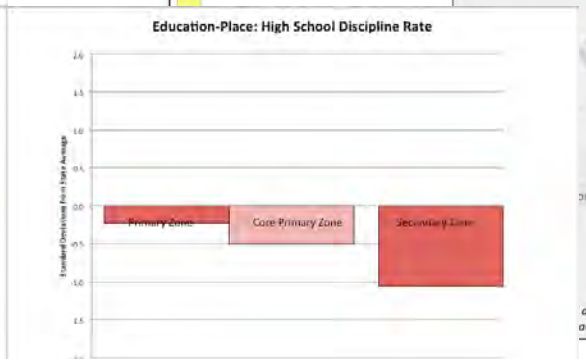
Educational indicators for the quality of schools and instruction in the Delta are below average across nearly the whole region. As the map in Figure 3 shows, it is only the single tract in the northwest of the Primary Zone linked to Davis that has an Education Place Index score that is above average. The reasons for this low overall score are *not* linked to low high school graduation rates, as can be seen by the charts in Figure 3. High schools in the Primary Zone, including the Core Primary Zone actually have above average graduation rates, with an average graduation rate in the Primary zone of 88% of the 9th grade cohort graduating four years later, compared to a state-wide average of 81%. The primary factors driving the low Education Place Opportunity scores are a low percentage of elementary school teachers with advanced training and experience (an indirect indicator of quality of instruction in the schools), and a high level of suspensions and expulsions from high school (a sign of a punitive, rather than a more positive, approach to school discipline).

The low Education Place Opportunity scores are mirrored by low Education People Opportunity scores across much of the region, as shown in the map in Figure 4. There are portions of the region, particularly in west Sacramento and in Brentwood and Byron (southwest Delta), where Educational People indicators are above average, but in the Core Primary Zone, educational attainment levels are quite low. There are two main factors that seem to be driving this low score, which can be seen in the charts in Figure 4. The first are indications of poor early childhood education (as indicated by low math and English proficiency scores in elementary school). The second is low levels of adult educational attainment, as indicated by the low levels of College-Educated Adults. In the Core Primary Zone, only 20% of adults have a Bachelor's Degree or higher, compared to 38% state-wide.

Figure 3: Place: Education Measures







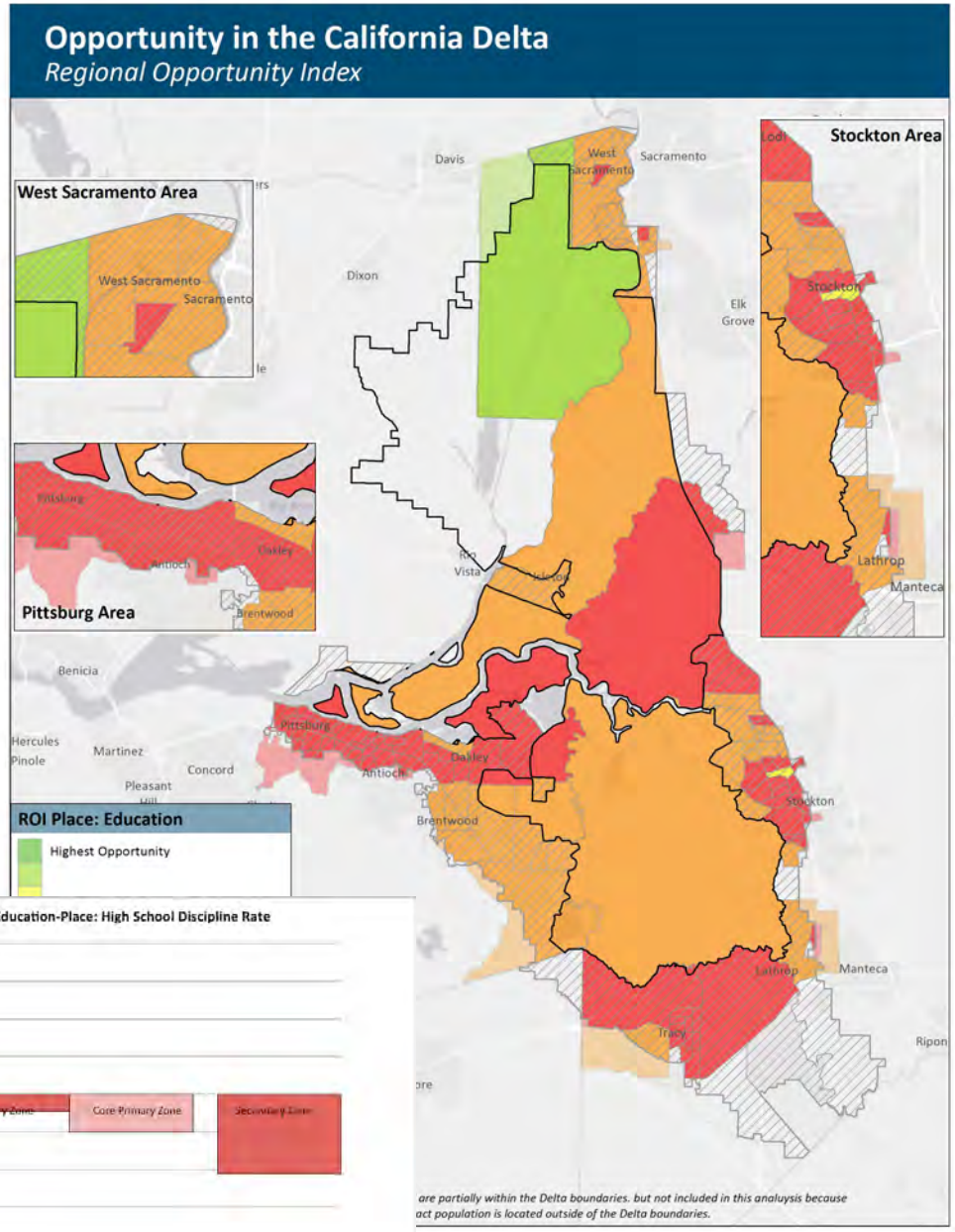
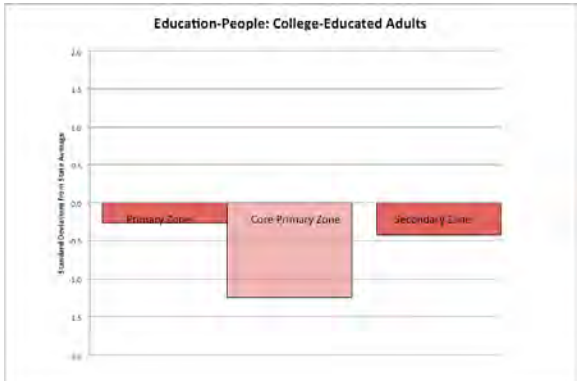
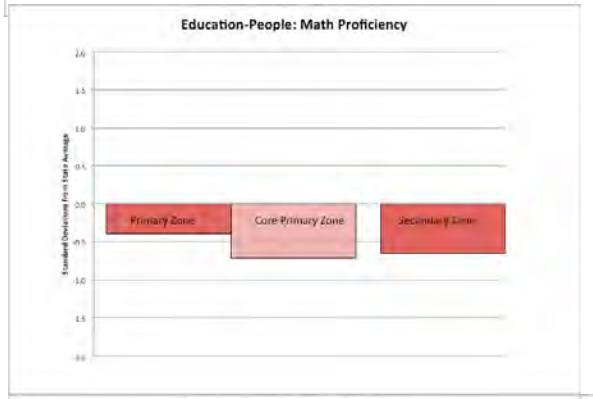
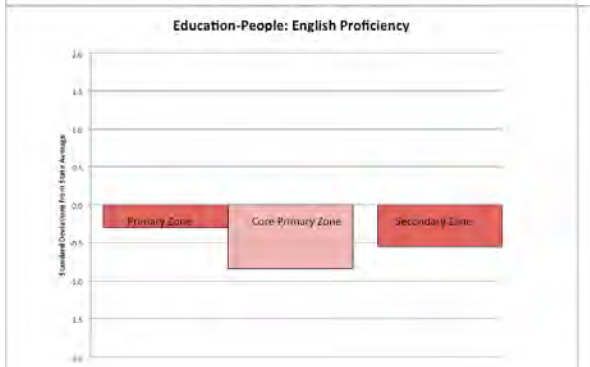
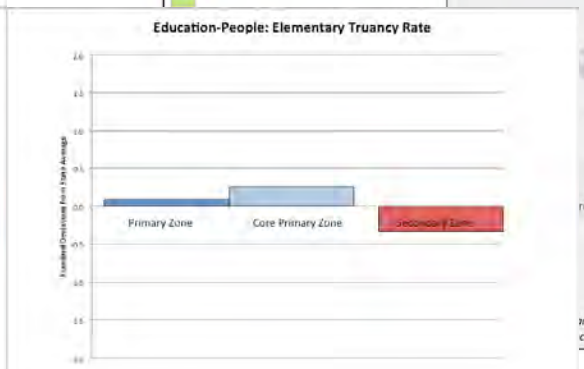


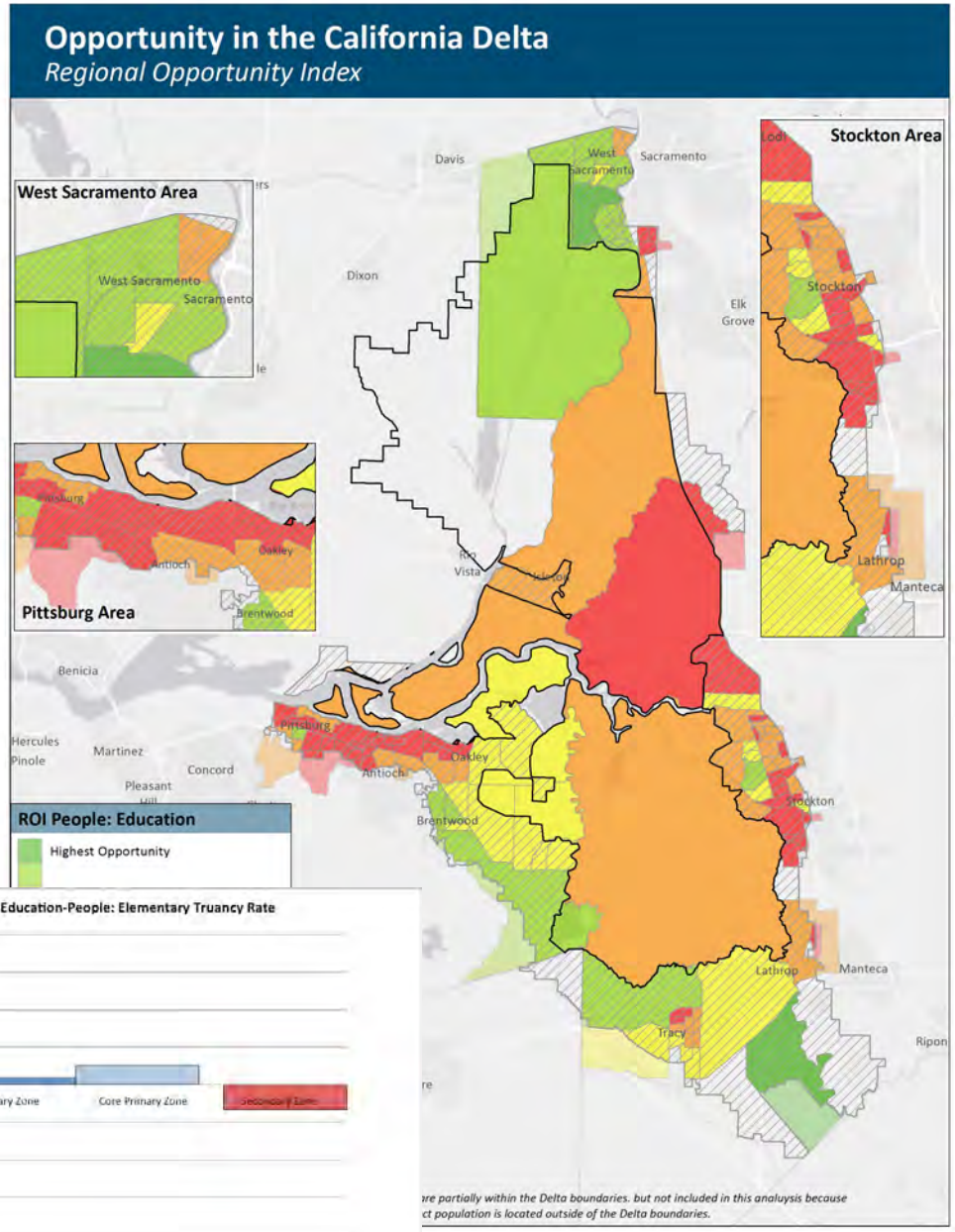
Figure 4: People: Education Measures











Low-wage jobs and low-paying industries

The economy of the Delta is another area showing signs of low opportunity. The Core Primary Zone of the Delta is almost entirely in the lowest category of Economy Place Opportunity as measured by our index, with the exception of one tract (in yellow) in the western Delta near Rio Vista (see map in Figure 5). Most of the Secondary Zone is in the lowest 40% of census tracts in Economic Place Opportunity, as indicated by being either in red or orange on the map. The key components of the index point to a pattern not so much of a lack of jobs, but rather a lack of high quality jobs. The total number of jobs available in the Core Primary Zone, for example, is just over 800 jobs per 1000 people, only slightly below the state-wide average of 838 jobs per 1000 people. Only 18% of those jobs, however, are in high-paying industries, compared to 41% state-wide. Patterns are slightly different in the Secondary Zone. Here, there is a shortage of total number of jobs, as well as a lack of good paying jobs. On average, throughout the Secondary Zone, there are only 595 jobs per 1000 people, substantially below state-wide averages. An estimated 34% of jobs in the Secondary Zone are in high-paying industries—still somewhat below state-wide averages, but not as low as the Core Primary Zone.

An examination of the Economy People Opportunity Index shows that people living in the Delta are also experiencing poor economic circumstances, but that their opportunity levels are perhaps not quite as bad as would be indicated by the low Place Economy Opportunity measures (see map in Figure 6). Geographically, we see clear patterns of inequality within towns surrounding the Delta, with portions of Stockton, Pittsburg and West Sacramento areas showing quite low opportunity and others in the highest opportunity categories. The patterns of the quality of jobs, rather than total number of jobs, being the primary concern is still clear in the Core Primary Zone. Here, total employment levels are slightly below state-wide averages, with 85% of adults age 20-64 employed, compared to a statewide average of 89%. But only 55% of people earn what we consider a minimum basic income, compared to 64% of people state-wide. In the Secondary Zone, on average, 66% of people are earning a minimum basic income (200% of the Federal Poverty Level), slightly higher than the 64% statewide average.

Figure 5: Place: Economy Measures

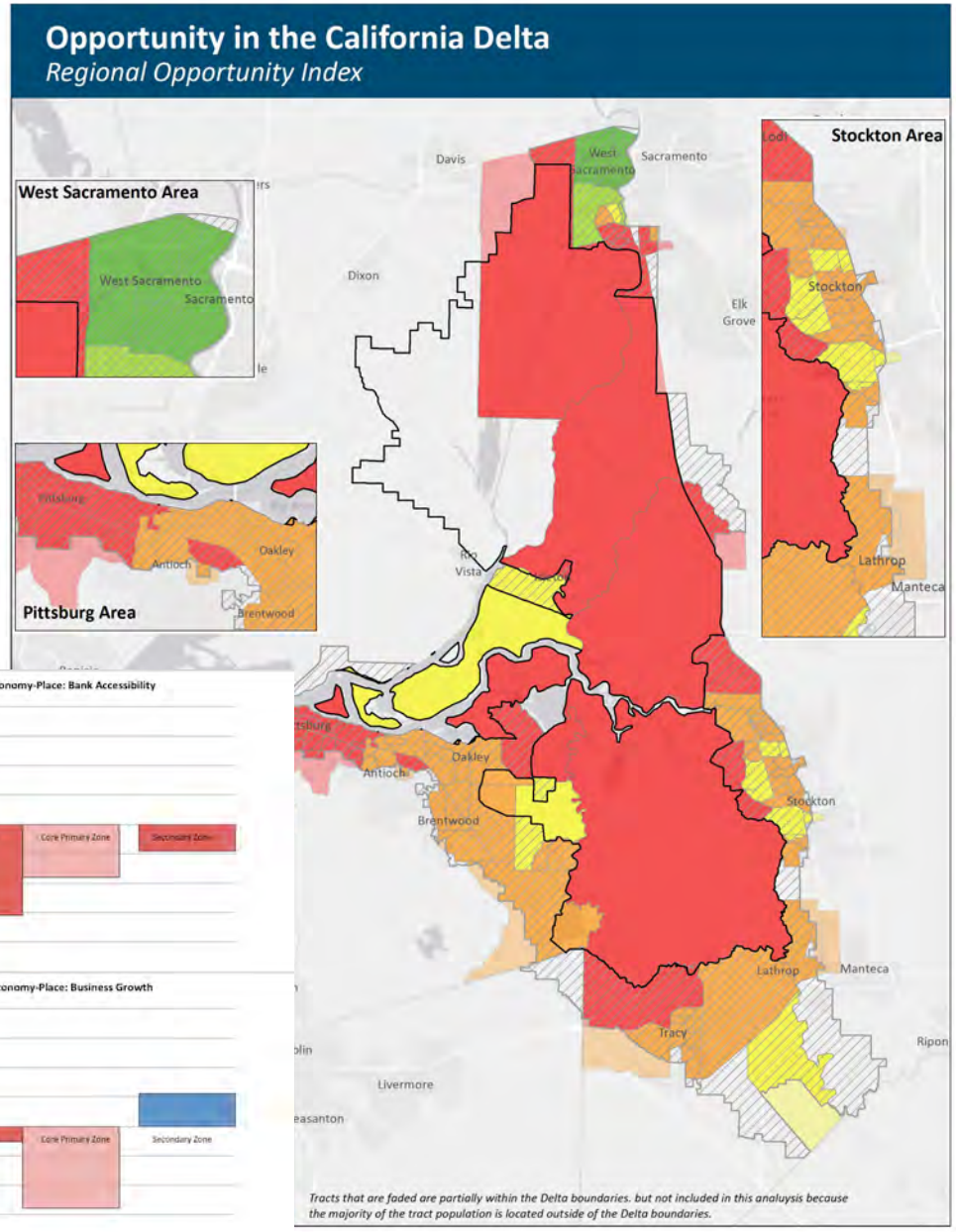
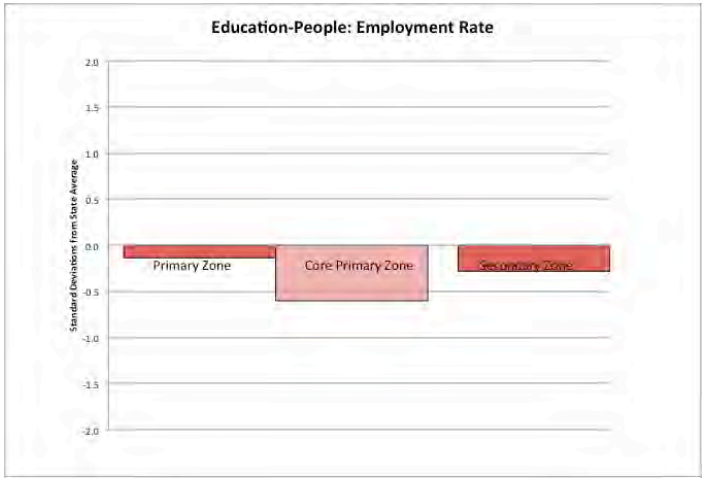
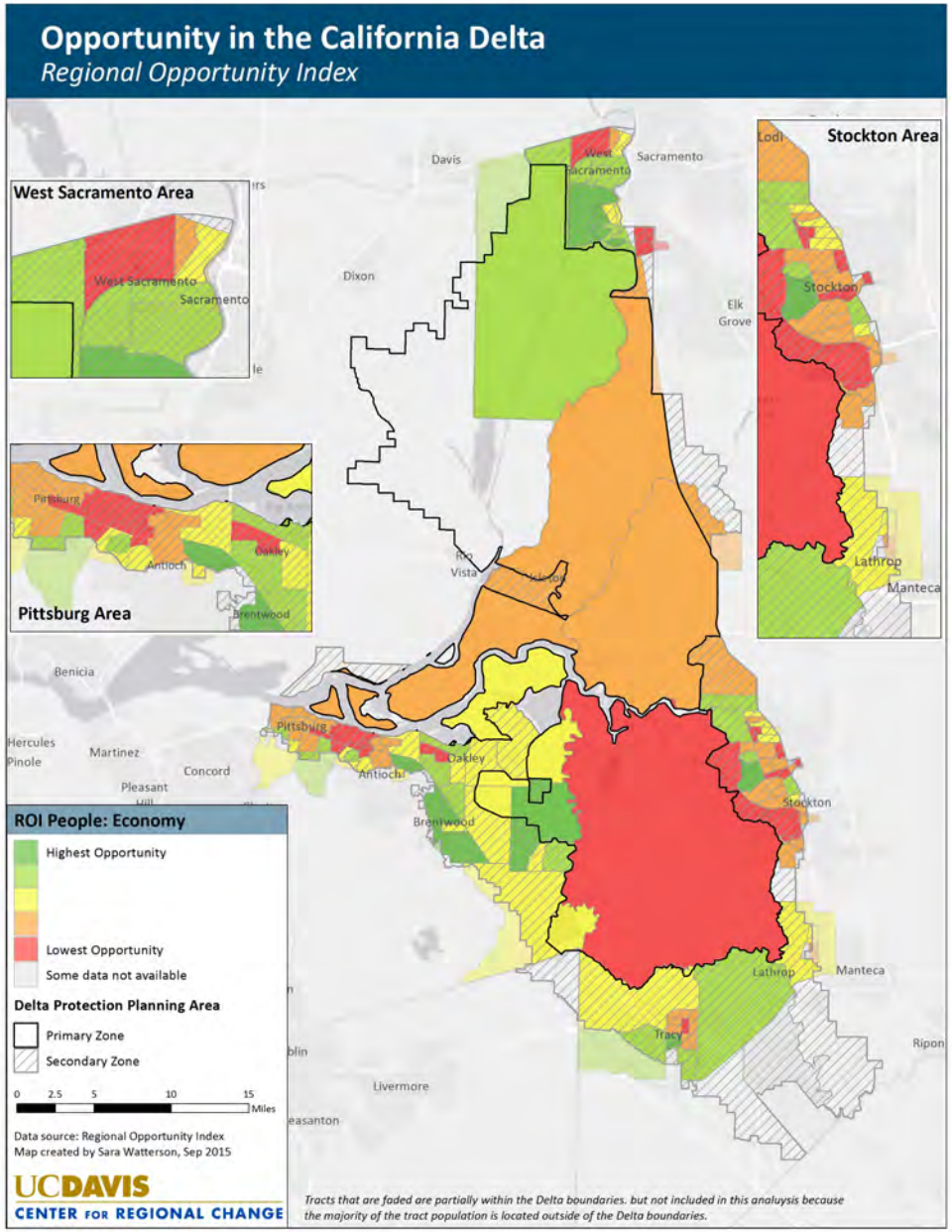


Figure 6: People: Economy Measures



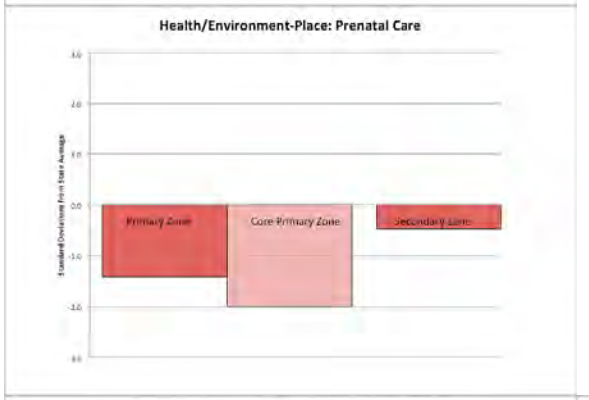


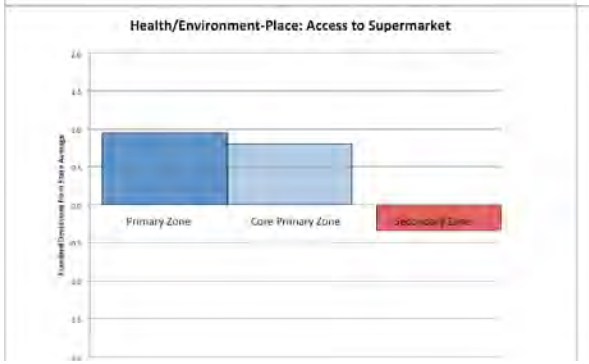
Poor Health Indicators

Health and related environmental indicators is another area where the Delta faces substantial challenges. Most of the Core Primary Zone falls into the lowest 20 or 40% of tracts in the state in our Place Health/Environment Opportunity Index (see map in Figure 7). The Secondary Zone has a more mixed pattern, with some areas showing much higher levels of health opportunity, though with many of the poor neighborhoods of Stockton and Pittsburg still showing low health opportunity levels. In looking more deeply at what is driving the Health Opportunity levels, we can see some positive and some negative indicators. Overall, air quality is above state averages, as measured by particulate matter in the air. Similarly, on the US Department of Agriculture's measures of close access to supermarkets, the Primary Zone also scores above average, though there are some challenges of food access in parts of the Secondary Zone. The levels of access to health services, however, are substantially below statewide averages across both Primary and Secondary Zones (see charts in Figure 7). Overall, the number of providers of basic medical services per 1000 population within a 5 mile radius is substantially below state-wide averages (.23 providers per 1000 people, compared to 1.76 state-wide). Access to prenatal care is also quite poor—in the Core Primary Zone, only 68% of mothers received prenatal care in their first trimester of pregnancy (a good indicator of overall maternal health care availability), compared to 83% state-wide.

Looking at the People Health Opportunity Index shows that on average across both the Primary and Secondary Zone, people have below average indicators of health opportunity, with the Core Primary Zone showing disturbingly low levels of healthy birthweight babies, and high levels of teenage births and premature death (as measured by years of potential life lost) (see charts in Figure 8). These indicators show quite a wide disparity across the region, however. The Core Primary Zone had consistent lower than average scores, as does most of Stockton and Pittsburg. But there are portions of the Secondary Zone, particularly in West Sacramento and in the Brentwood and Oakley area, where health conditions appear to be significantly better (see map in figure 8)

Figure 7: Place: Health & Environment Measures





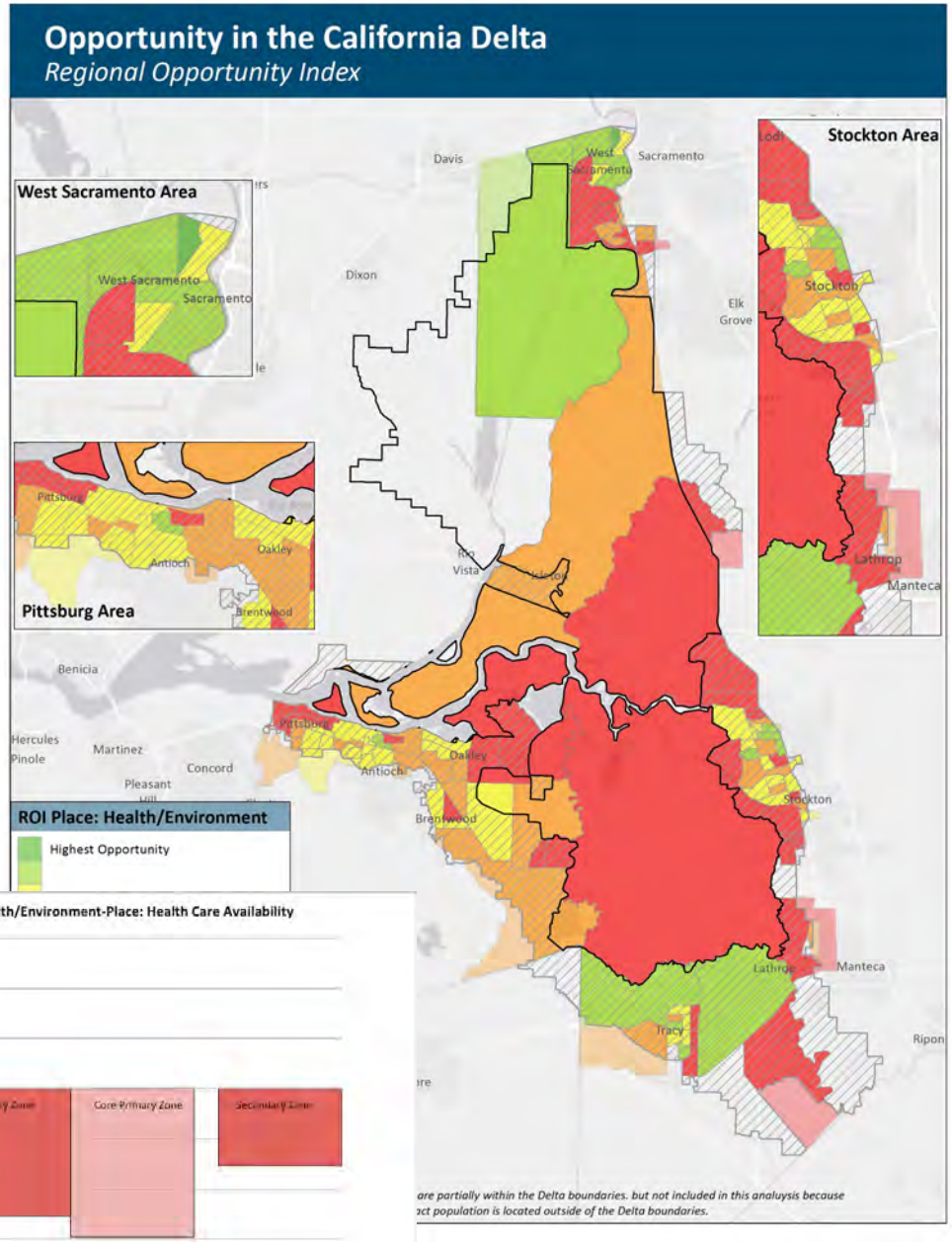
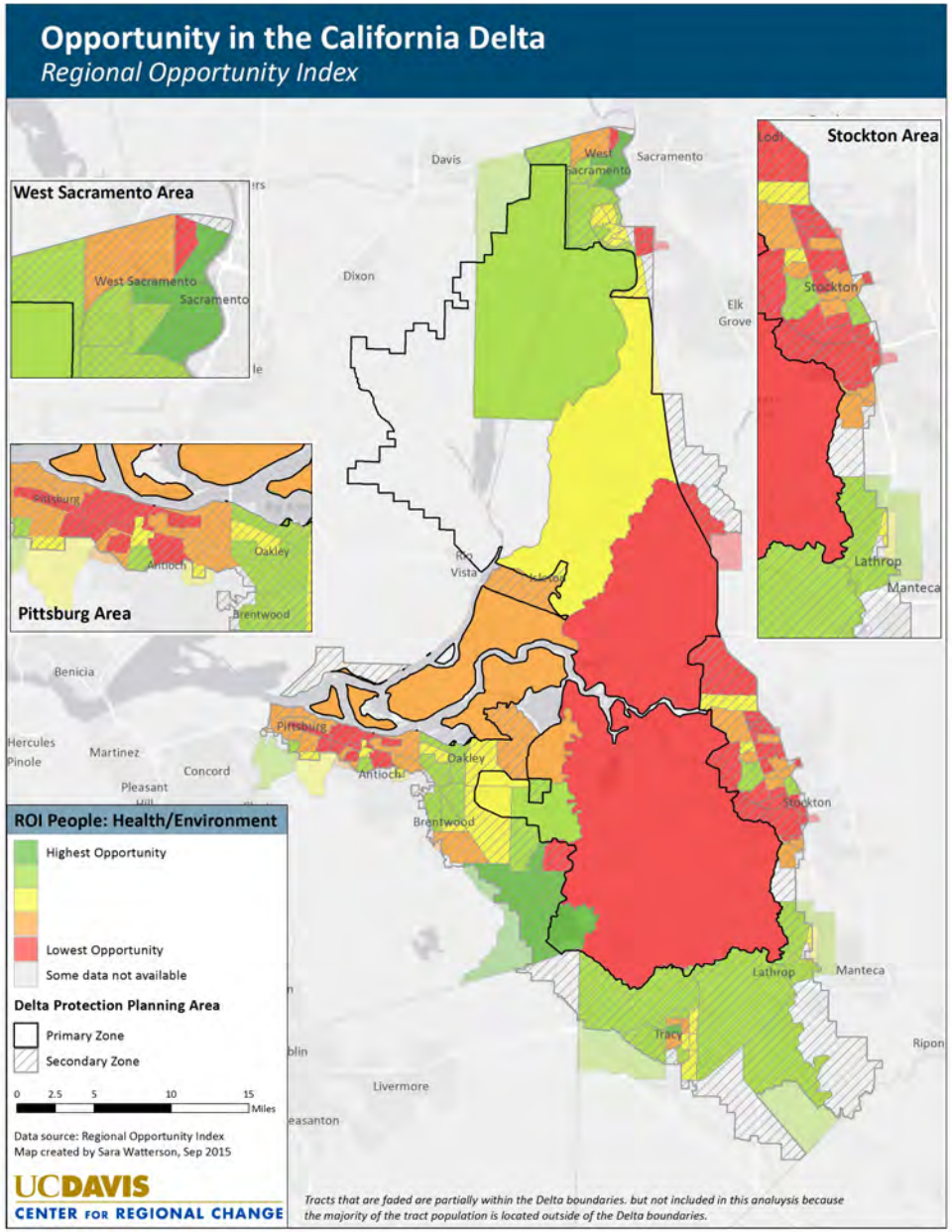


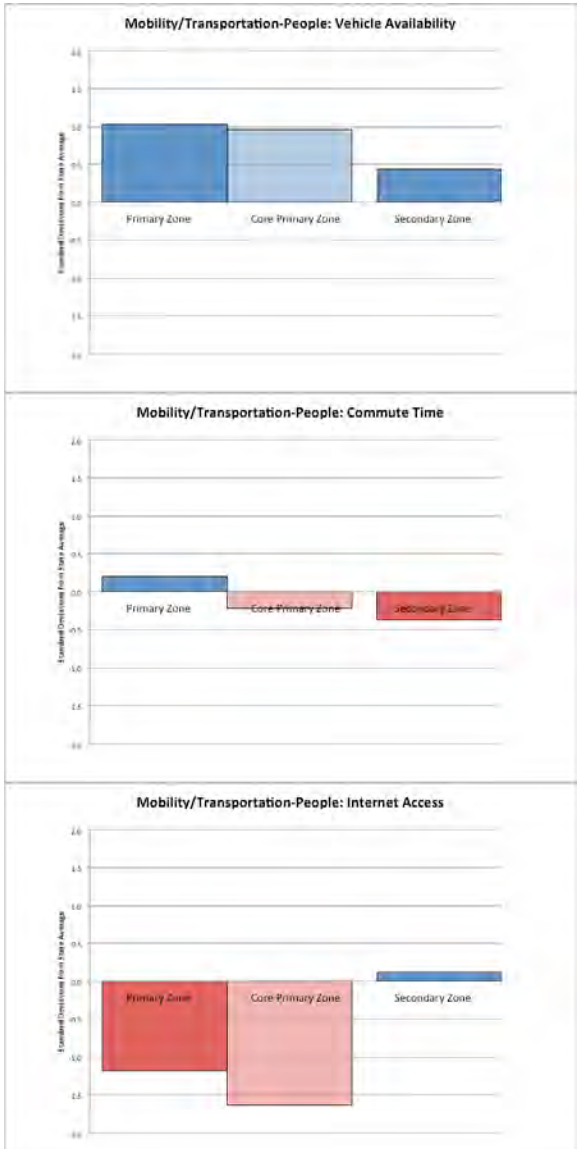
Figure 8: People: Health Measures

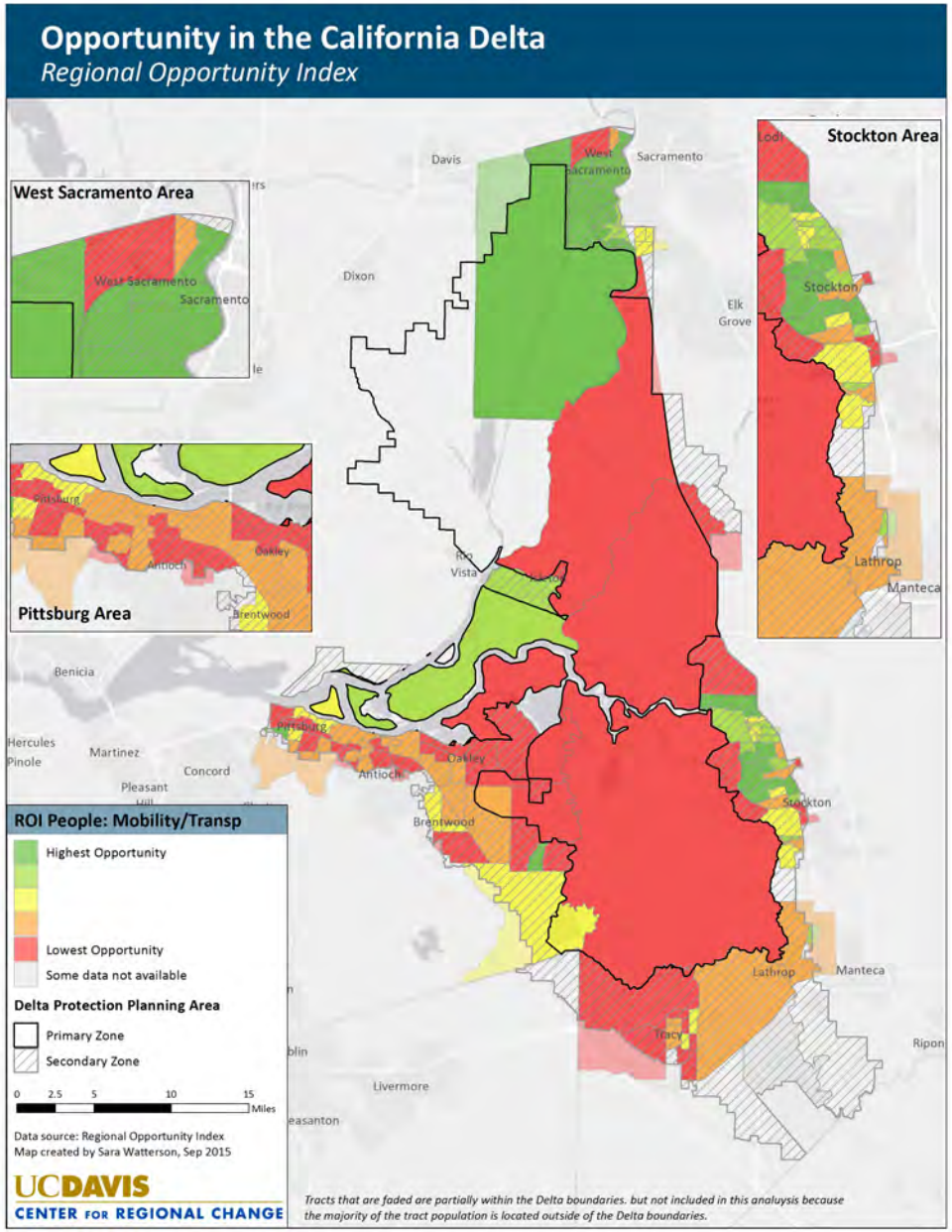


Long Commutes and Low Access to Broadband

An examination of the transportation, mobility and connectivity characteristics of people living in the Delta overall suggests that transportation issues are not as high a priority as the education, economic and health factors described above. As shown in the charts in Figure 9, the level of vehicle availability throughout the Delta is substantially higher than state-wide averages. The proportion of people with long commute times in the Core Primary Zone and Secondary Zone is somewhat higher than state-wide averages, but not dramatically so in most of the region. What really stands out, however, is the low levels of access to broadband internet access in the Primary Zone. In the Core Primary Zone, on average only roughly 300 out of every 1000 households have high-speed internet, compared to a state-wide average of above 800 per 1000. While many people are accessing the internet through smartphones and other mobile devices, access via a computer at home remains critically important for accessing key benefits of the internet, including access to educational resources, training programs, and other economic resources.

Figure 9: People: Mobility & Transportation Measures





Patterns of High Opportunity

Not all socio-economic conditions in the Delta are below state-wide averages. In particular, housing characteristics emerged as an arena in which there seem to be high opportunities in the Delta. Similarly within civic life they are indicators of significant strengths. We examine each of these in turn.

Affordable and Adequate Housing Opportunities

With a few exceptions, throughout most of the Delta region, the Housing People Opportunity Index is at or above state averages (see map in Figure 11). This is driven primarily by high levels of affordable housing costs, and by high levels of home ownership. An average of 59% of households in the Primary Zone, and 56% in the Core Primary Zone spend less than 30% of their income on housing costs (considered an affordable amount). This compares to 51% state-wide. An average of 60% of households within the Primary Zone, and 62% in the Secondary Zone, are home-owners, compared to a 55% average state-wide. The few exceptions to the high Housing People Opportunity scores are in poor neighborhoods of West Sacramento, Stockton and Pittsburg, where homeownership is lower and where a higher percentage of households face unaffordable housing costs.

The positive housing circumstances show up even more strongly in our Housing Place Opportunity Index, where almost the entire region is at or above state averages (see Figure 10). The strongest factor here is the lack of overcrowding (as measured by our housing adequacy indicator), but overall housing is also affordable compared to median incomes in the region. In the Secondary Zone, for example, the ratio of median income to median housing prices is 0.29, compared to a state-wide average of 0.19.

Civic Life Shows Signs of Strength

In addition to the strong housing indicators, there are also some indicators that suggest an above average level of civic engagement and involvement in Delta communities. On average, voting rates in the Primary Zone are significantly above average, including in the Core Primary Zone (see Figure 13). In the last election for which we have data, 51% of the citizen voting aged population voted in the Primary Zone, including 46% in the Core Primary Zone, compared to a state-wide average of 44%. There is also a relatively high-level of residential stability in the Primary Zone of the Delta, with an above average percent of the population living in the same residence as a year ago. The Delta does face certain challenges in civic life, including a high proportion of people who are linguistically isolated (18% in the Core Primary Zone) and a high proportion of non-citizens (20% in the Core Primary Zone). But overall these indicators suggest there is a substantial basis of a strong civic life in the Delta that can be built on for future development efforts.

Figure 10: Place: Housing Measures

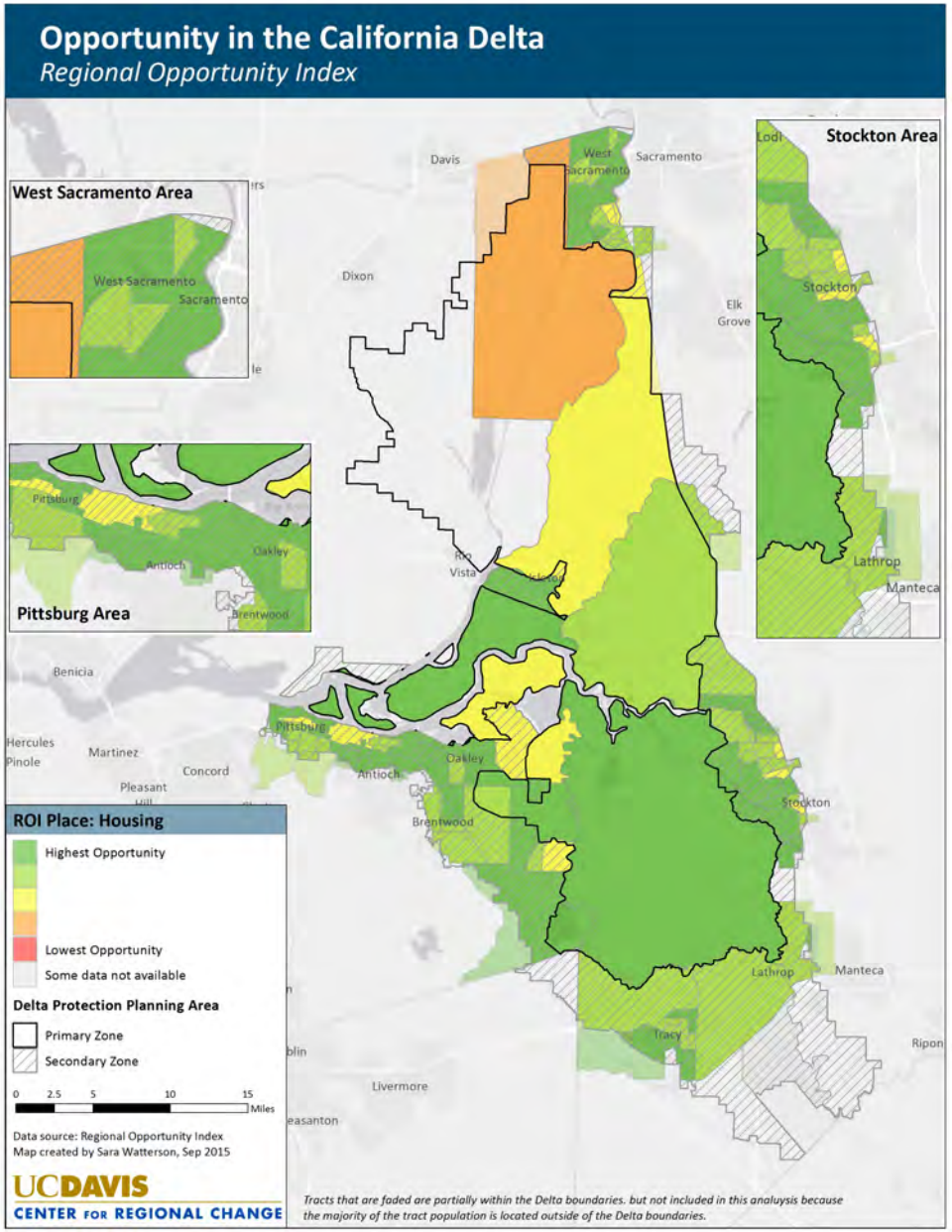
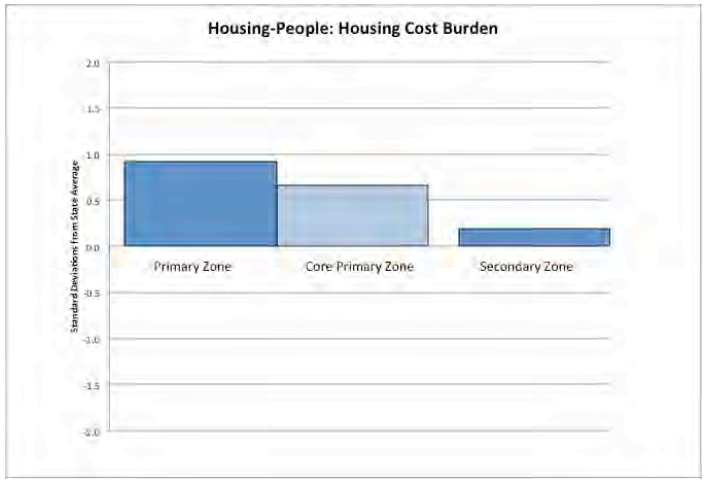


Figure 11: People: Housing Measures



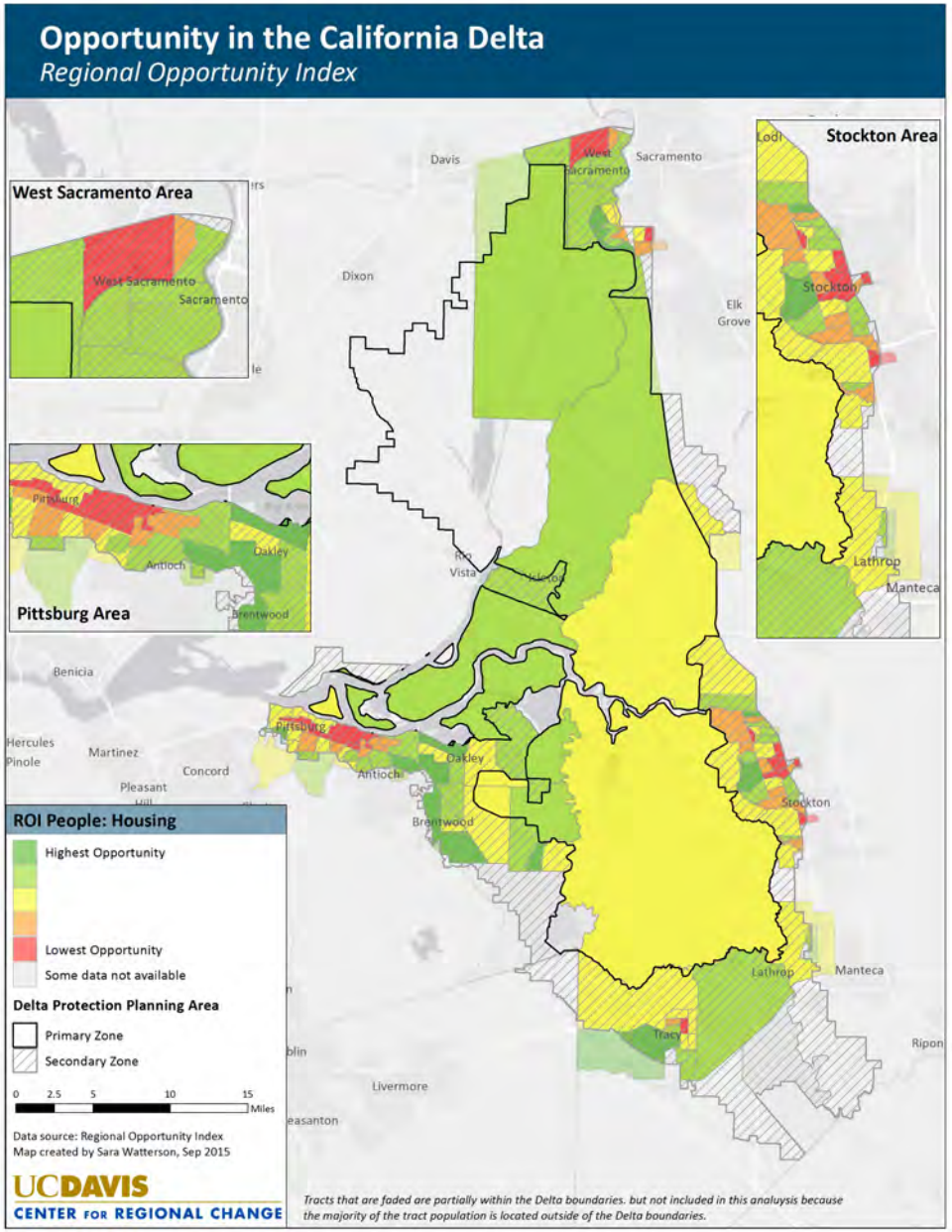


Figure 12: Place: Civic Life Measures

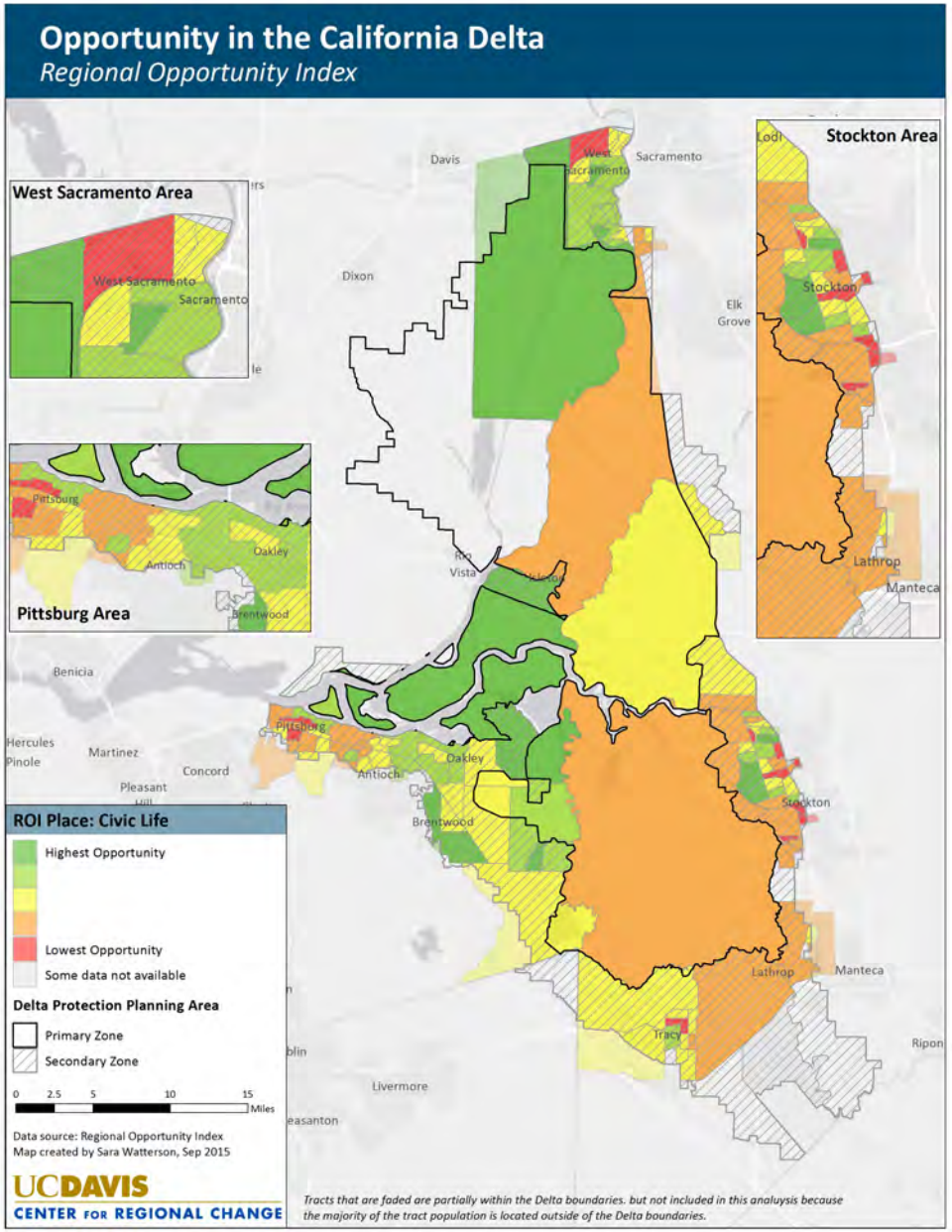
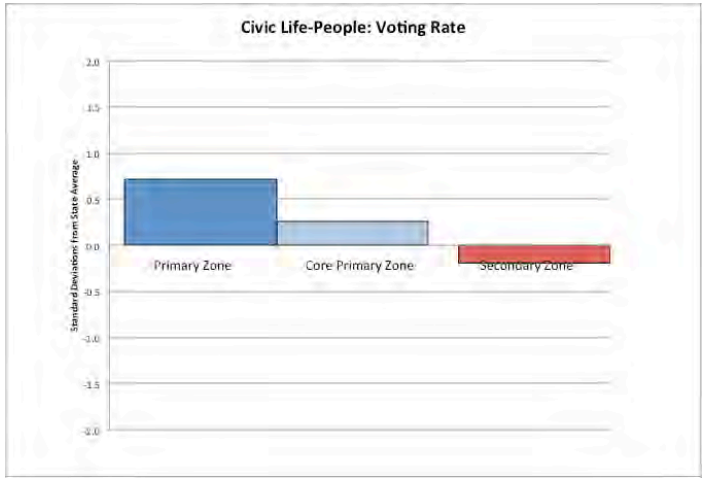
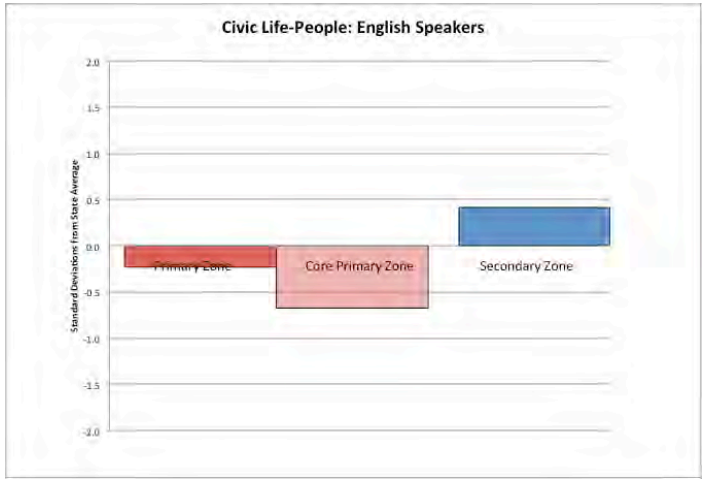
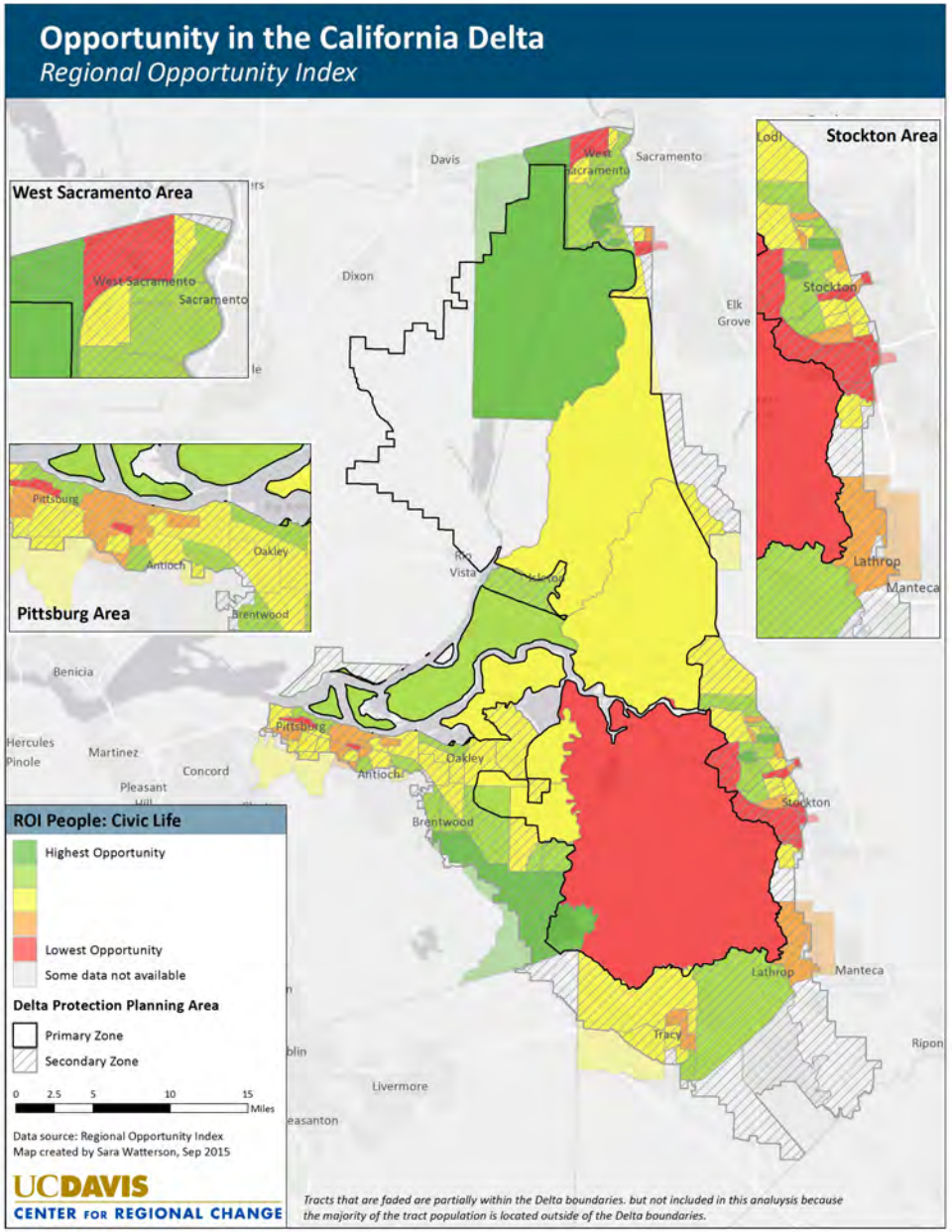


Figure 13: People: Civic Life Measures







Conclusions and Recommendations

Overall this analysis of socio-economic conditions in the region presents a picture of a region struggling economically, with significant challenges related to education and health conditions as well. Economically, the primary challenge is not so much the need for job creation, though this would be welcome. Rather the greater challenge seems to be the preponderance of low-paid jobs and industries with below average wages. In the education sphere, an above average percentage of students graduate from local high schools, but a lower than average percentage of those graduating are ready for college. There are also signs that the educational challenges in the region start at a much younger age, with signs of poor early childhood education, and a lower than average percentage of experienced and highly qualified teachers in local elementary schools. Health challenges in the region clearly relate to a lack of health services, which is associated with various indicators of lower than average health conditions in the region.

These patterns of low-opportunity do vary across the region. Areas with the most challenging circumstances are in the southern portion of the Core Primary Zone, as well as in the poor neighborhoods of West Sacramento, south-central Stockton and Pittsburg.

Not all indicators of socio-economic circumstances are negative in the region, however. As we've detailed above, housing prices in the region are affordable, a lower than average percentage of households are paying unaffordable amounts of income on housing, and homeownership rates are above average. Communities in the region seem to be relatively stable, with a higher-than average percentage of people living in the same residence as a year ago, and voting rates amongst the citizen voting age population are high.

These findings suggest priorities for development in the region might include the following:

- Improve school quality, with a focus on improving teacher skills and capacities in elementary schools, improving college preparedness, and pursuing alternatives to suspension and expulsion for disciplinary practices in area high schools;
- Focus economic development efforts on improving job quality in existing industries in the region, while working to diversify economic opportunities to higher-wage industries;
- Expand access to broadband internet, to help overcome digital isolation in the region, while expanding educational and economic opportunities; and
- Improving the provision of health services and primary health care in the region.

These recommendations, however, are based on a "30,000-foot" level of secondary data, and need to be supplemented by more in-depth analysis incorporating local knowledge and perspectives. Hopefully this assessment of conditions in the Delta will provide a useful information base for future research and development efforts.

Appendix A: ROI Index and Indicator Values

Regional Opportunity Index and Indicator Values for Various Geographies in the Delta and California

	PEOPLE				PLACE				
		Delta		California			Delta		California
Indicators/Index	Primary Zone	Core Primary Zone	Secondary Zone		Indicators/Index	Primary Zone	Core Primary Zone	Secondary Zone	
PEOPLE OVERALL INDEX	0.11	-0.49	-0.13		PLACE OVERALL INDEX	-1.08	-1.46	-0.46	
People: Education Index	-0.34	-0.94	-0.63		*Place: Education Index*	-0.57	-1.26	-1.79	
% of adults with post-secondary education	34%	20%	31%	38%	High school graduation rate	88%	86%	78%	81%
% 4th graders proficient in ELA	62%	56%	59%	65%	High school grads college ready	48%	41%	31%	42%
% 4th graders proficient in math	66%	63%	64%	70%	% elementary teachers with 5 years experience and more than BA degree	21%	19%	22%	37%
Elementary school truancy rate	22%	20%	27%	23%	High school suspension and expulsion rate	21%	24%	32%	18%
People: Economy Index	-0.20	-0.69	-0.02		*Place: Economy Index*	-2.49	-2.60	-0.59	
% of adult population employed	88%	85%	87%	89%	Jobs within 5 mile radius per 1000 population	657	801	595	838
% of households above 200% FPL	61%	55%	66%	64%	% jobs that are in high-paying industries within 5 mile radius	23%	18%	34%	41%
					% job growth in last year within 5 mile radius	0%	-3%	3%	3%
People: Housing Index	0.67	0.48	0.24						
% of households who own home	60%	57%	62%	55%	Banks per 1000 population within 5 mile radius	0.14	0.18	0.21	0.24
% of households paying <30% of income on housing	59%	56%	52%	51%	% change in number of employers within 5 mile radius, 2009-2011	3%	-5%	8%	4%
					Place: Housing Index	0.46	1.26	1.42	
People: Mobility/Transportation Index	-0.45	-1.14	-0.23		% homes with <= 1 occupant per room	95%	93%	94%	91%
% who commute 30 min. or less	64%	57%	54%	61%	Ratio of median income to median home value	0.18	0.20	0.29	0.19
% households with at least 1 vehicle for worker	95%	95%	90%	86%	*Place: Health/Environment Index*	-0.65	-1.21	-0.58	
Households with broadband *	2.96	2.51	4.27	4.13	% mothers receiving prenatal care in first trimester	72%	68%	80%	83%
People: Health Index	-0.11	-0.64	-0.25		% with access to full-service grocery stores	87%	82%	41%	53%
% healthy weight babies	95%	94%	95%	95%	Healthcare provider locations (5 miles) per 1000 population	0.44	0.23	0.95	1.76
% births to teens	7%	9%	8%	7%	PM2.5 score **	10.76	10.97	10.99	11.69
% deaths to <75 year olds	35%	42%	37%	31%	*Place: Civic Life Index*	0.32	-0.08	0.14	
People: Civic Life Index	0.47	-0.01	0.02		% who live in same residence as a year ago	87%	85%	82%	85%
% CVAP that voted in 2010	51%	46%	42%	44%	% U.S. citizens	84%	80%	86%	82%
% households not linguistically isolated	86%	82%	92%	88%					

Technical Notes:

All index values are measured as Z-scores in relation to the average for all California census tracts.

All indicator values are popultion weighted averages of all the tracts within the specified geography

** This is a categorical variable which takes on the following number of household out of every 1000 households: 1= 0-199; 2=200-399; 3=400-599; 4=600-799; 5=800+*

*** This is the annual mean concentration of PM2.5*

Appendix B: Regional Opportunity Index People and Place Components

The following tables show the metrics, description of the data, and the data source used in the ROI. The first table summarizes the ROI People measure and its components, and the second table summarizes the ROI Place measure and its components. The data are obtained from reputable sources but all data have limitations. Certain potentially useful indicators of People and Place Opportunity are not employed due to the lack, or poor quality of, available data.[4]

These charts provide a general overview of the ROI. For more detailed information about the indicators and index methodology used, please see:
http://interact.regionalchange.ucdavis.edu/roi/Download_Data/ROI%20Metadata.pdf

Key to acronyms used:
ACS – American Community Survey (US Census Bureau)
CA EDD – California Employment Development Department
CalEPA – California Environmental Protection Agency
CA Reg. of Voters – California Registrar of Voters
CDE - California Department of Education
CDPH - California Department of Public Health
CREE - CA Regional Economies Employment
CSU – California State University
FCC – Federal Communications Commission
FDIC - Federal Deposit Insurance Corporation
NCUA - National Credit Union Association
NETS - National Establishment Time-Series
UC – University of California
USDA – United States Department of Agriculture

I. People	The overall People score for the ROI is the geometric mean of the People domains.	
A. Education Opportunity People Domain	The Education Opportunity People Domain score is the geometric mean of the following four indicators.	
1. College-educated Adults	Percentage of adults (age 25+) who have completed a post-secondary certificate/degree	ACS 2009-2013
2. Math Proficiency	Percentage of 4th graders who scored proficient or above on the math portion of California's Standardized Testing and Reporting (STAR) test	CDE 2009-2011

[4] The ROI does not currently have data on indicators such as transit access, crime, drinking-water contamination, adult education, and housing quality..

3. English Proficiency	Percentage of 4th graders who scored proficient or above on the English Language Arts portion of California's Standardized Testing and Reporting (STAR) test	CDE 2009-2011
4. Elementary Truancy Rate	Percentage of students who have missed more than 30 minutes of instruction without an excuse at least three times during the school year	CDE 2009-2011
B. Economic Opportunity: People Domain	The Economic Opportunity People Domain score is the geometric mean of the following two indicators.	
1. Employment Rate	Percentage of adults age 20-64 employed	ACS 2009-2013
2. Minimum Basic Income	Percentage of individuals with income over 200% of the federal Poverty Level	ACS 2009-2013
C. Housing Opportunity: People Domain	The Housing Opportunity People Domain score is the geometric mean of the following two indicators.	
1. Home Ownership	Percentage of households in which residents own their own home	ACS 2009-2013
2. Housing Cost Burden	Percentage of homeowners and renters for whom housing is less than 30% of household income	ACS 2009-2013
D. Mobility/ Transportation Opportunity People Domain	The Mobility/Transportation Opportunity People Domain score is the geometric mean of the following three indicators.	
1. Vehicle Availability	Percentage of households with at least 1 vehicle, or 1 vehicle per worker	ACS 2009-2013
2. Commute Time	Percentage of workers whose commute time is less than 30 minutes	ACS 2009-2013
3. Internet Access	Number of households per 1000 with high-speed internet	FCC 2013
E. Health/ Environment Opportunity People Domain	The Health/Environment Opportunity People Domain score is the geometric mean of the following three indicators.	
1. Infant Health	Percentage of births at or above healthy weight, or 2500 grams/5.5 pounds	CDPH 2009-2011
2. Births to Teens	Percentage of all births to teens	CDPH 2009-2011
3. Years of Life Lost	Years of potential life lost before age 65	CDPH 2009-2011 ACS 2009-2013
F. Civic Life	The Civic Life Opportunity People Domain score is the	

Opportunity: People Domain	geometric mean of the following two indicators.	
1. Voting Rates	Percentage of Citizen Voting Age Population (CVAP) that voted in 2010	2010 CA Reg. of Voters & ACS 2009-2013
2. English Speakers	Percentage of population age 18-64 who speak only English or speak English "well" or "very well"	ACS 2009-2013

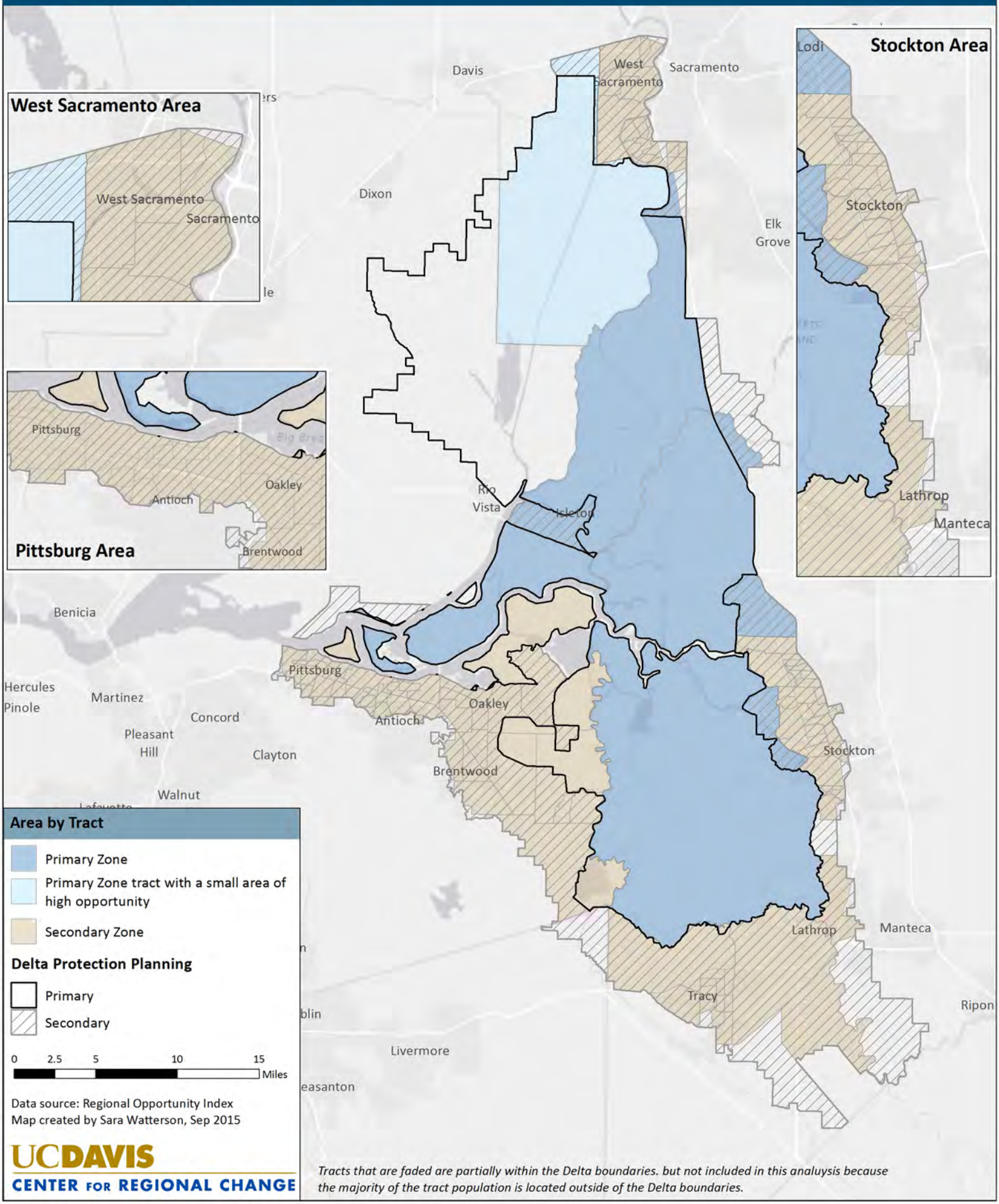
II. Place	The overall Place score for the ROI is the geometric mean of the Place domains.	
A. Education Opportunity: Place	The Education Opportunity Place Domain score is the geometric mean of the following four indicators.	
1. High School Graduation Rate	Percentage of 9th grade cohort that graduated from high school in four years	CDE 2009-2011
2. UC/CSU Eligibility	Percentage of high school graduates who completed UC/CSU A-G course requirements	CDE 2009-2011
3. Teacher Experience	Percentage of teachers at the three closest public elementary schools with more than 5 years of teaching experience and at least one year of education beyond a BA	CDE 2009-2011
4. High School Discipline Rate	Percentage of high school students in the school district who were suspended or expelled	CDE 2009-2010
B. Economic Opportunity: Place Domain	The Economic Opportunity Place Domain score is the geometric mean of the following five indicators.	
1. Job Availability	Number of jobs per 1000 people, within a 5-mile radius	NETS 2011 & ACS 2009-2013
2. Job Growth	Percentage 1-year change (2010-11) in the number of jobs, within a 5-mile radius	NETS 2011
3. Job Quality	Percentage of jobs that are in high-paying industries, within a 5-mile radius	NETS 2011, CREE 2012 & CA EDD
4. Bank Accessibility	Number of banks and credit unions per 1000 people, within a 5-mile radius	FDIC 2013, NCUA 2013 & ACS 2009-2013
5. Business Growth	Percentage 2-year change (2009-11) in the number of employers, within a 5-mile radius	NETS 2011
C. Housing Opportunity: Place	The Housing Opportunity: Place domain score is the geometric mean of the following two indicators.	

Domain		
1. Housing Adequacy	Percentage of households with no more than 1 occupant per room	ACS 2009-2013
2. Housing Affordability	Ratio of median income of census tract to median value of dwellings in census tract	ACS 2009-2013
D. Health/ Environment Opportunity: Place Domain	The Health/Environment Opportunity Place Domain score is the geometric mean of the following four indicators.	
1. Prenatal Care	Percentage of mothers who received prenatal care in first trimester	CDPH 2009-2011
2. Distance to Supermarket	Percentage who live within 1 mile (urban) or 10 miles (rural) of supermarket	USDA Food Access Research Atlas, 2010 Census
3. Health Care Availability	Number of locations providing basic medical services per 1000 population within 5-mile radius	NETS 2011 & ACS 2009-2013
4. Air Quality	Annual mean concentration of PM2.5	CalEPA 2007-09
E. Civic Life Opportunity: Place Domain	The Civic Life Opportunity Place Domain score is the geometric mean of the following two indicators	
1. US Citizenship	Percentage of adults who are U.S. citizens	ACS 2009-2013
2. Neighborhood Stability	Percentage of citizens, over age 1, who live in the same residence as the previous year	ACS 2009-2013

Appendix C: Full Size Maps and Indicator Charts

Opportunity in the California Delta

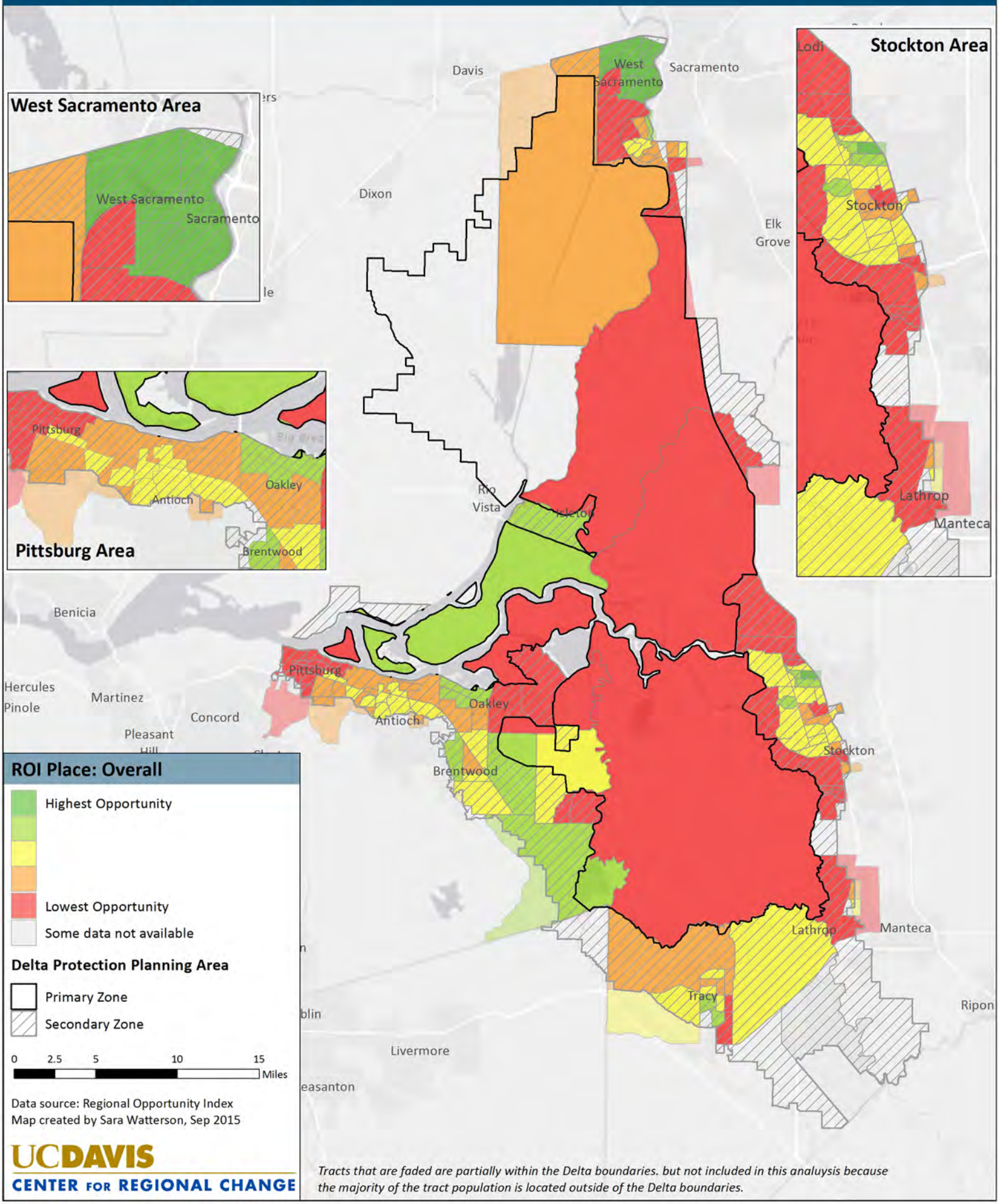
Regional Opportunity Index



Tracts that are faded are partially within the Delta boundaries. but not included in this analuysis because the majority of the tract population is located outside of the Delta boundaries.

Opportunity in the California Delta

Regional Opportunity Index



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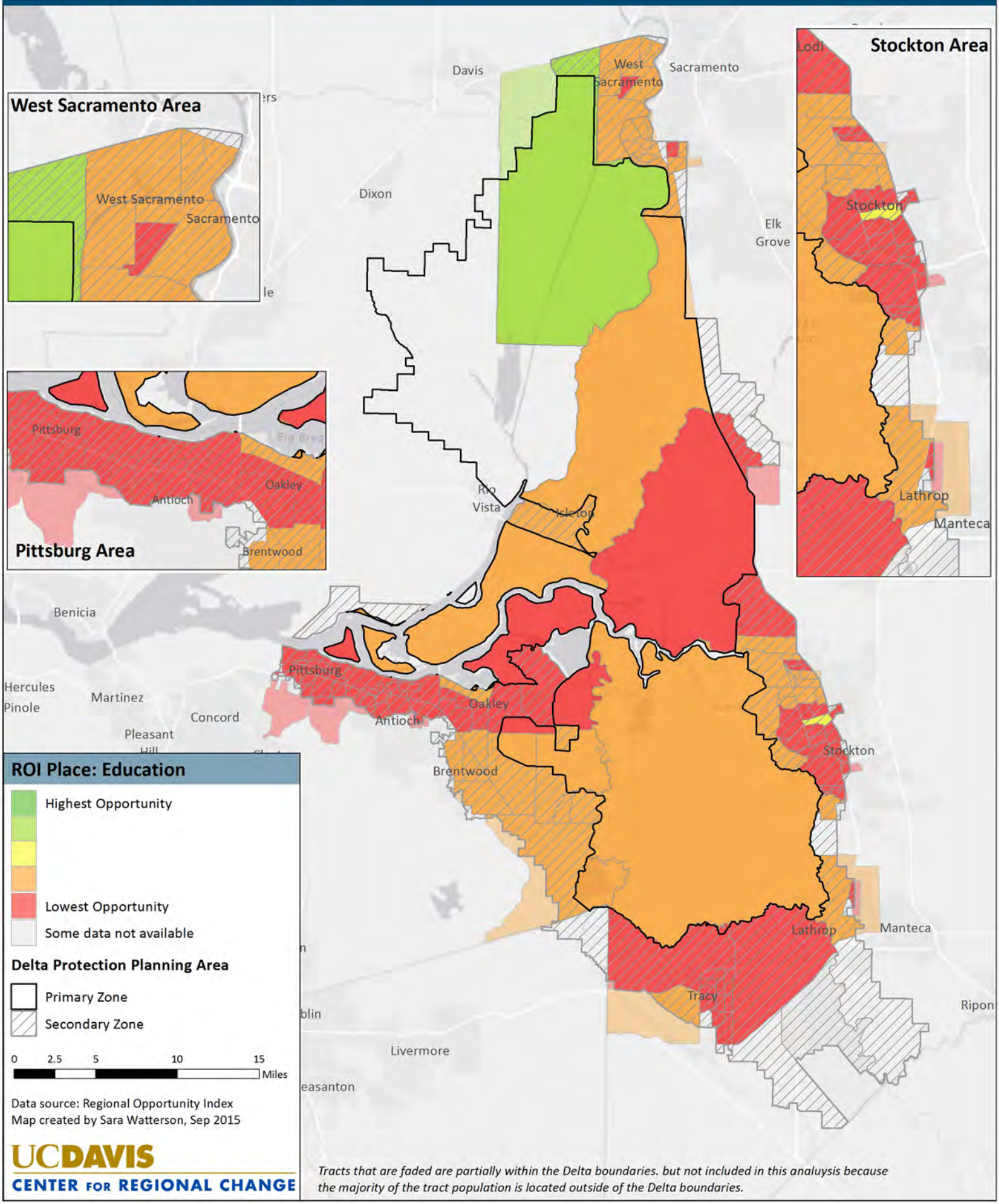
Opportunity in the California Delta

Regional Opportunity Index



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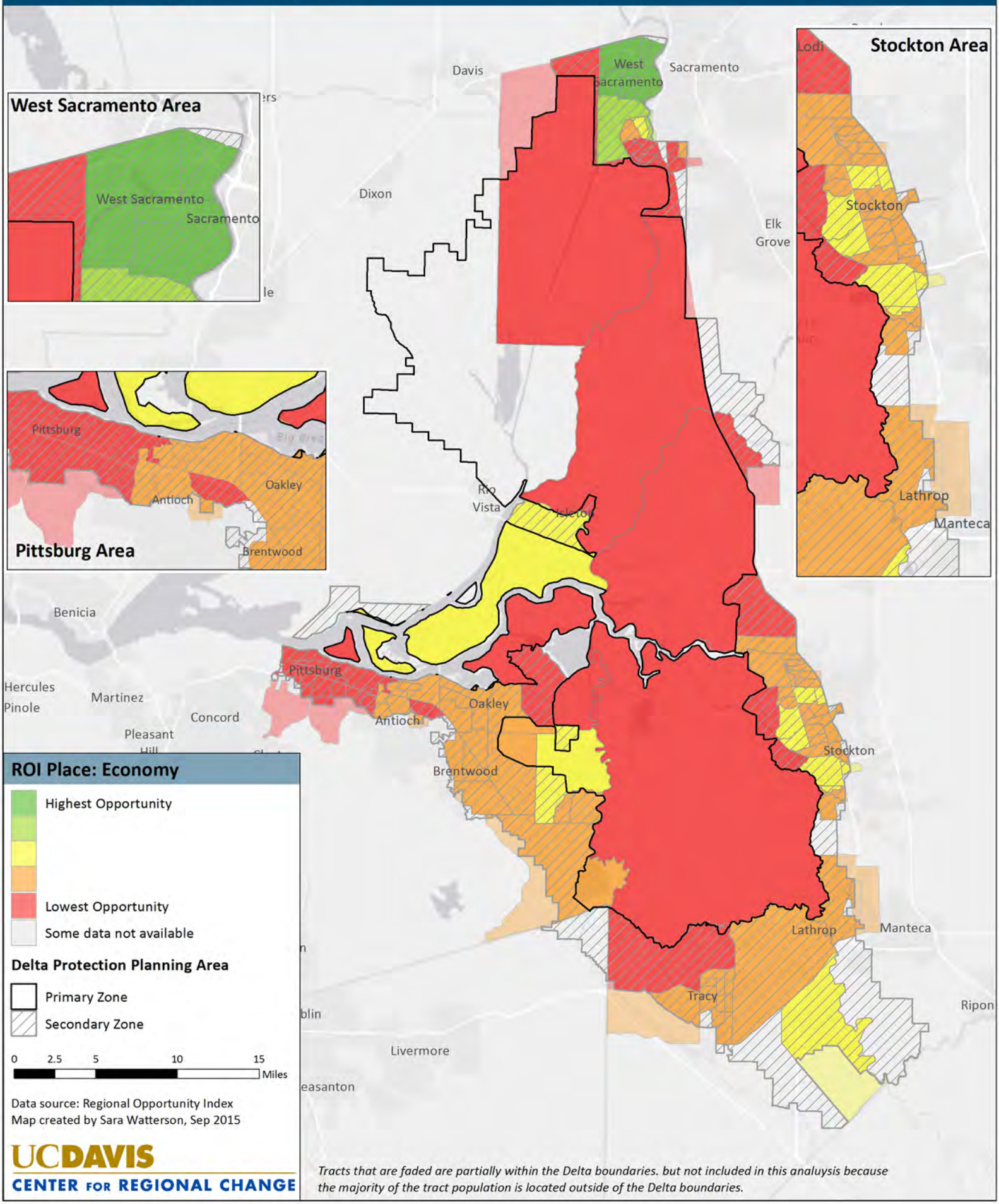
Opportunity in the California Delta

Regional Opportunity Index



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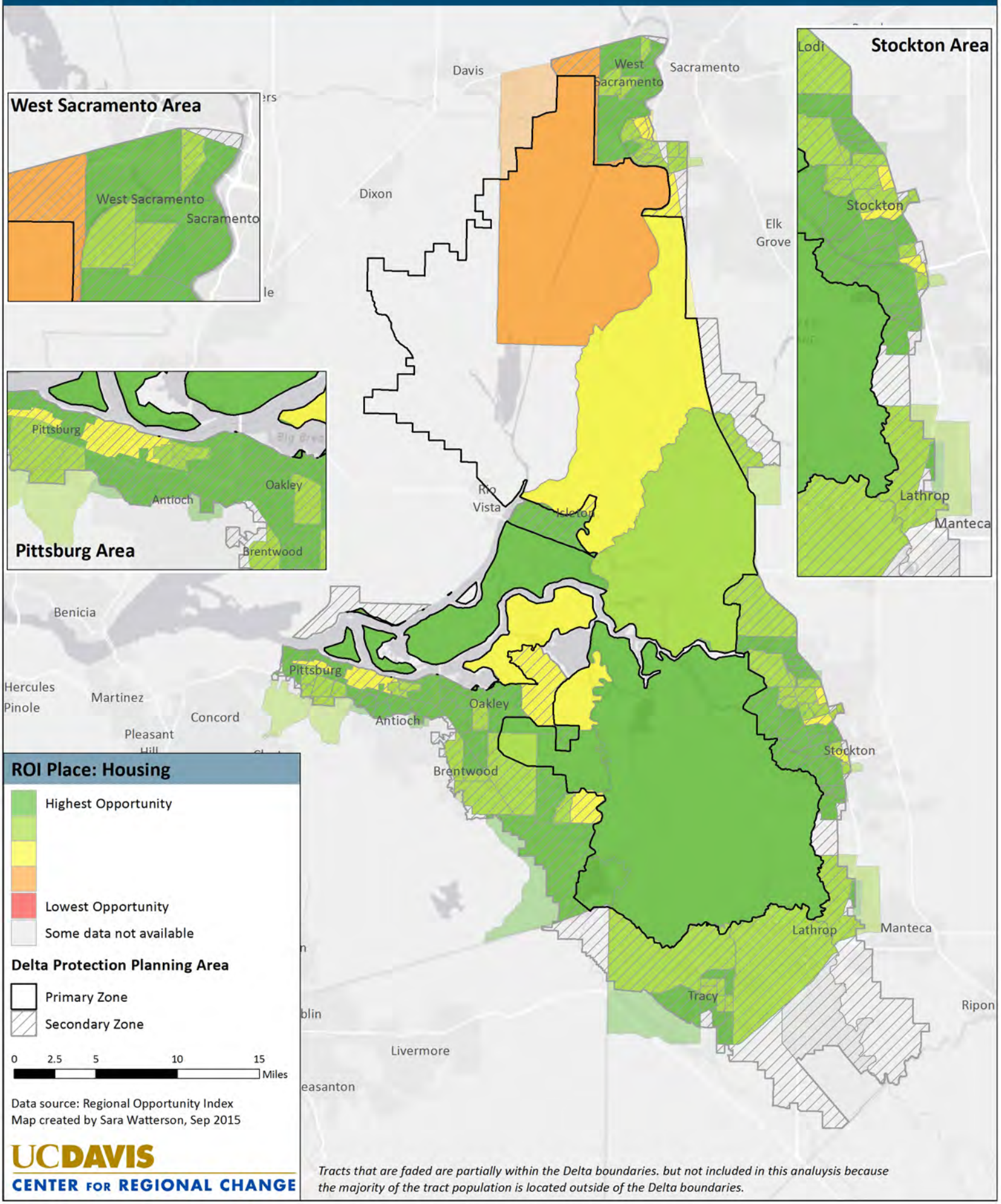
Opportunity in the California Delta

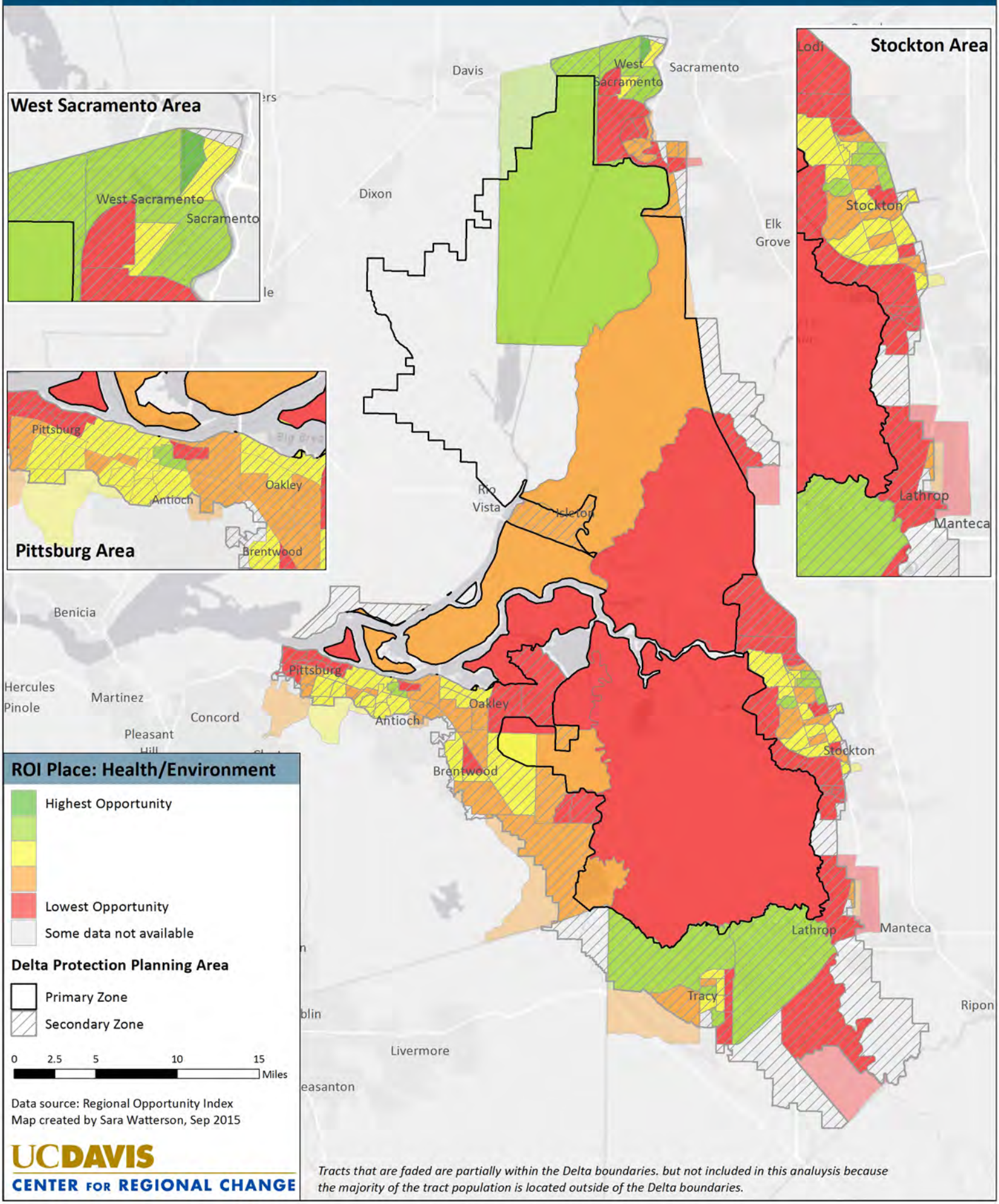
Regional Opportunity Index



Tracts that are faded are partially within the Delta boundaries. but not included in this analuysis because the majority of the tract population is located outside of the Delta boundaries.

Opportunity in the California Delta

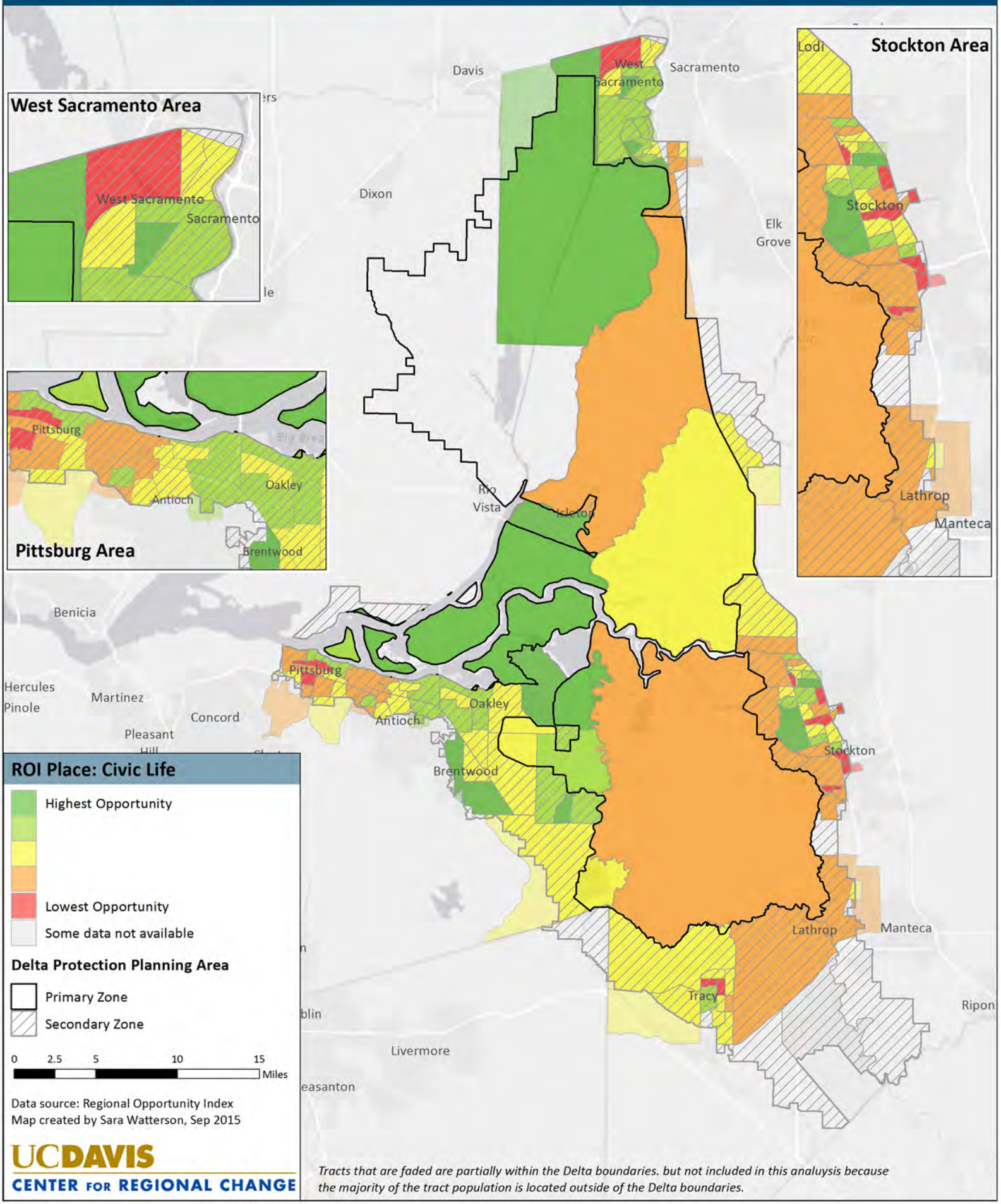
Regional Opportunity Index



Tracts that are faded are partially within the Delta boundaries. but not included in this analuysis because the majority of the tract population is located outside of the Delta boundaries.

Opportunity in the California Delta

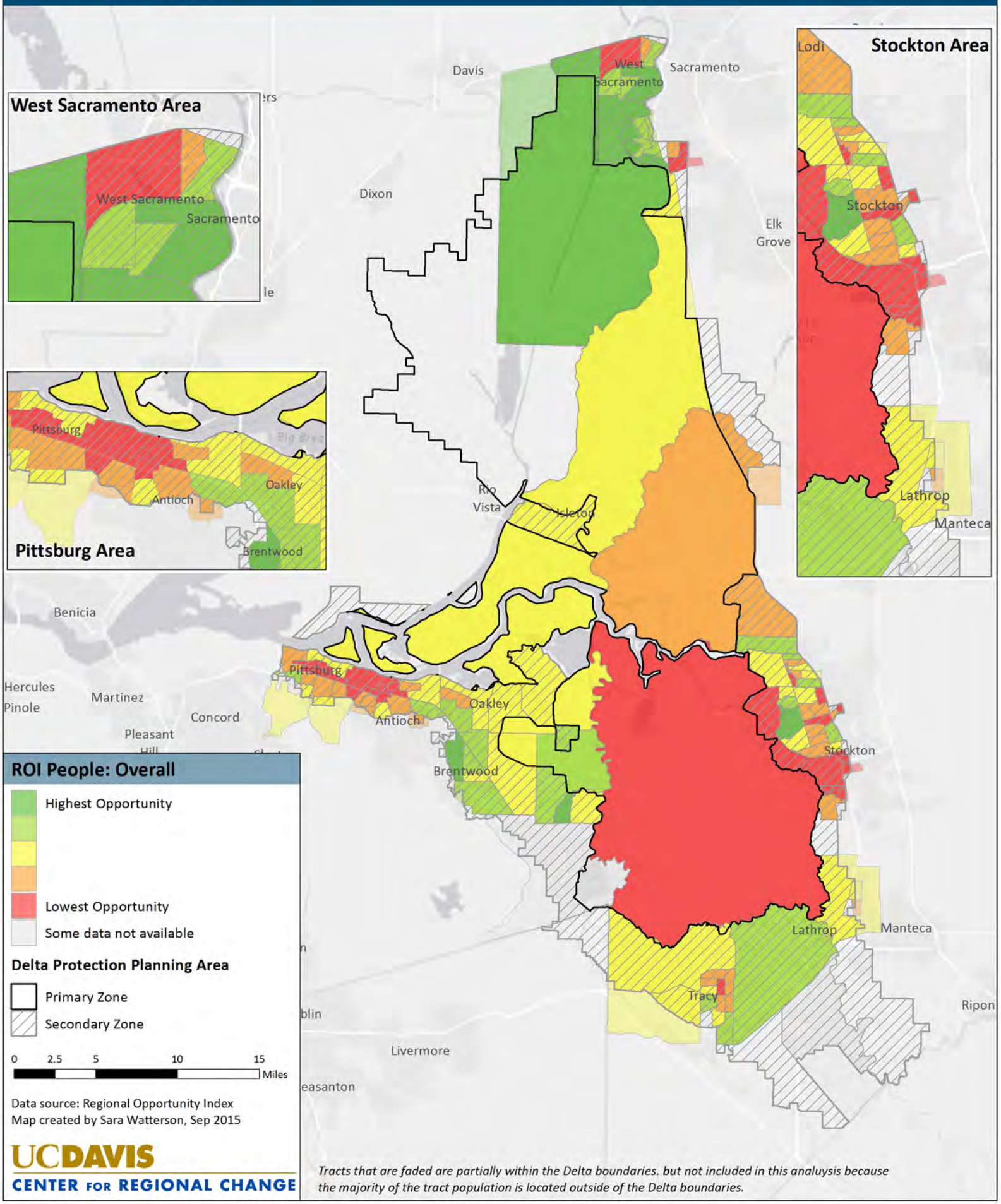
Regional Opportunity Index



Tracts that are faded are partially within the Delta boundaries. but not included in this analuysis because the majority of the tract population is located outside of the Delta boundaries.

Opportunity in the California Delta

Regional Opportunity Index



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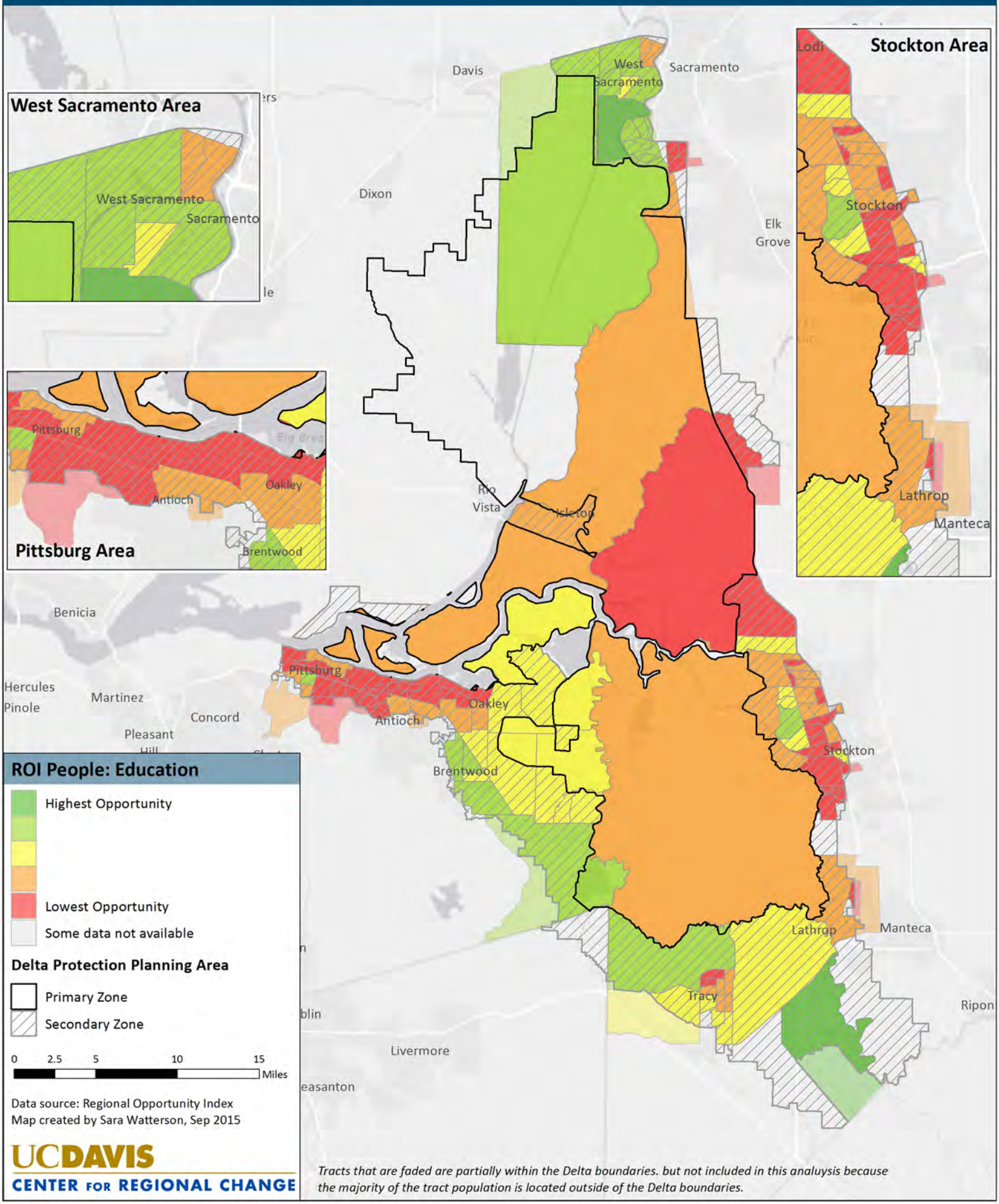
Opportunity in the California Delta

Regional Opportunity Index



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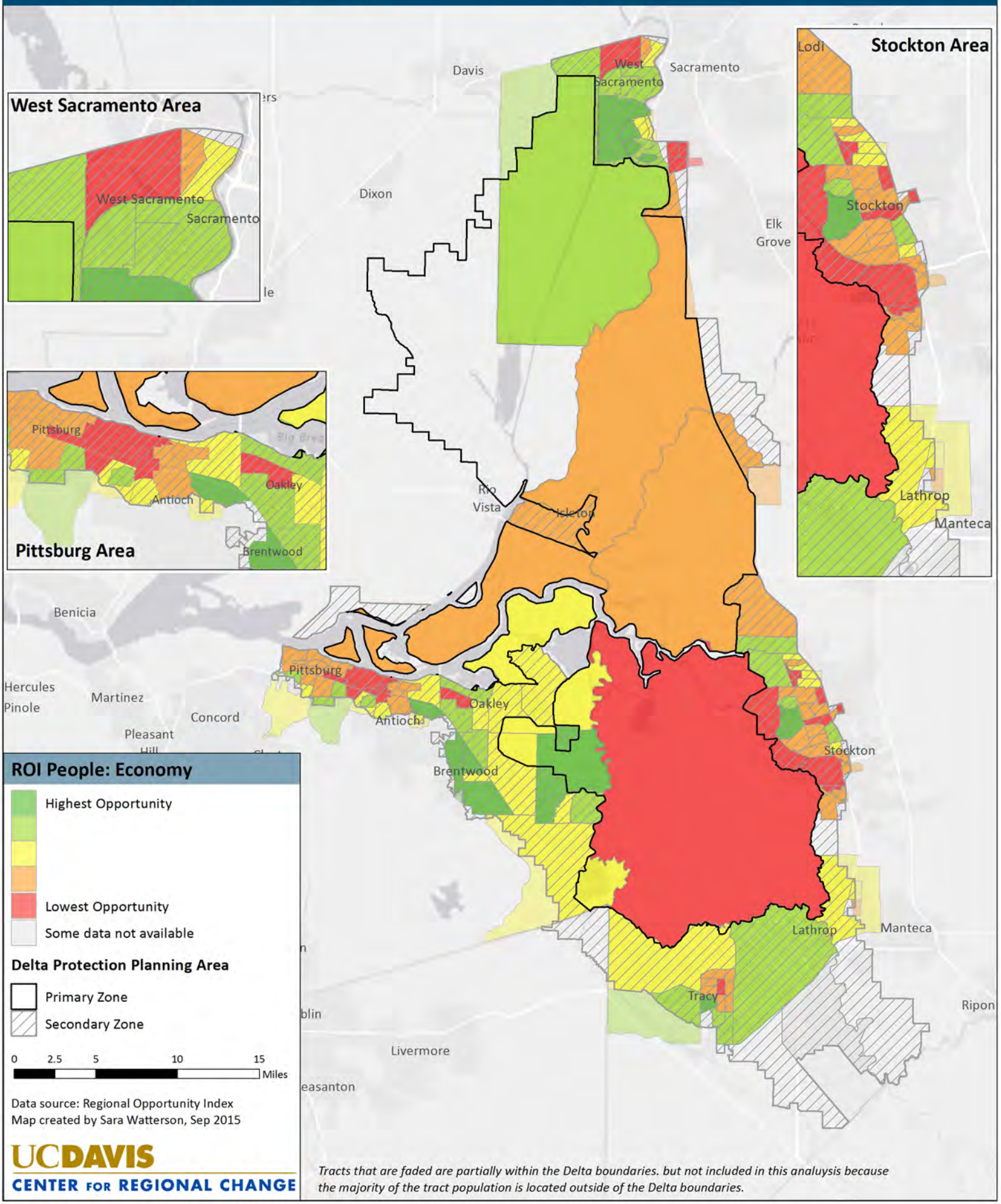
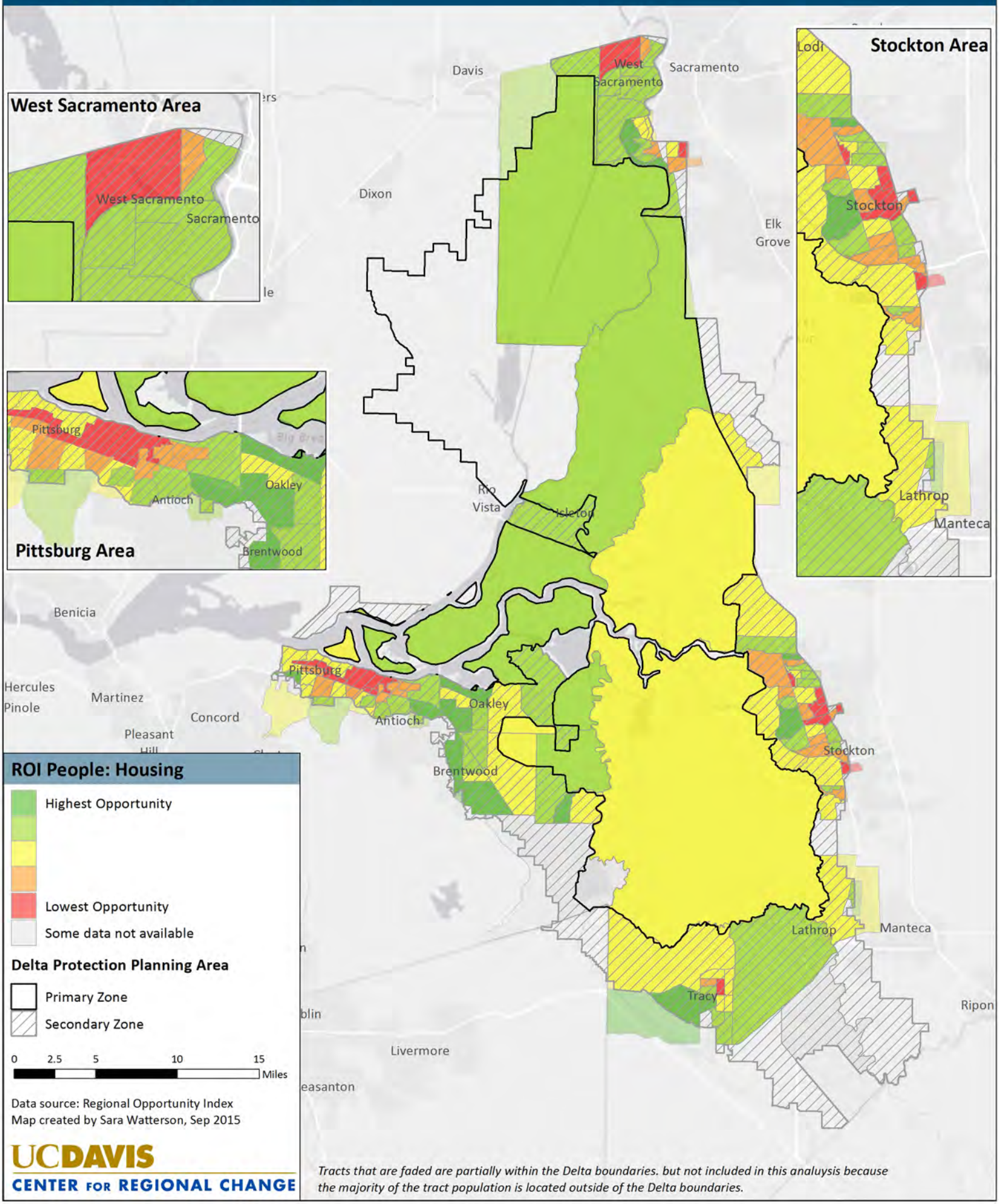
Opportunity in the California Delta

Regional Opportunity Index



Opportunity in the California Delta

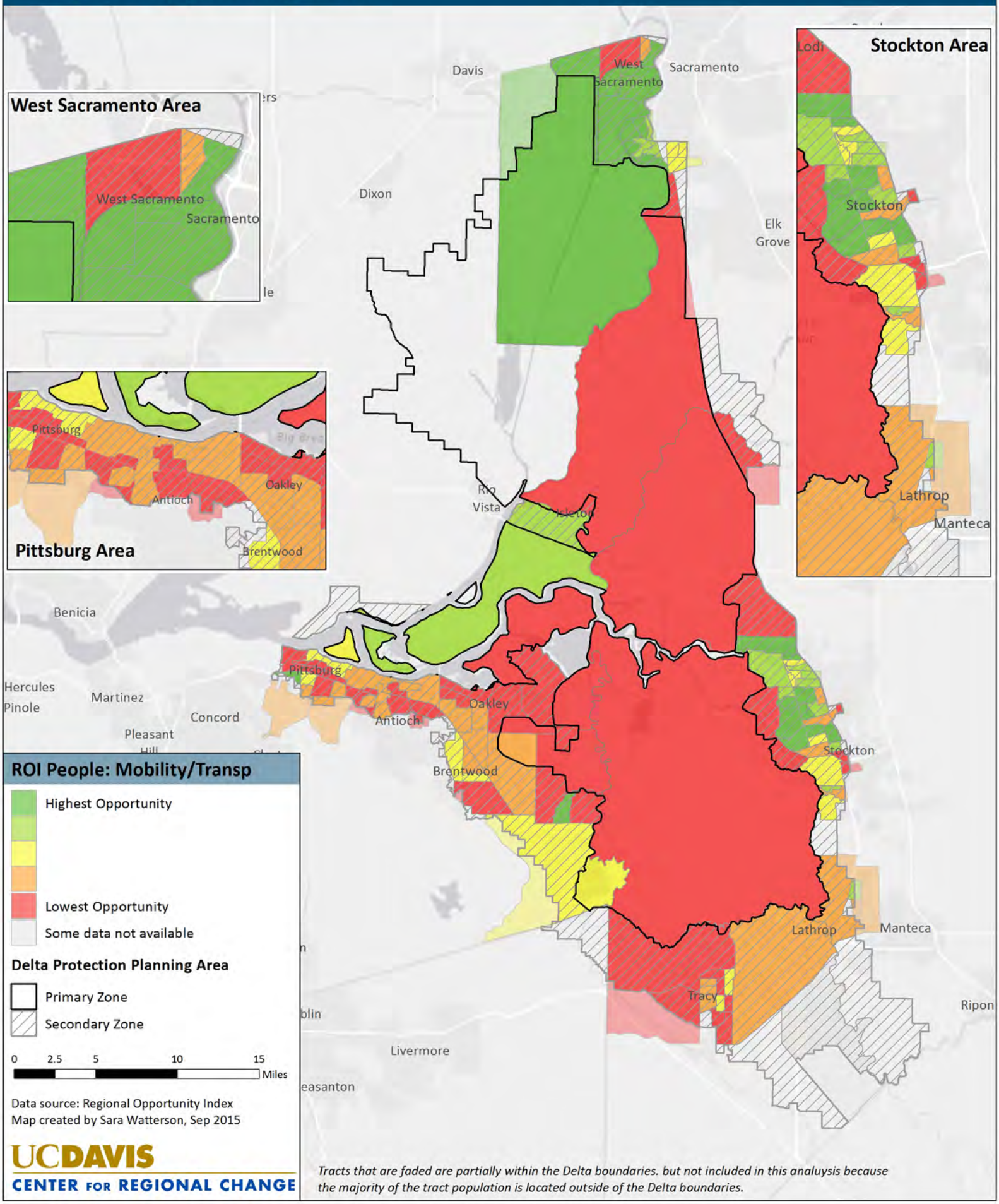
Regional Opportunity Index



Tracts that are faded are partially within the Delta boundaries. but not included in this analuysis because the majority of the tract population is located outside of the Delta boundaries.

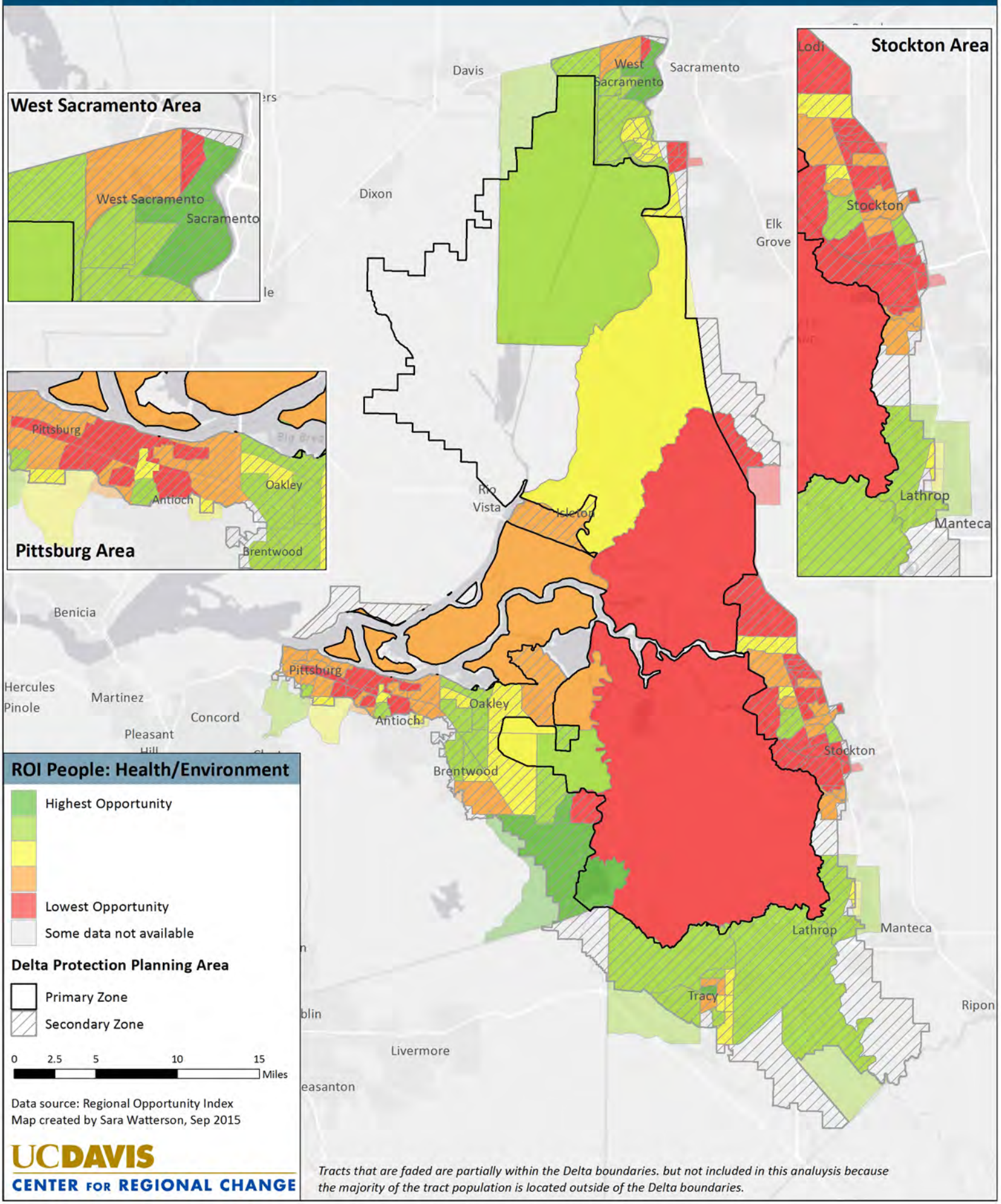
Opportunity in the California Delta

Regional Opportunity Index



Opportunity in the California Delta

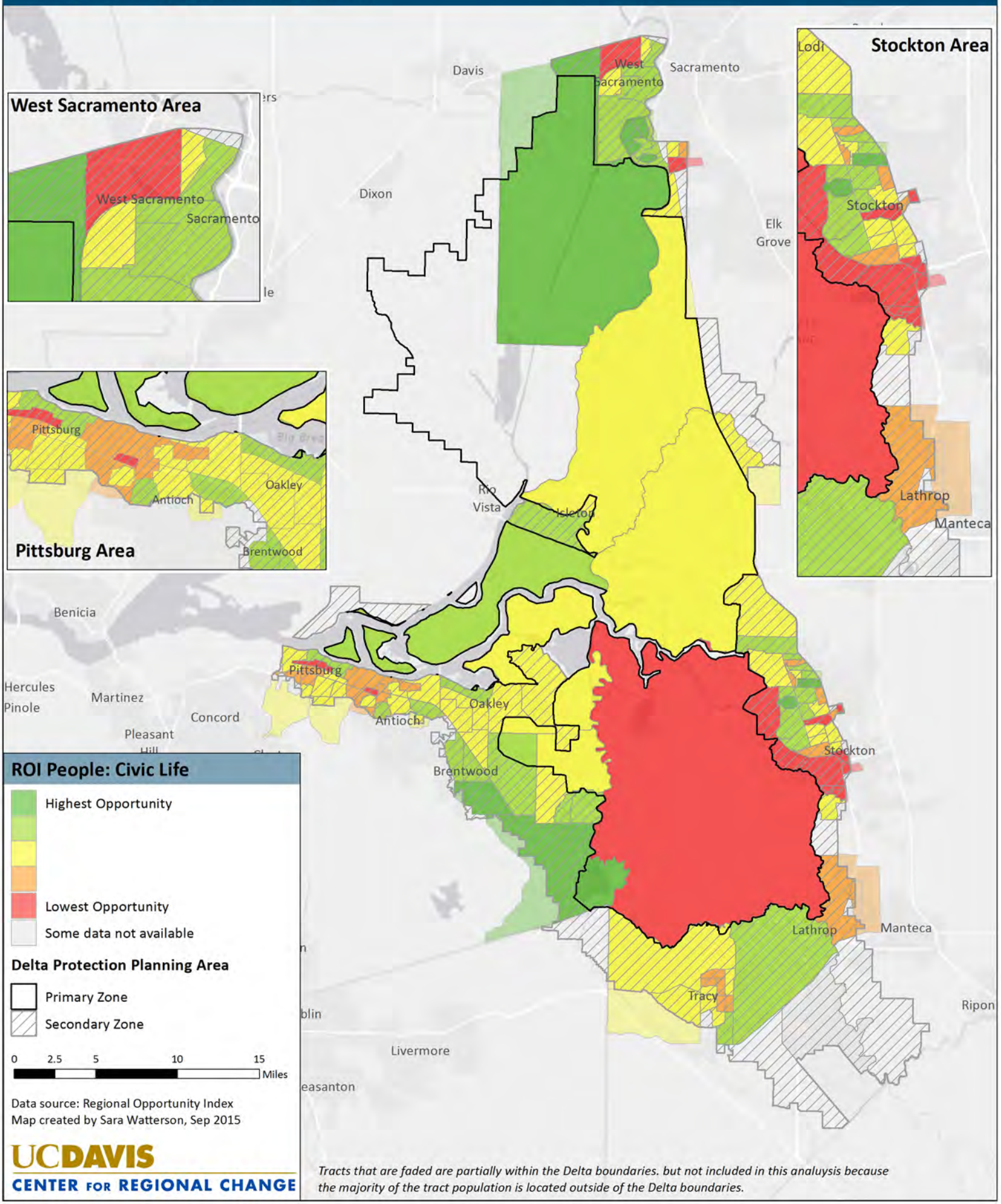
Regional Opportunity Index

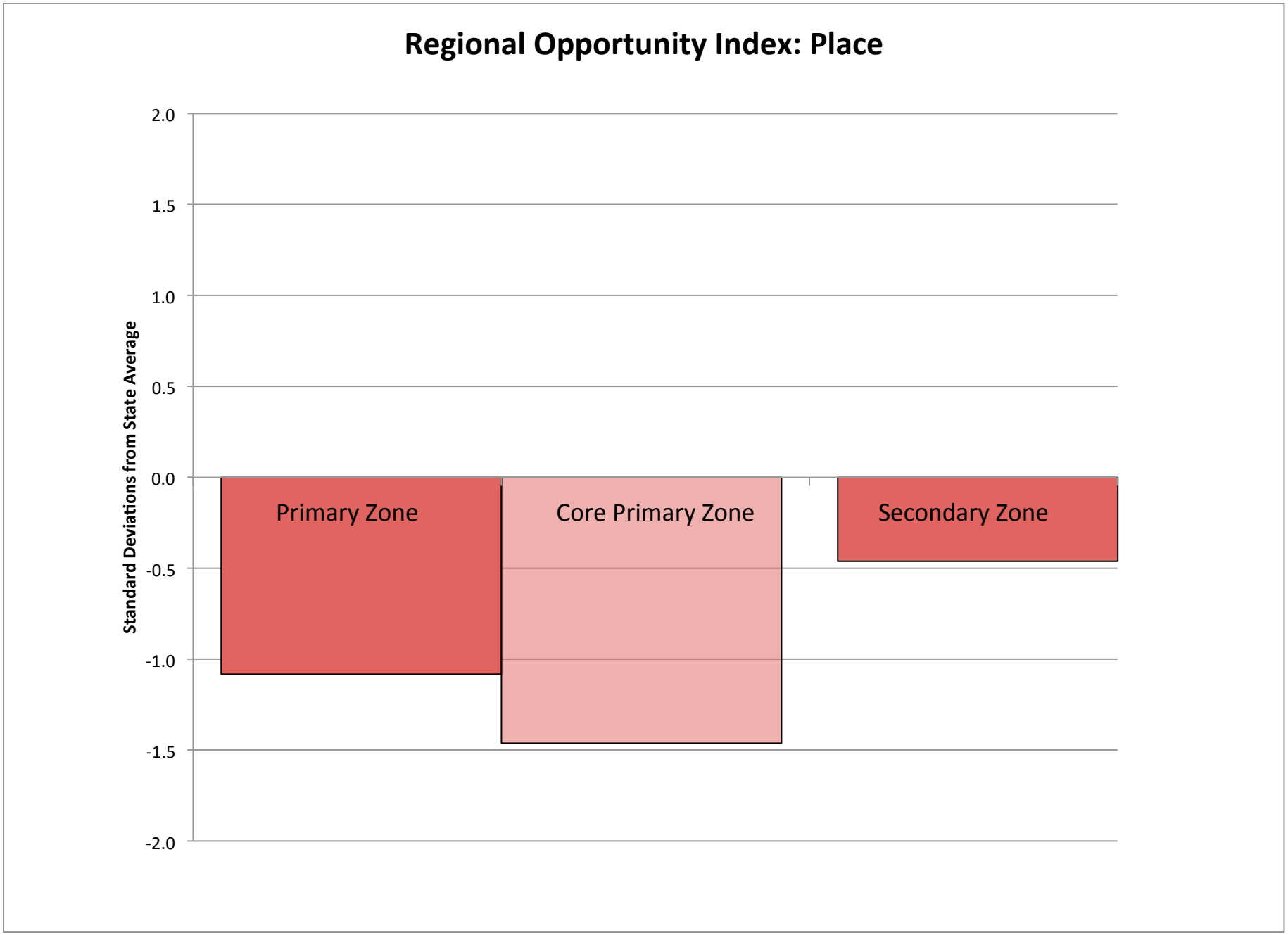


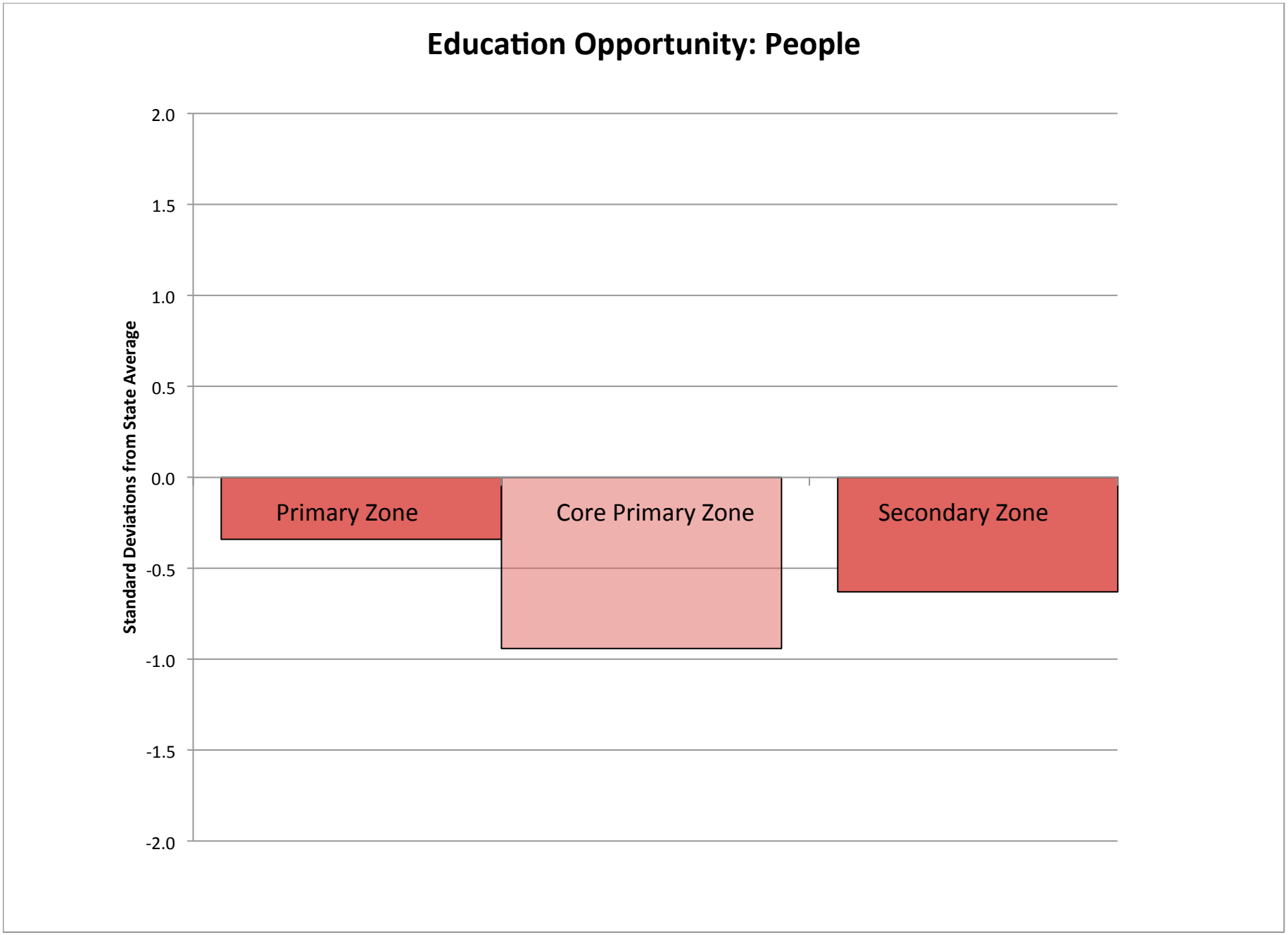
Tracts that are faded are partially within the Delta boundaries. but not included in this analuysis because the majority of the tract population is located outside of the Delta boundaries.

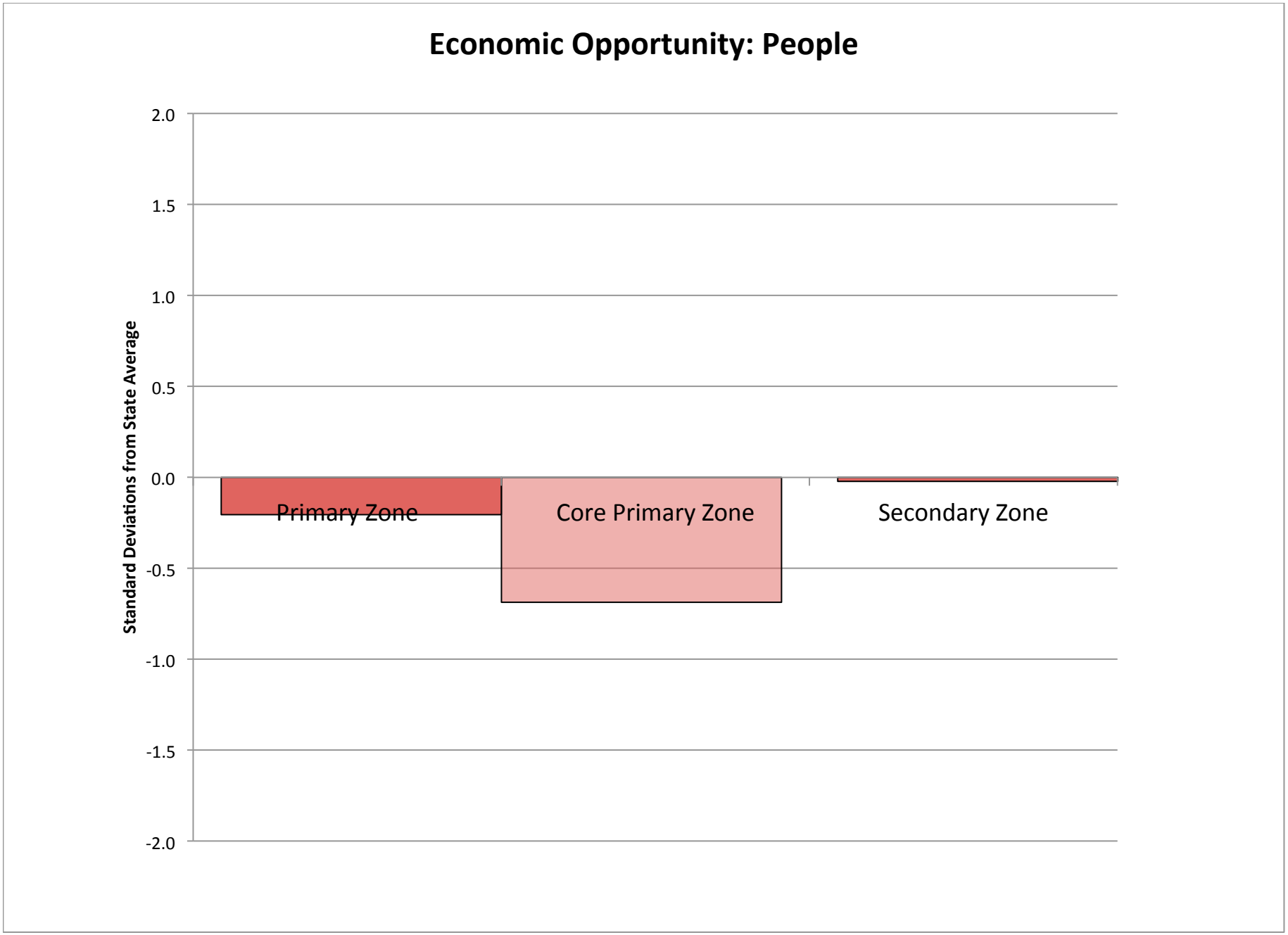
Opportunity in the California Delta

Regional Opportunity Index

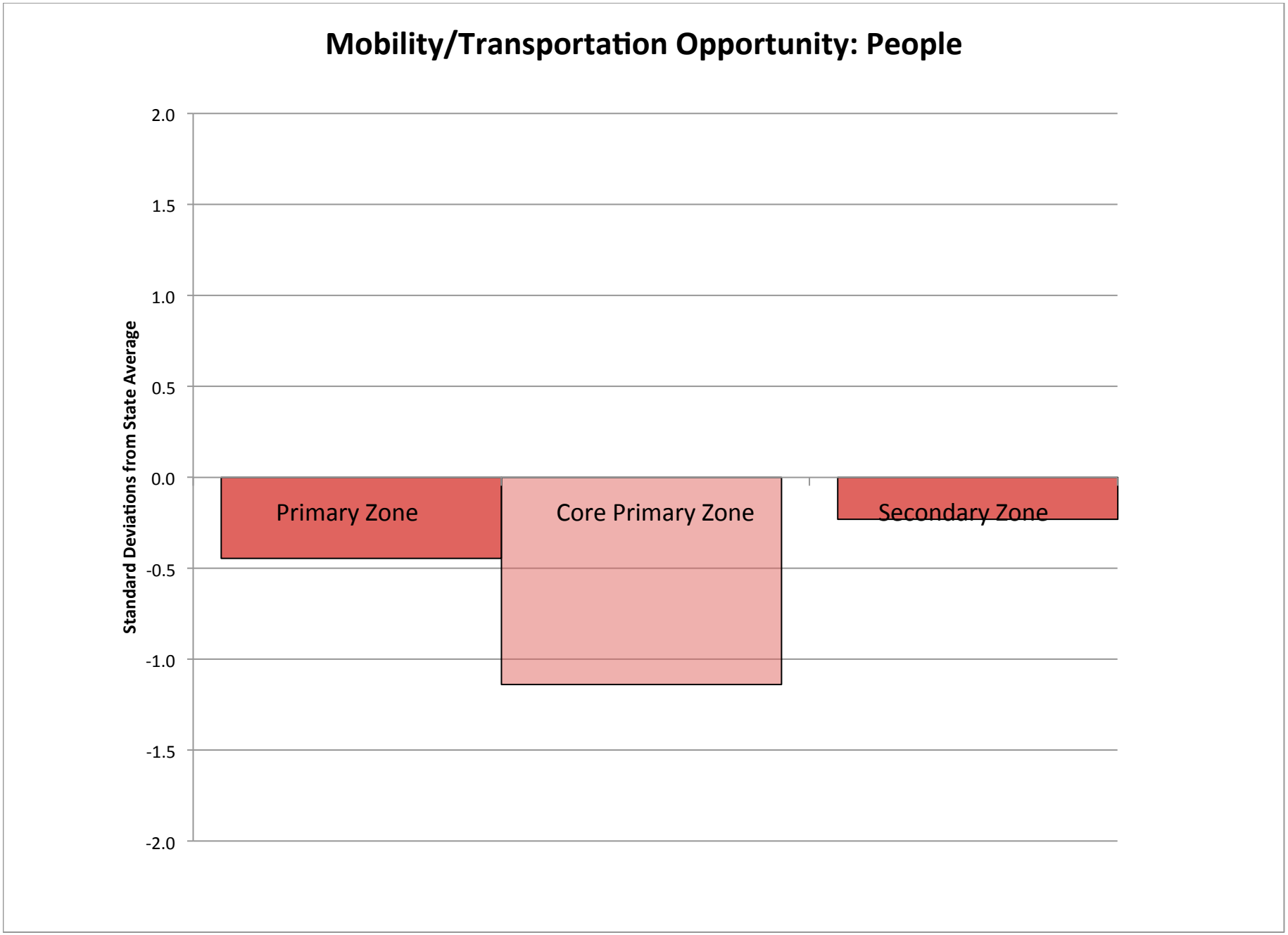


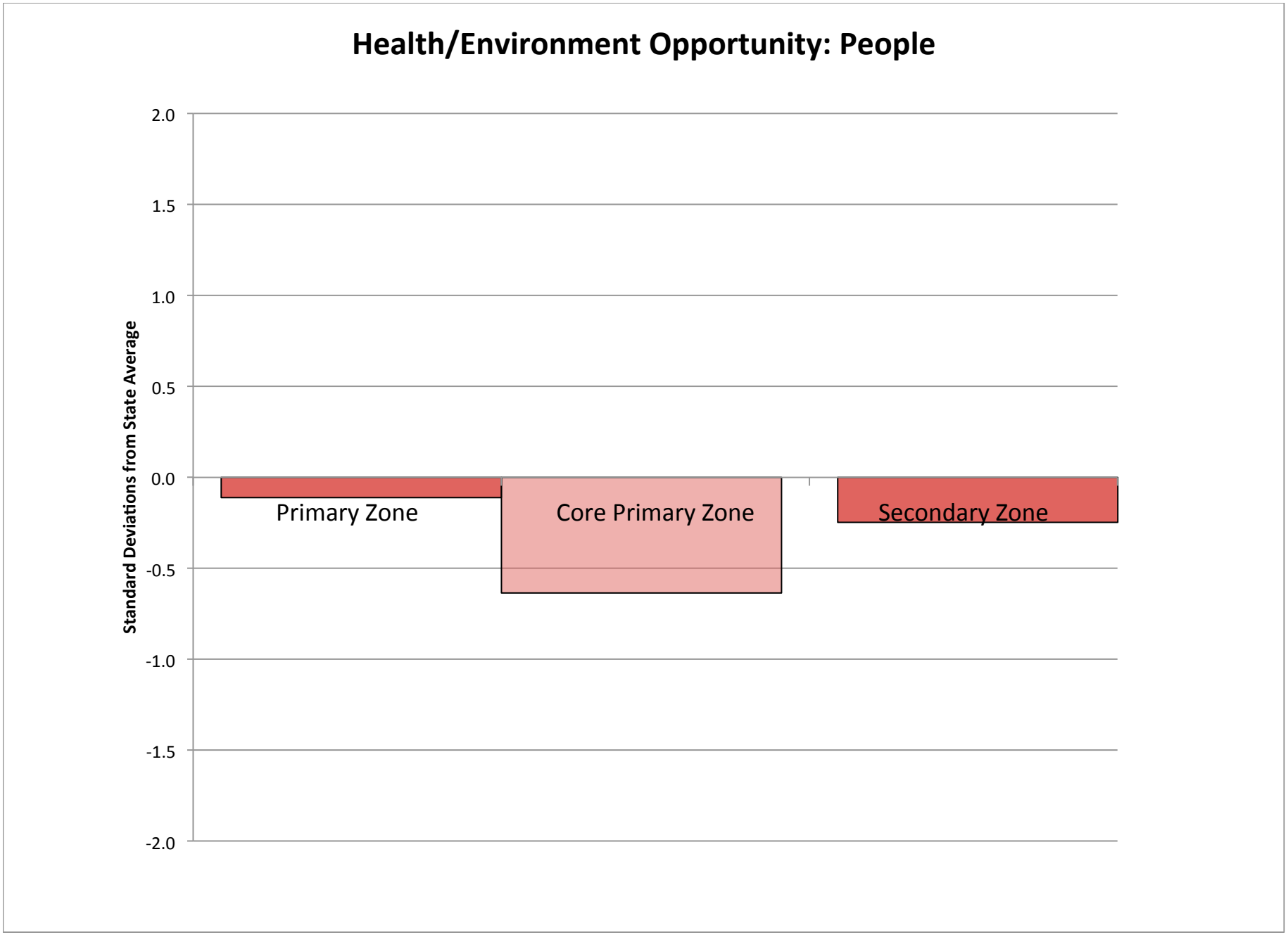

Regional Opportunity Index: Place
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

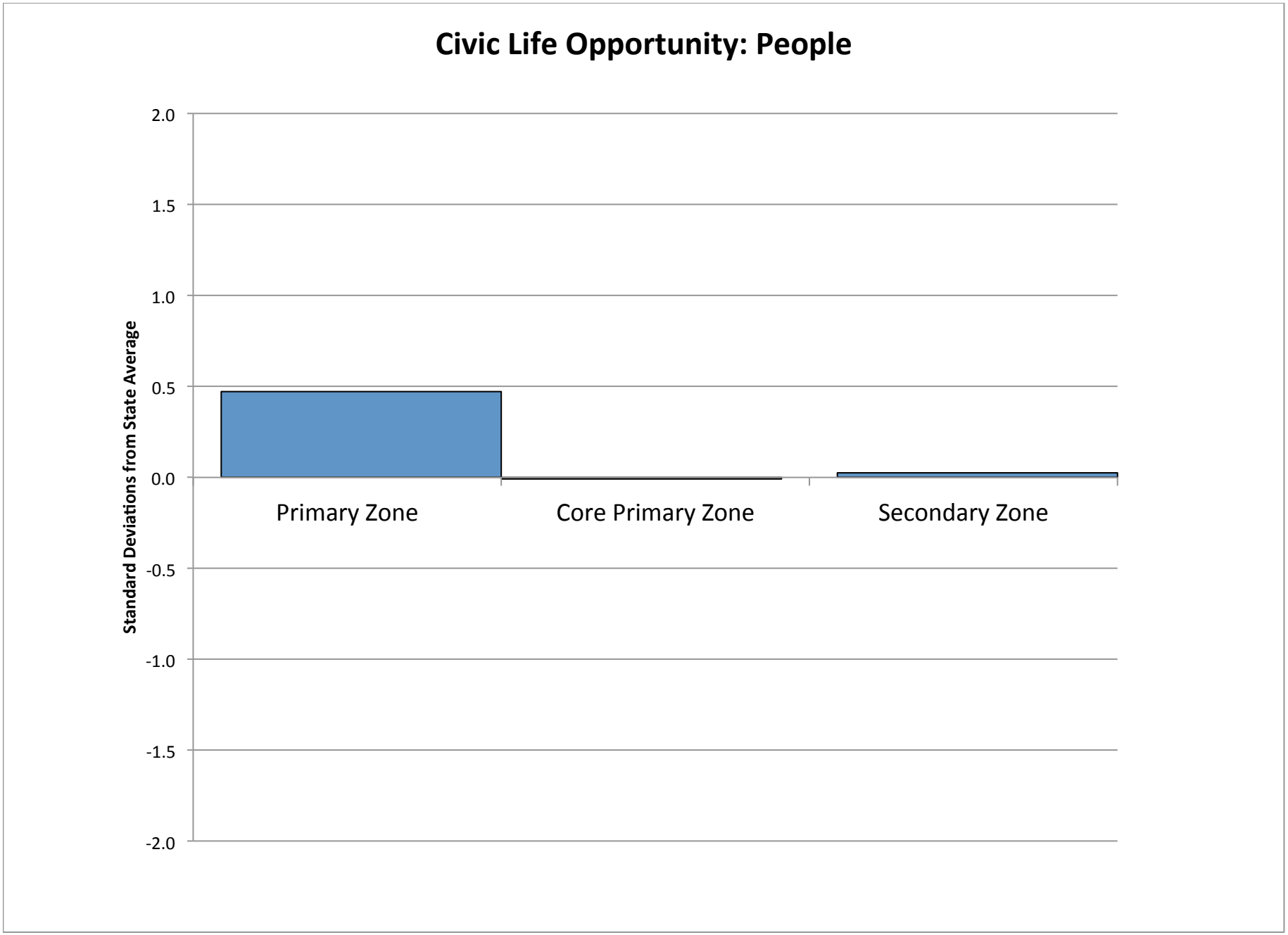

Education Opportunity: People
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

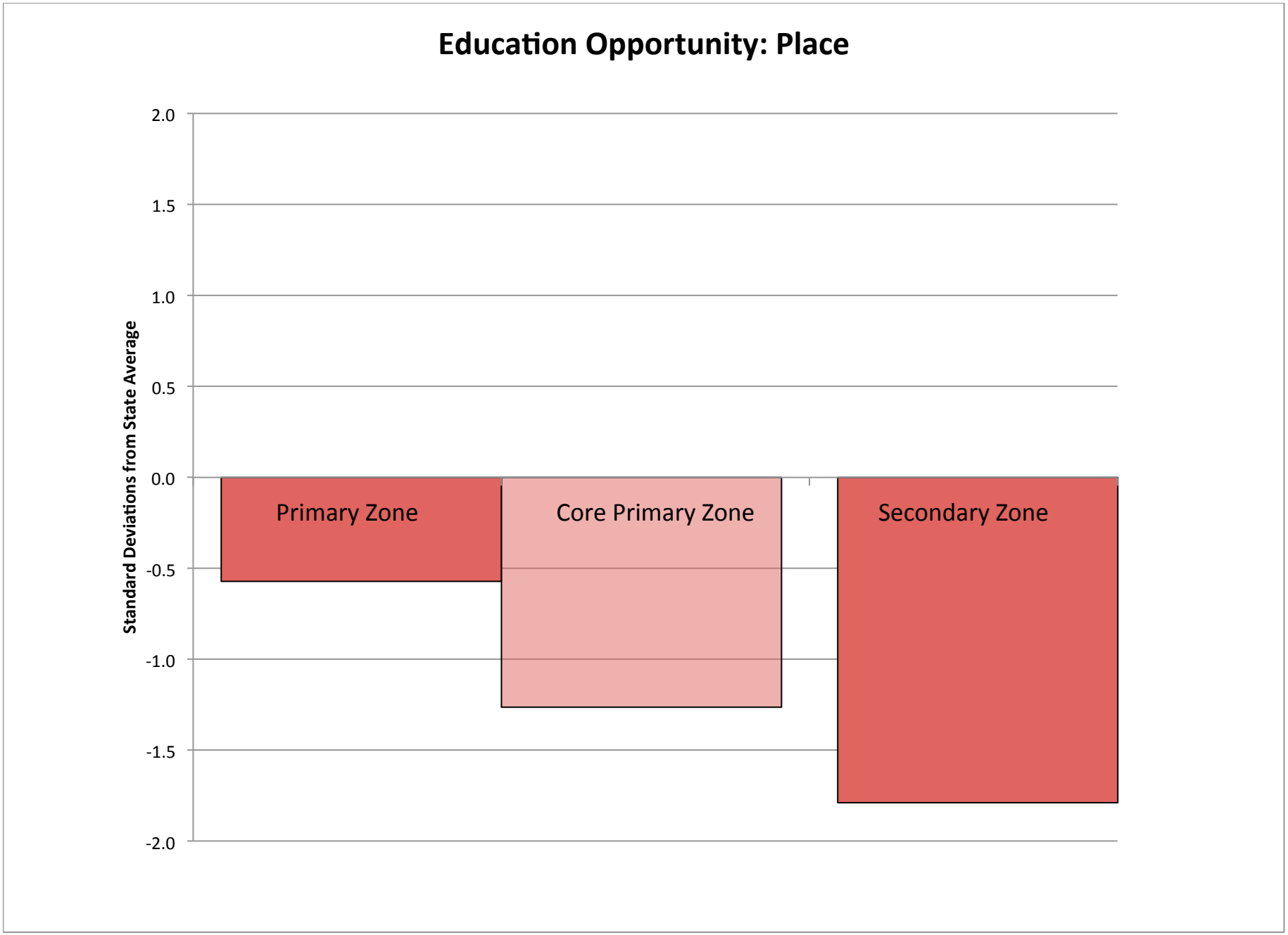

Economic Opportunity: People
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

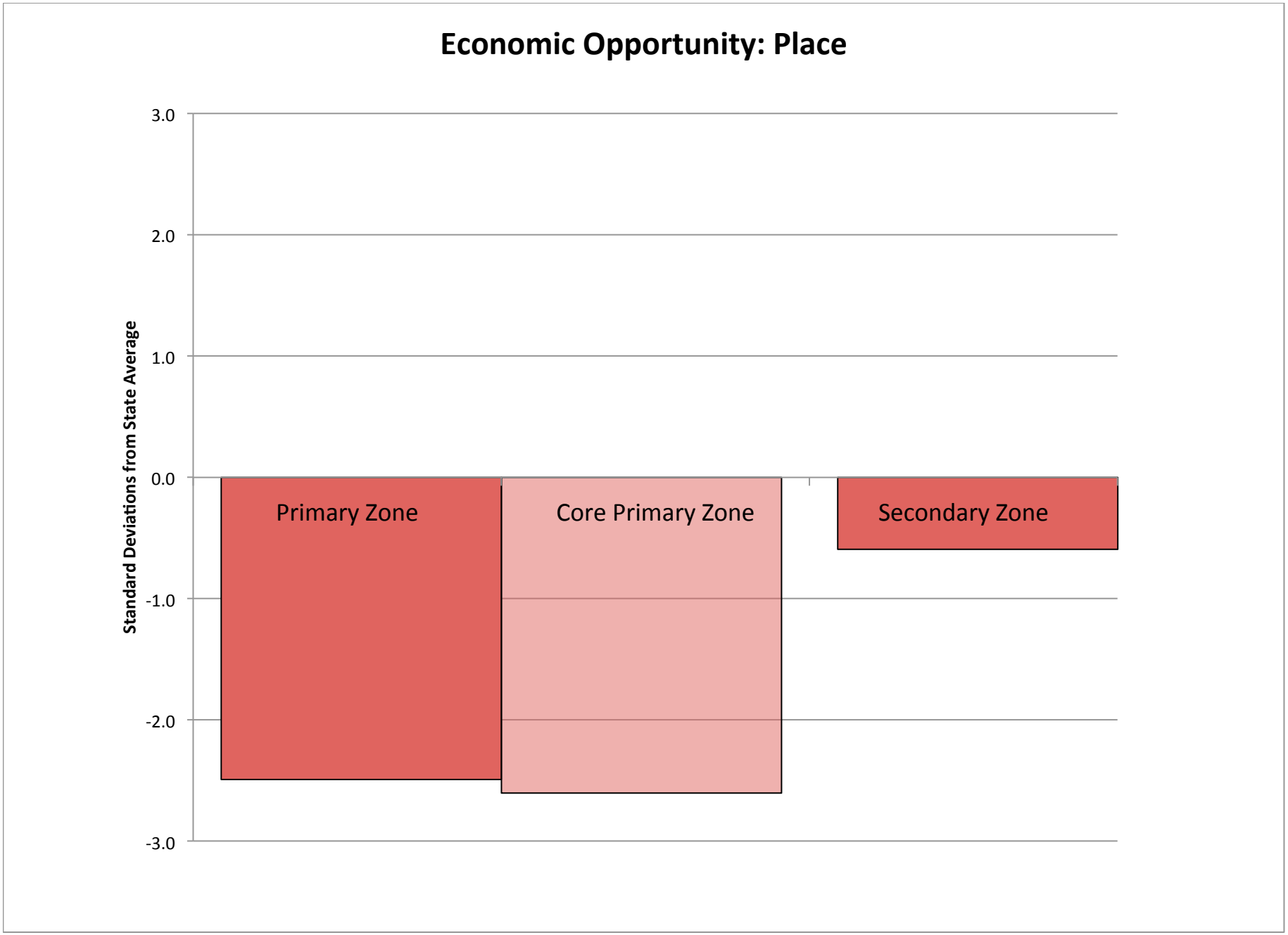

Housing Opportunity: People
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Mobility/Transportation Opportunity: People
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

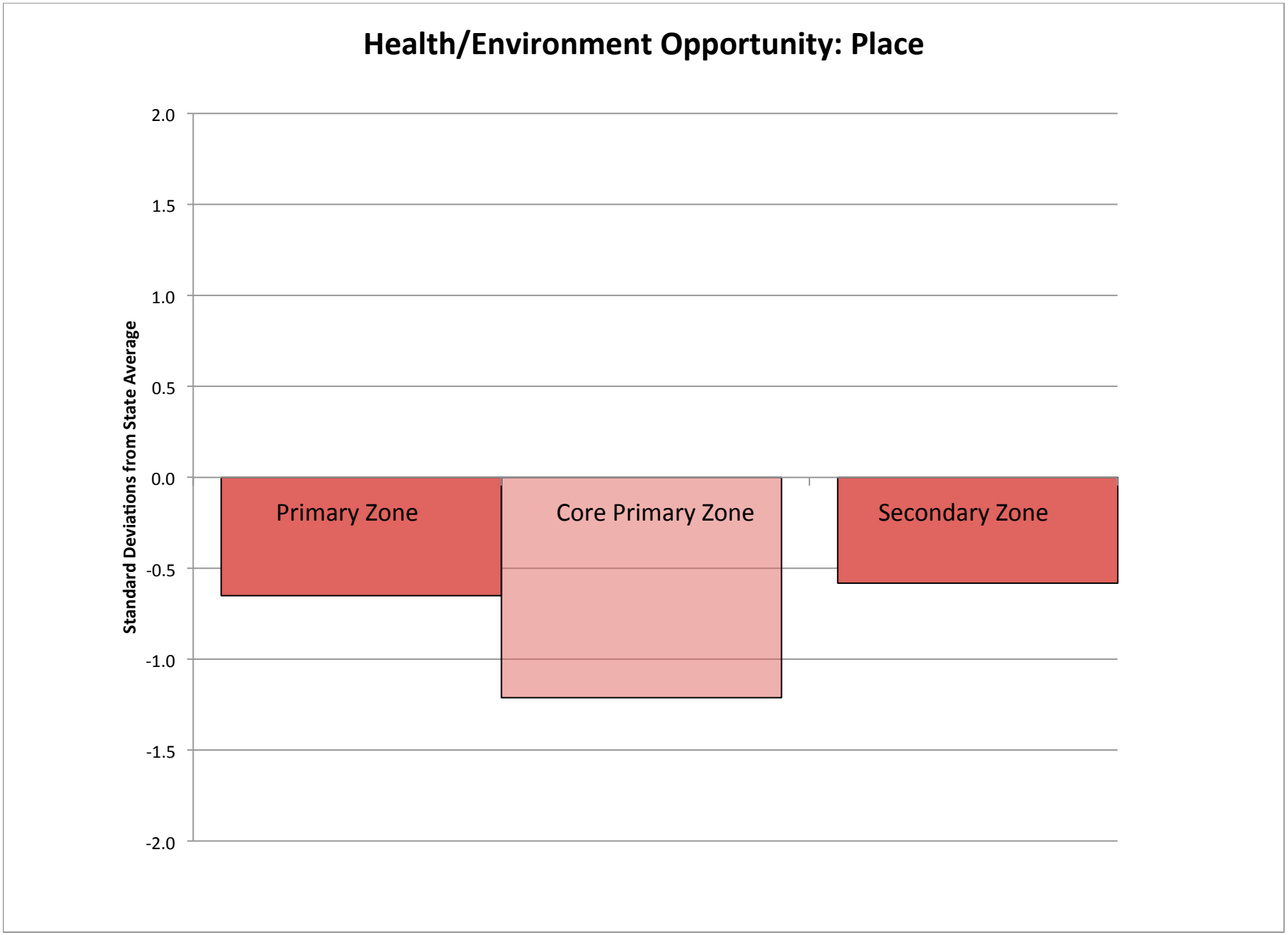

Health/Environment Opportunity: People
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

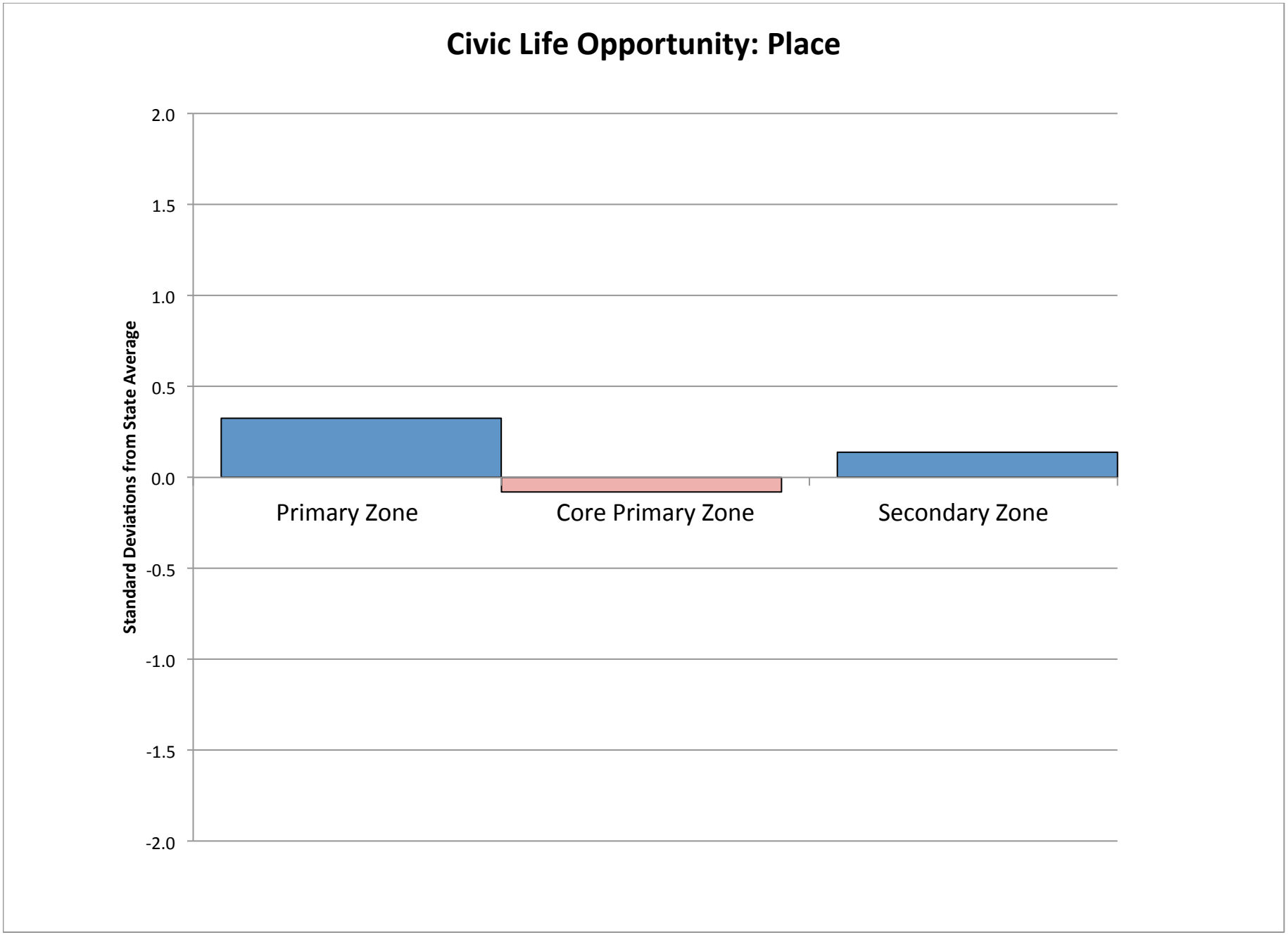

Civic Life Opportunity: People
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

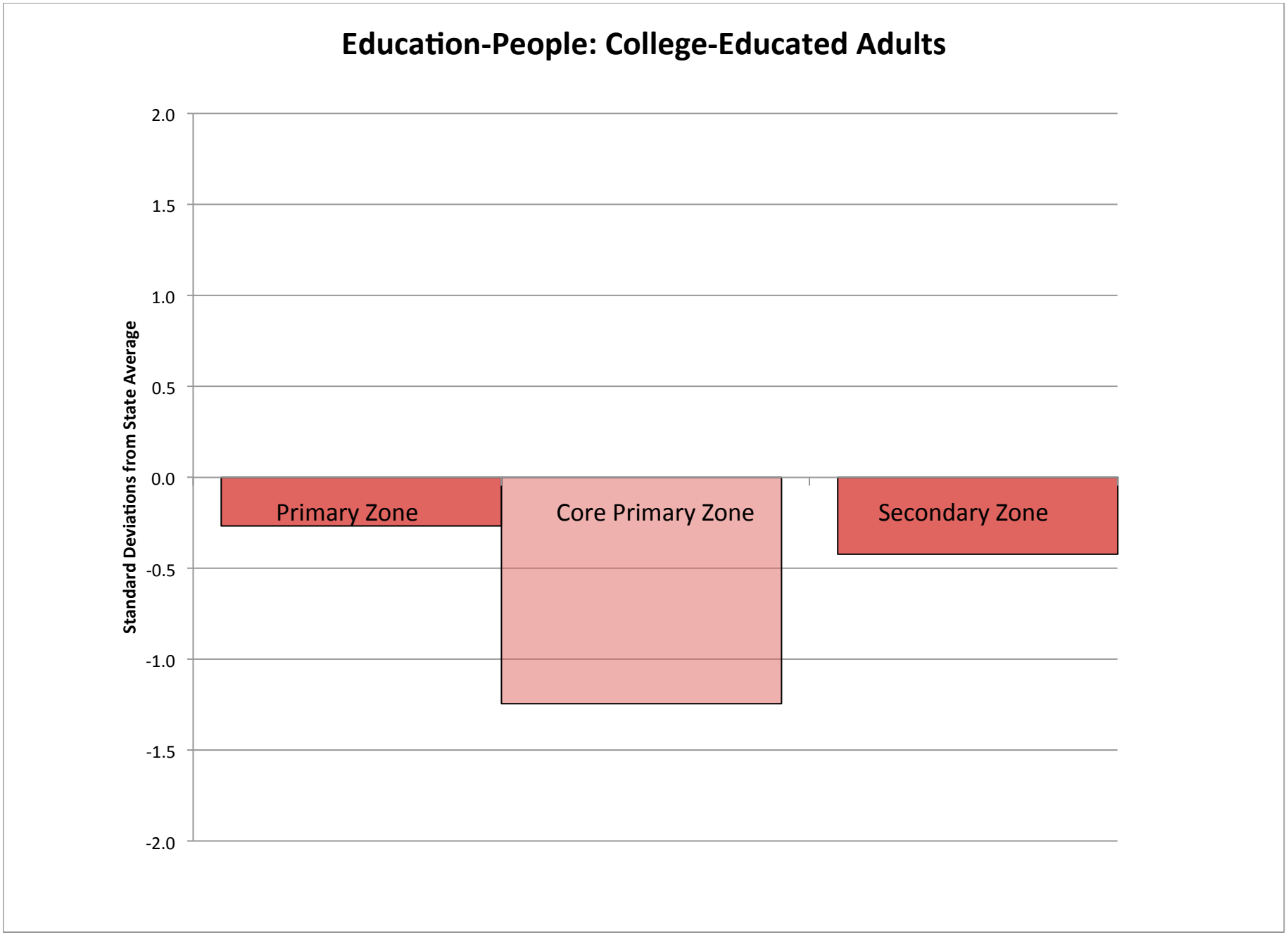

Education Opportunity: Place
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Economic Opportunity: Place
Standard Deviations from State Average
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
Primary Zone
Core Primary Zone
Secondary Zone


Housing Opportunity: Place
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Health/Environment Opportunity: Place
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Civic Life Opportunity: Place
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Education-People: College-Educated Adults
Standard Deviations from State Average
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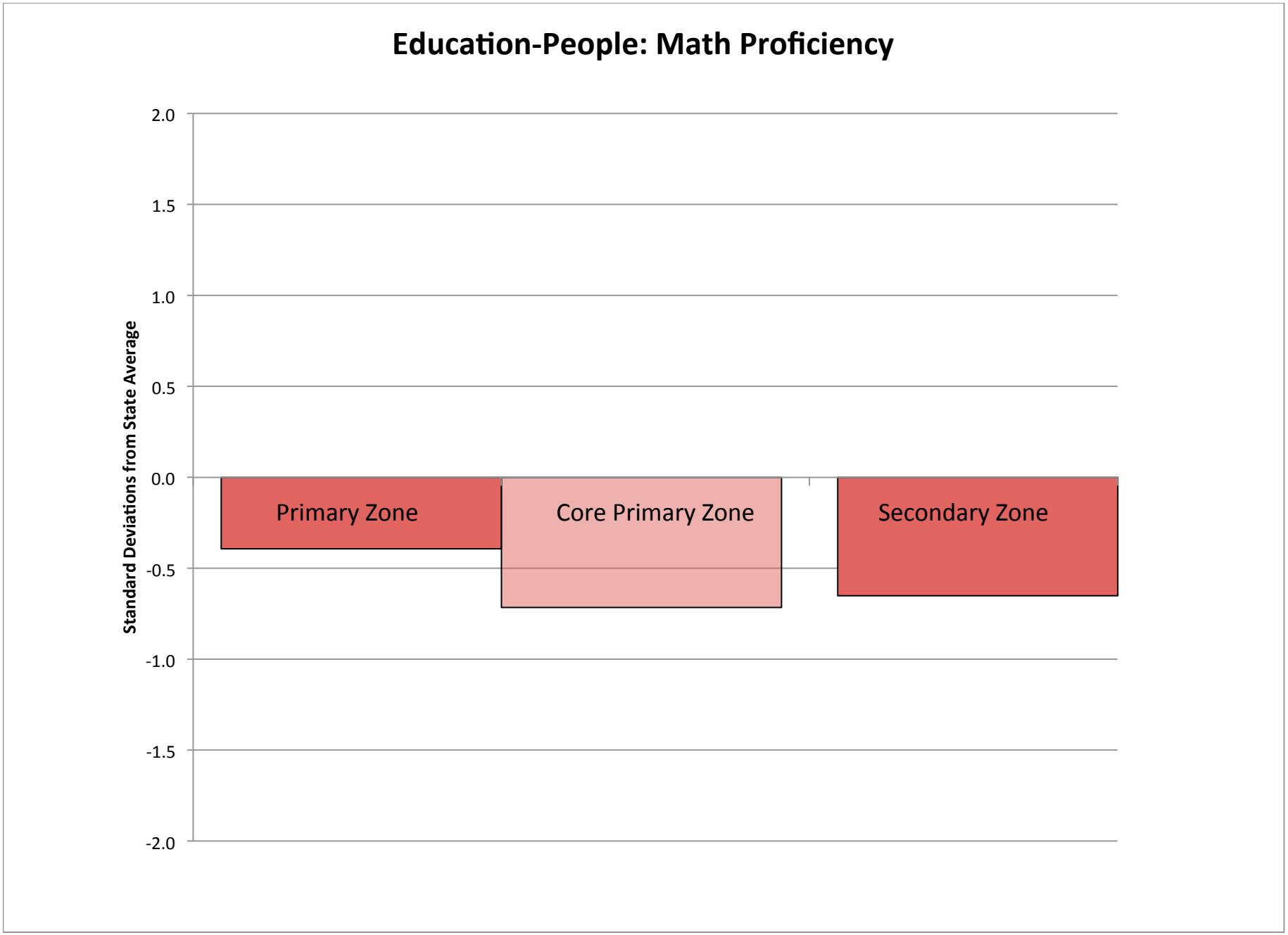
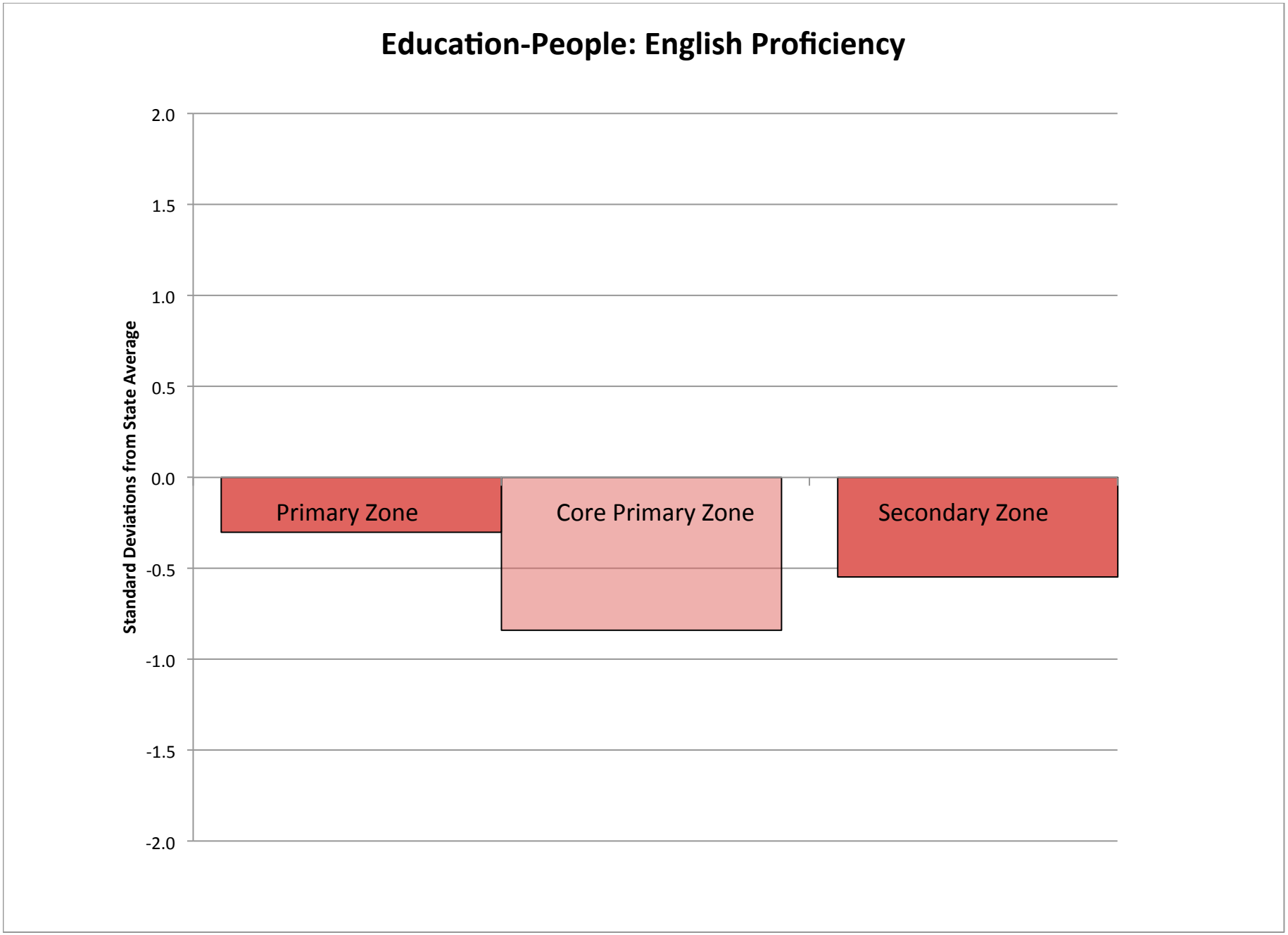
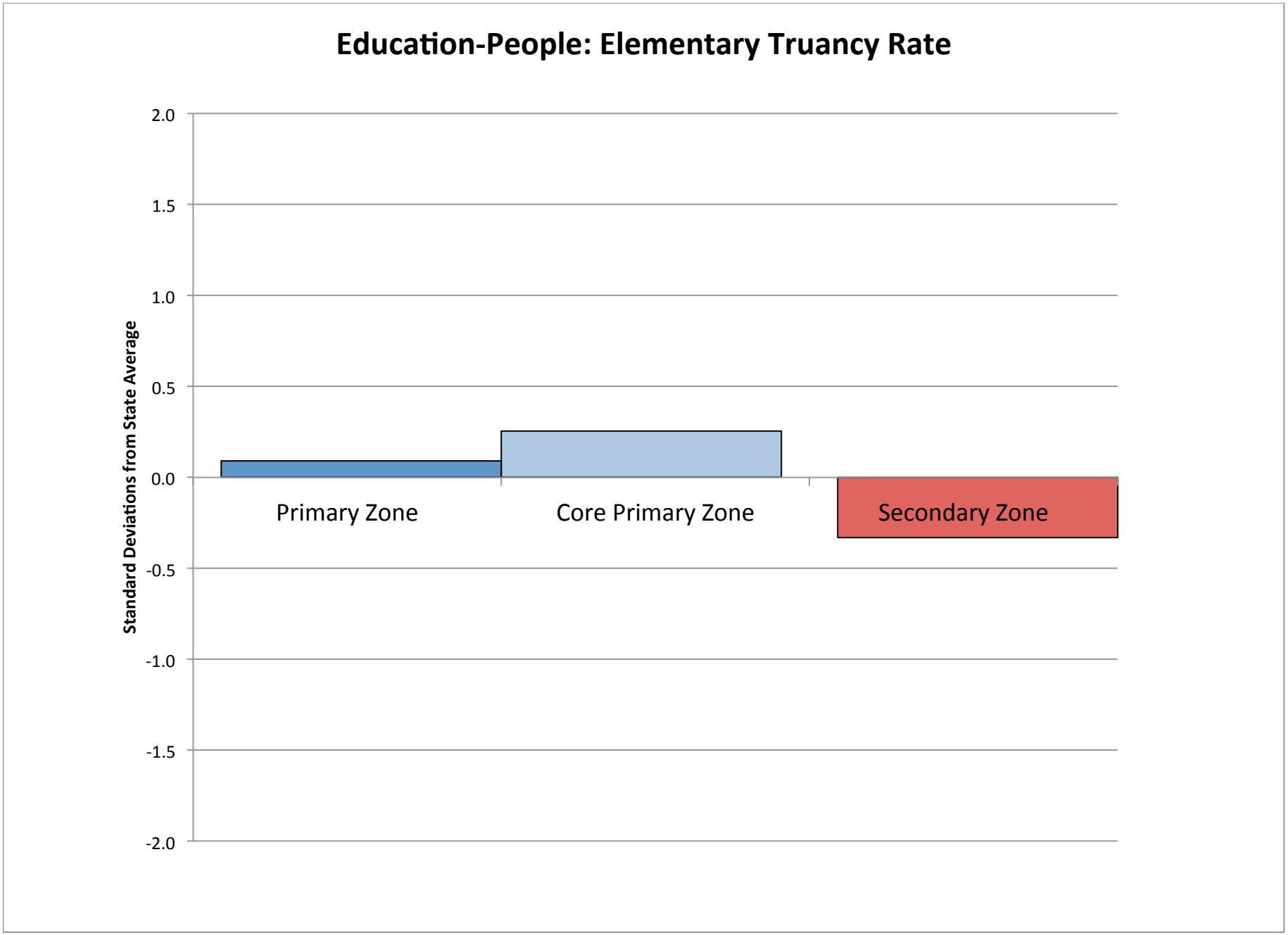
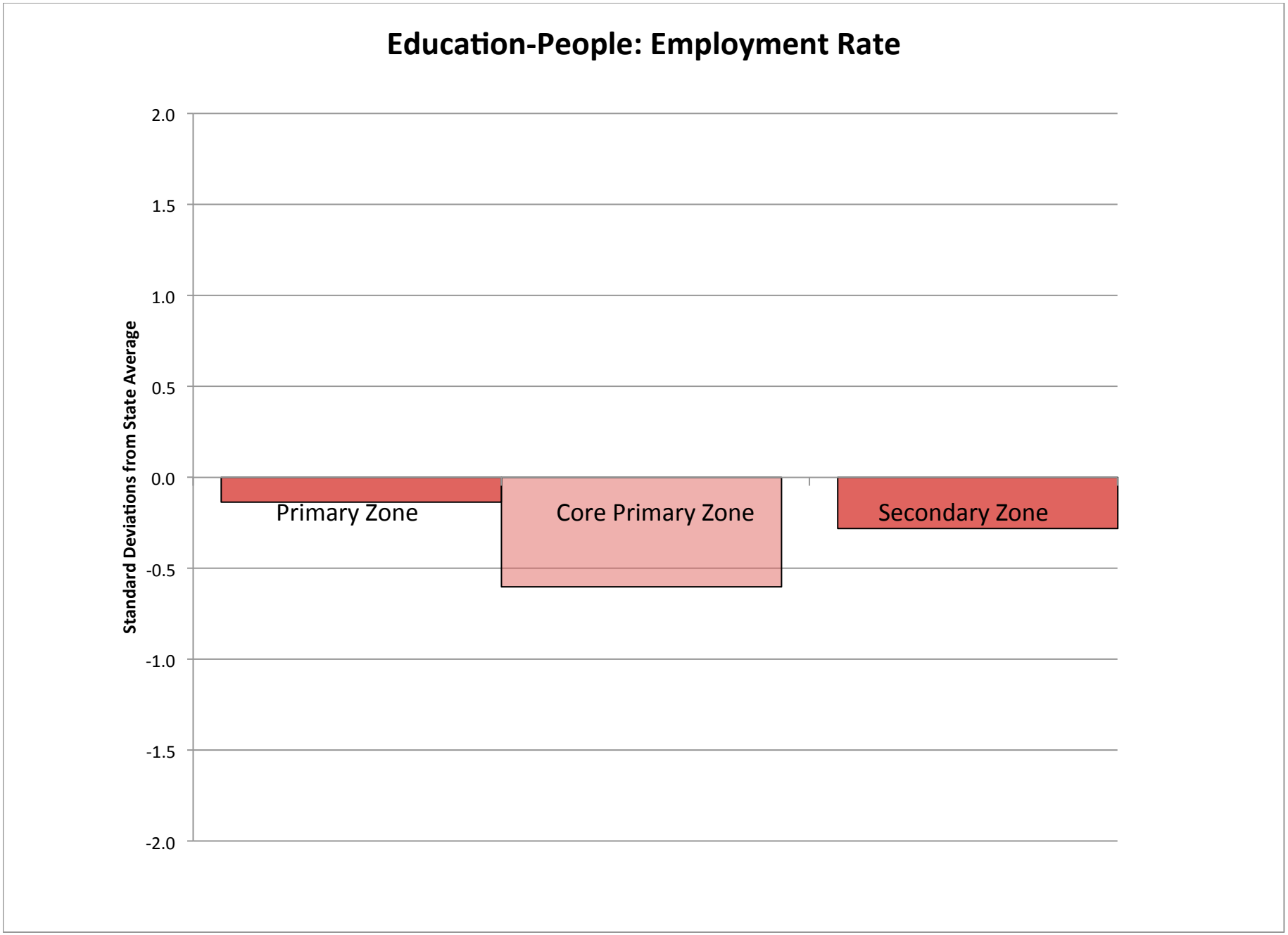
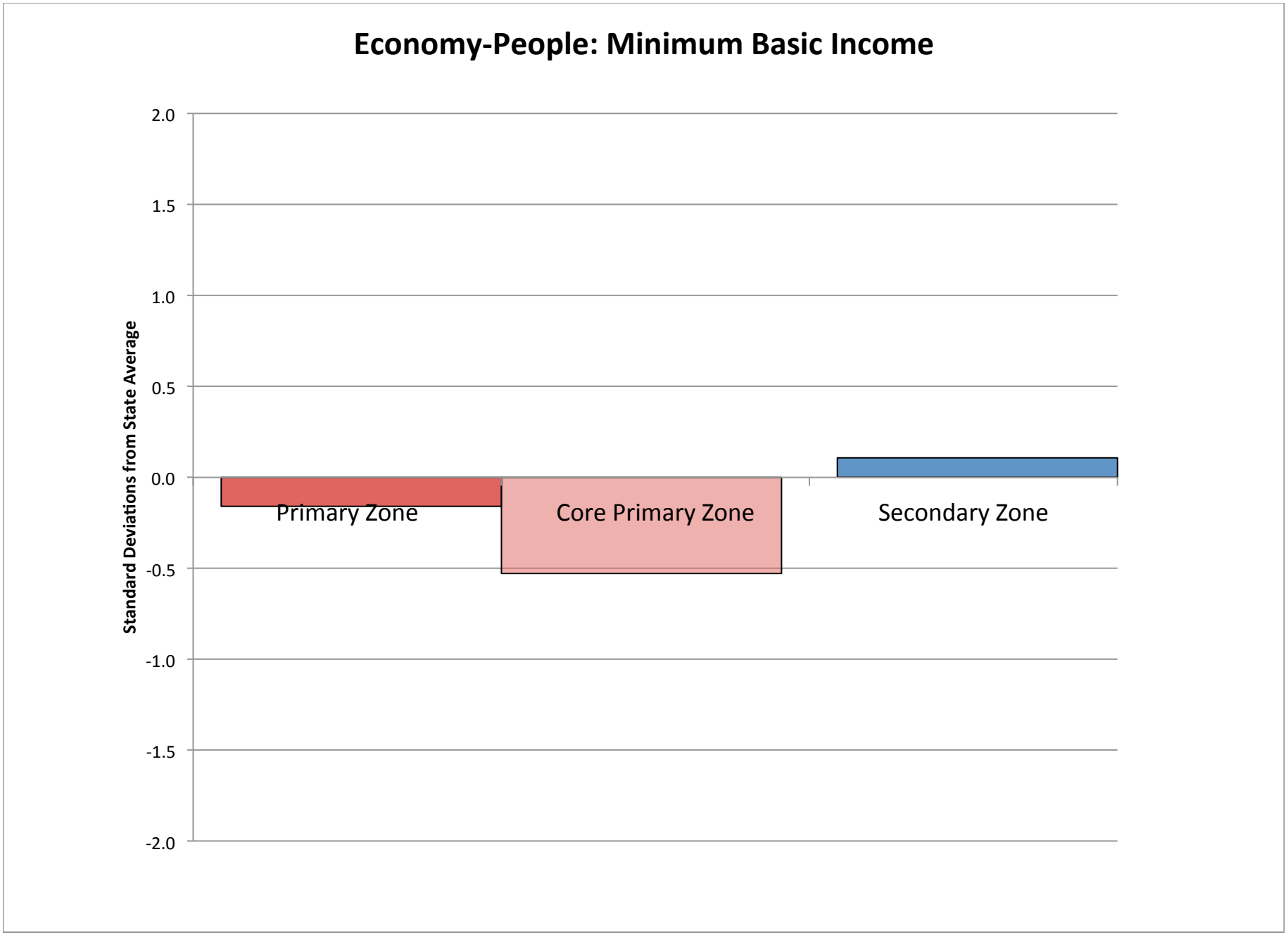
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

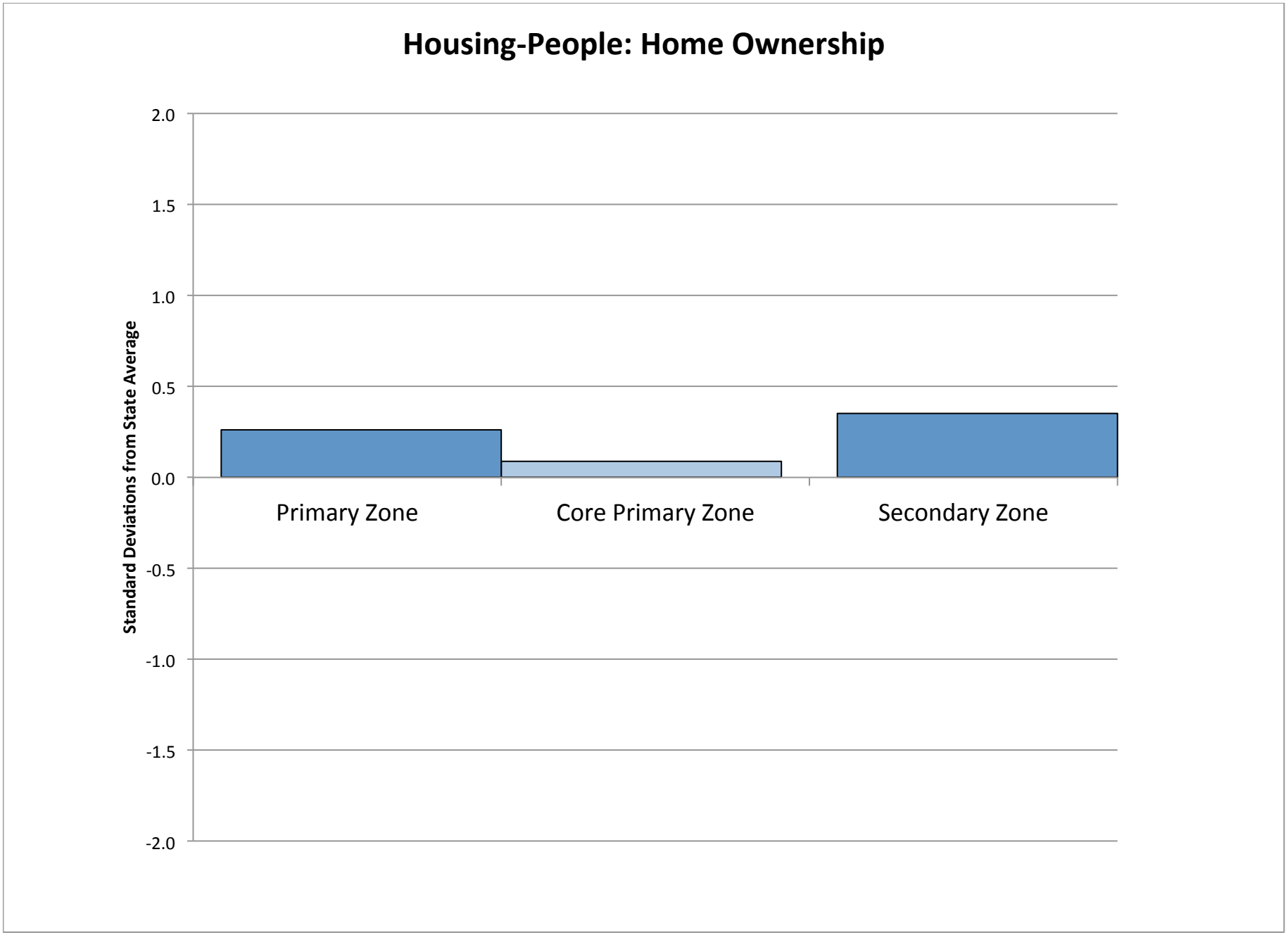

Education-People: Math Proficiency
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

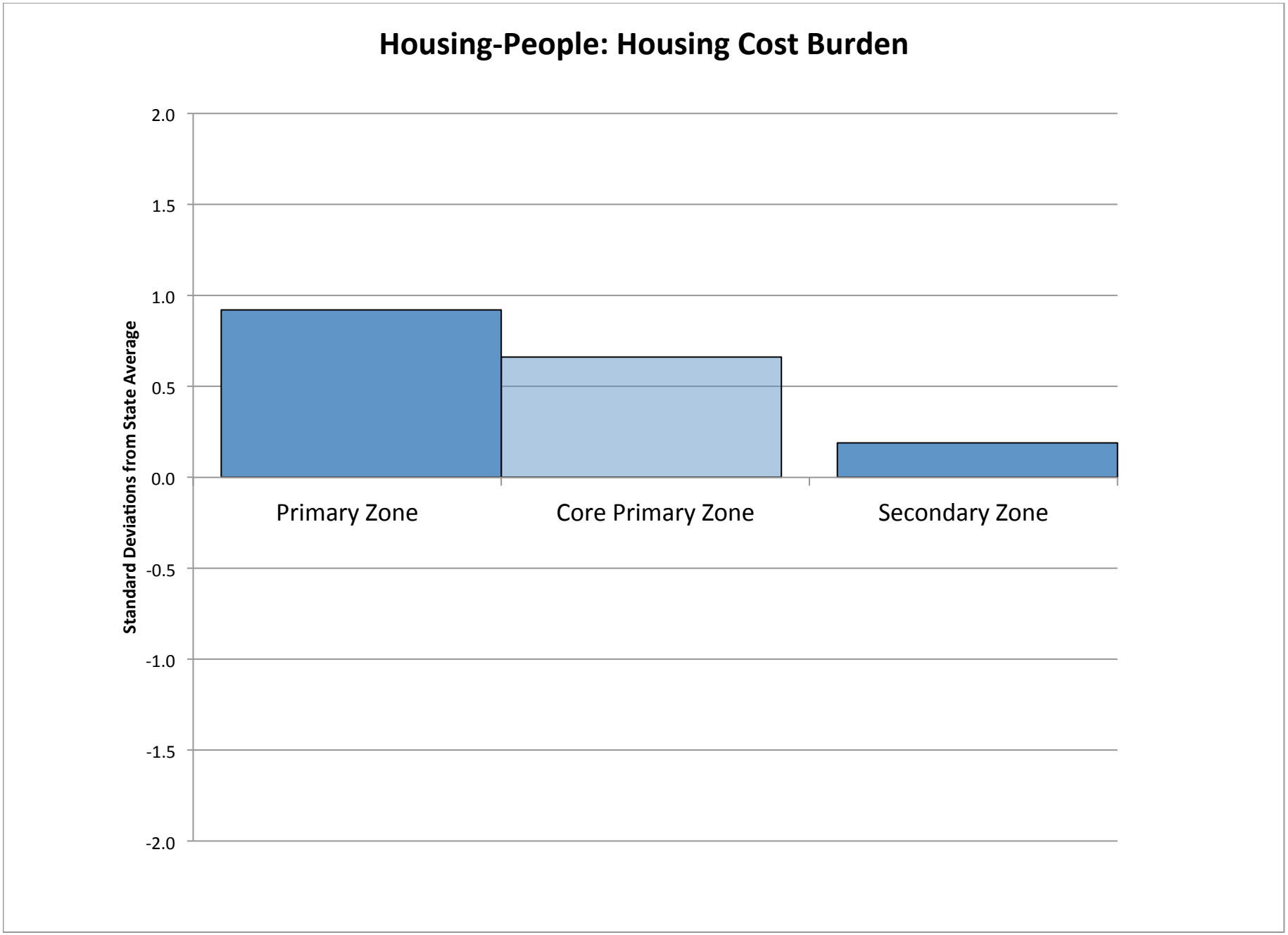

Education-People: English Proficiency
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

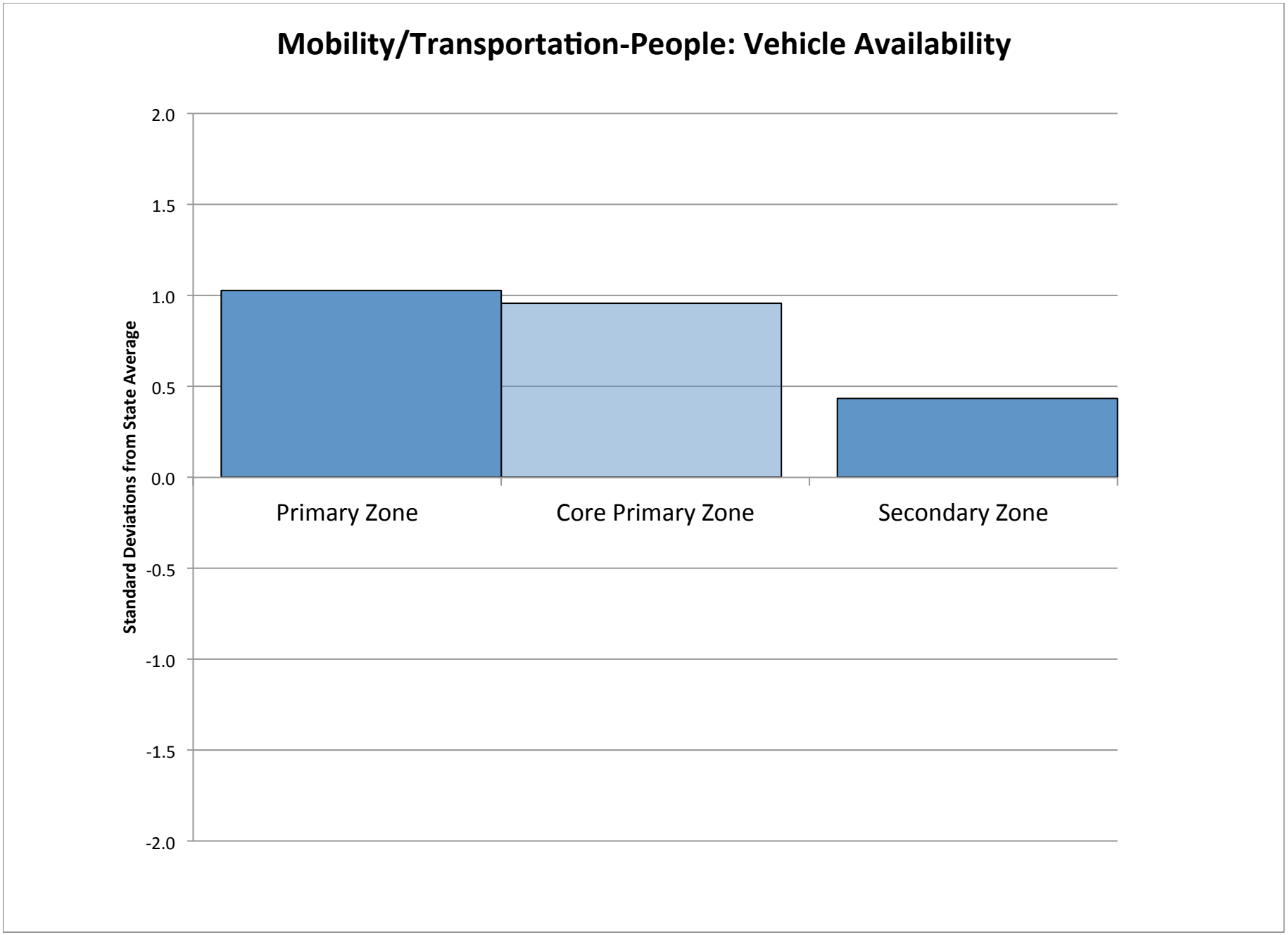

Education-People: Elementary Truancy Rate
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Education-People: Employment Rate
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

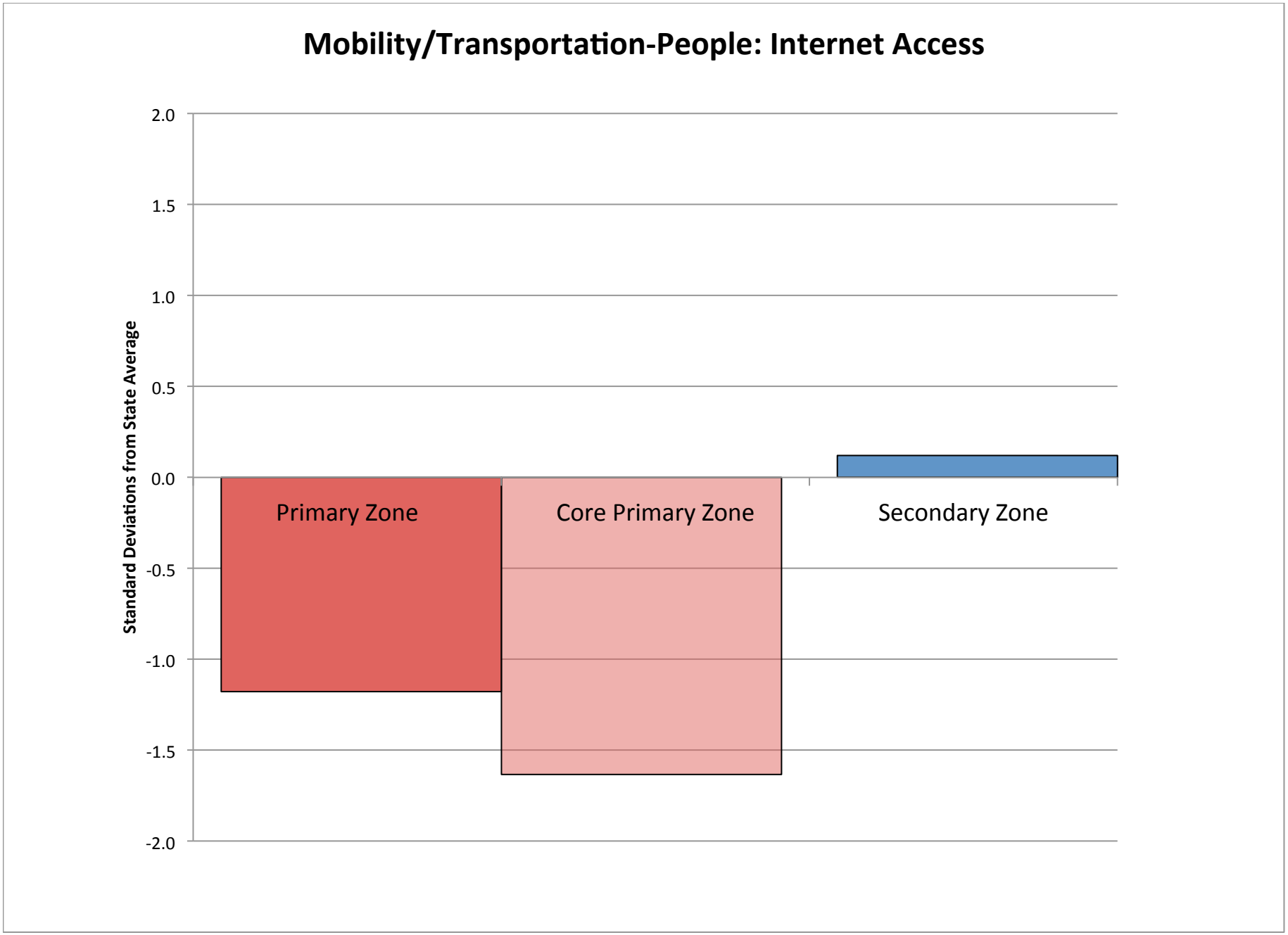

Economy-People: Minimum Basic Income
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

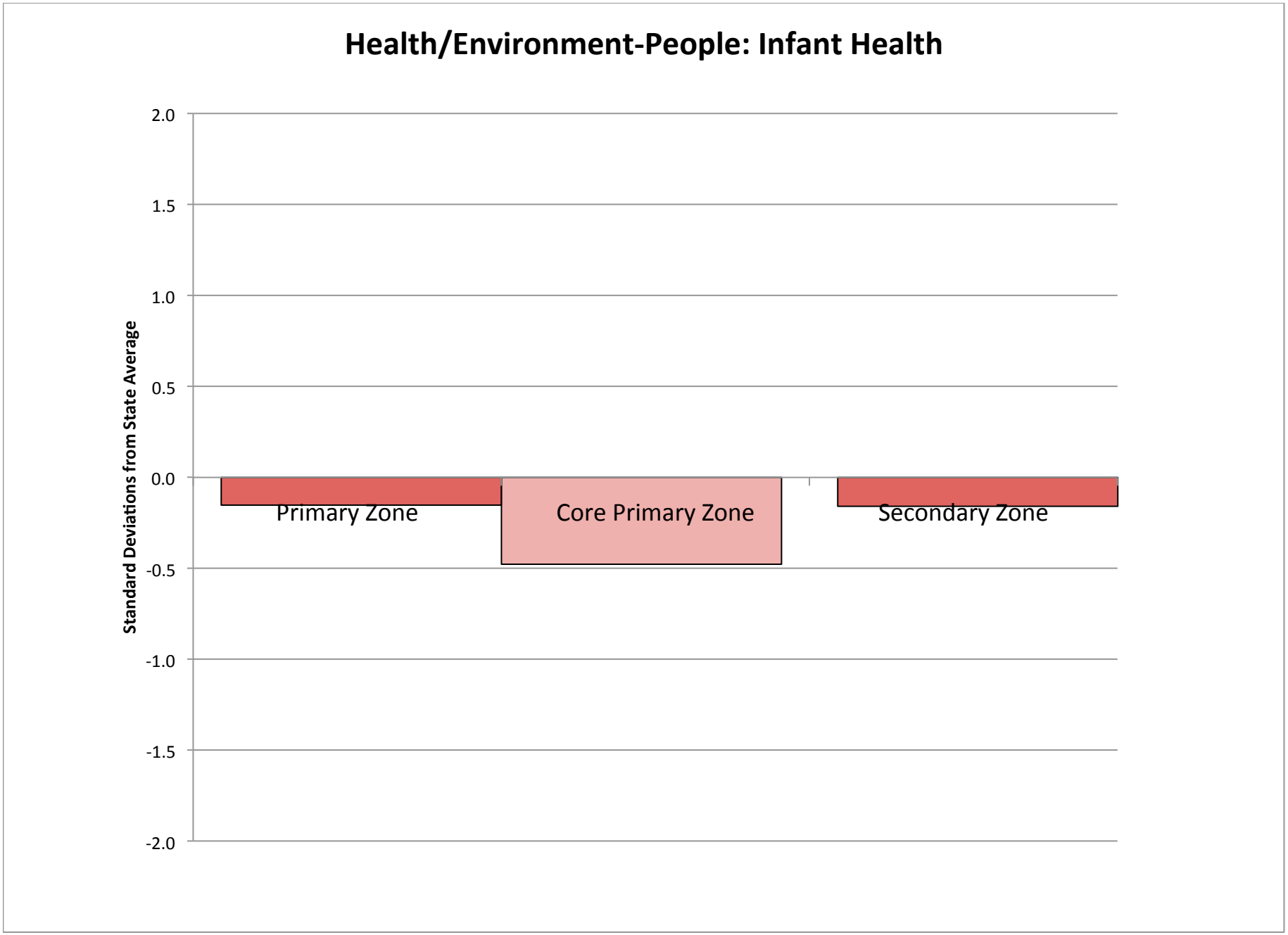

Housing-People: Home Ownership
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Housing-People: Housing Cost Burden
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

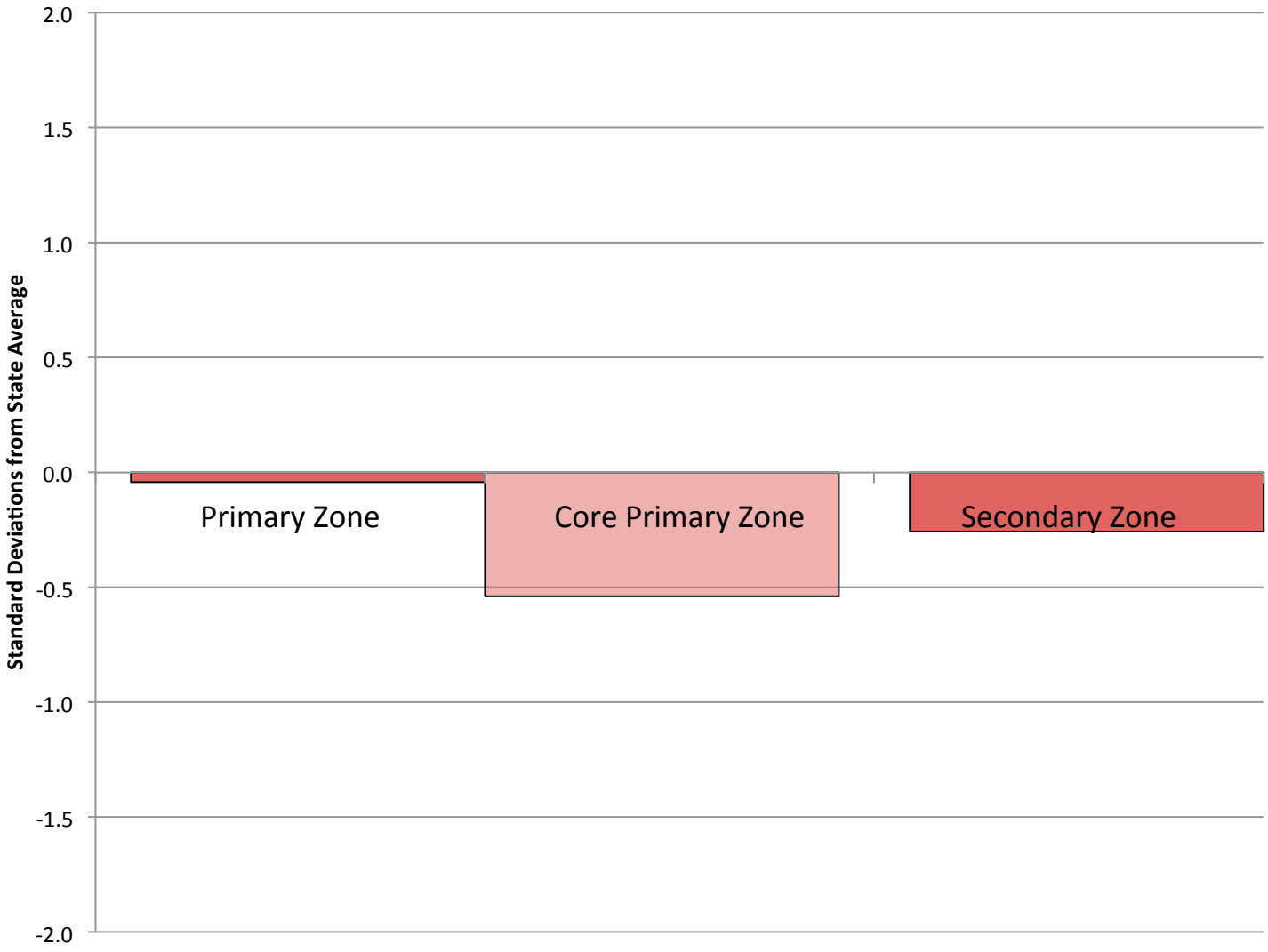

Mobility/Transportation-People: Vehicle Availability
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

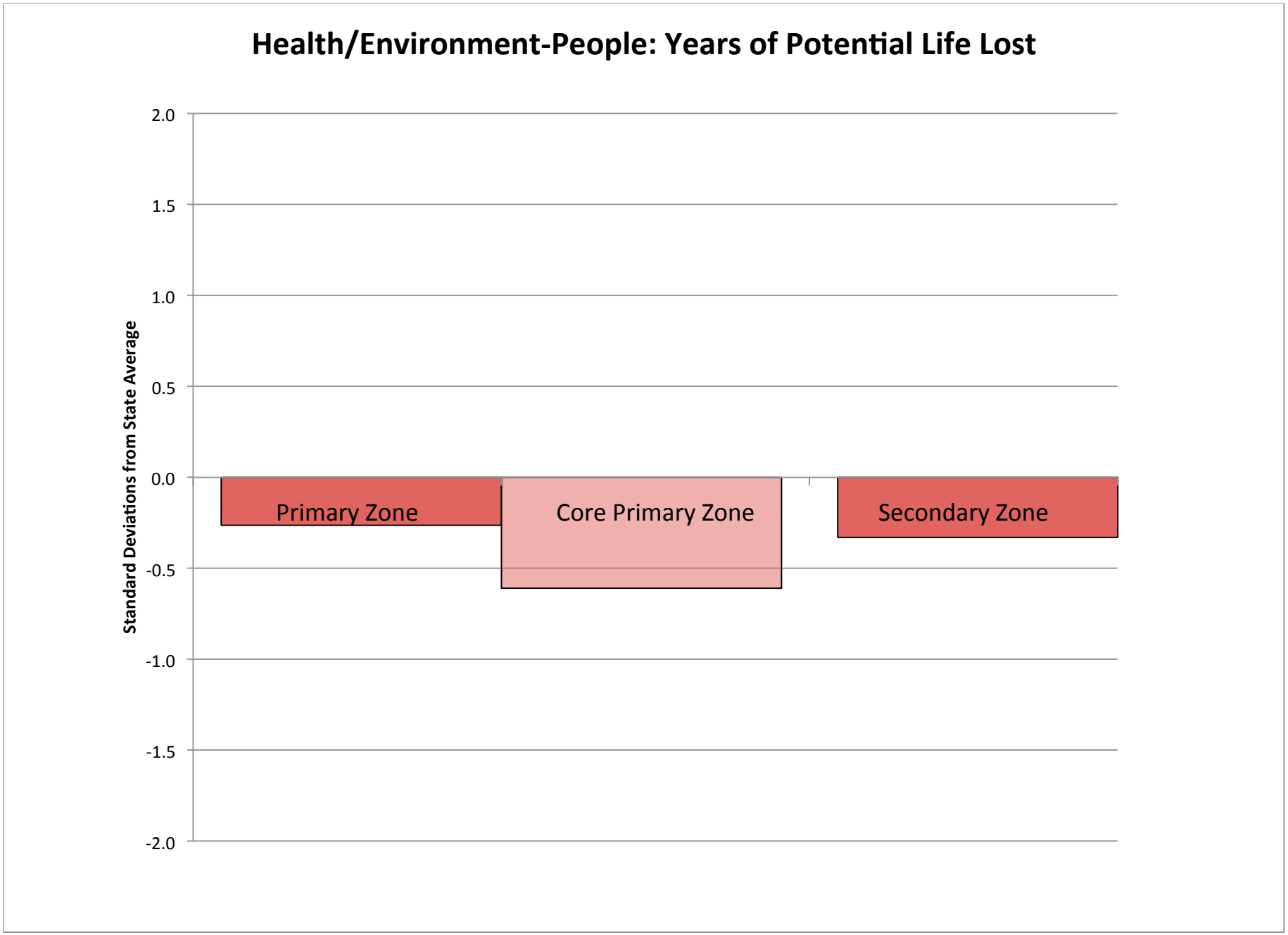

Mobility/Transportation-People: Commute Time
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

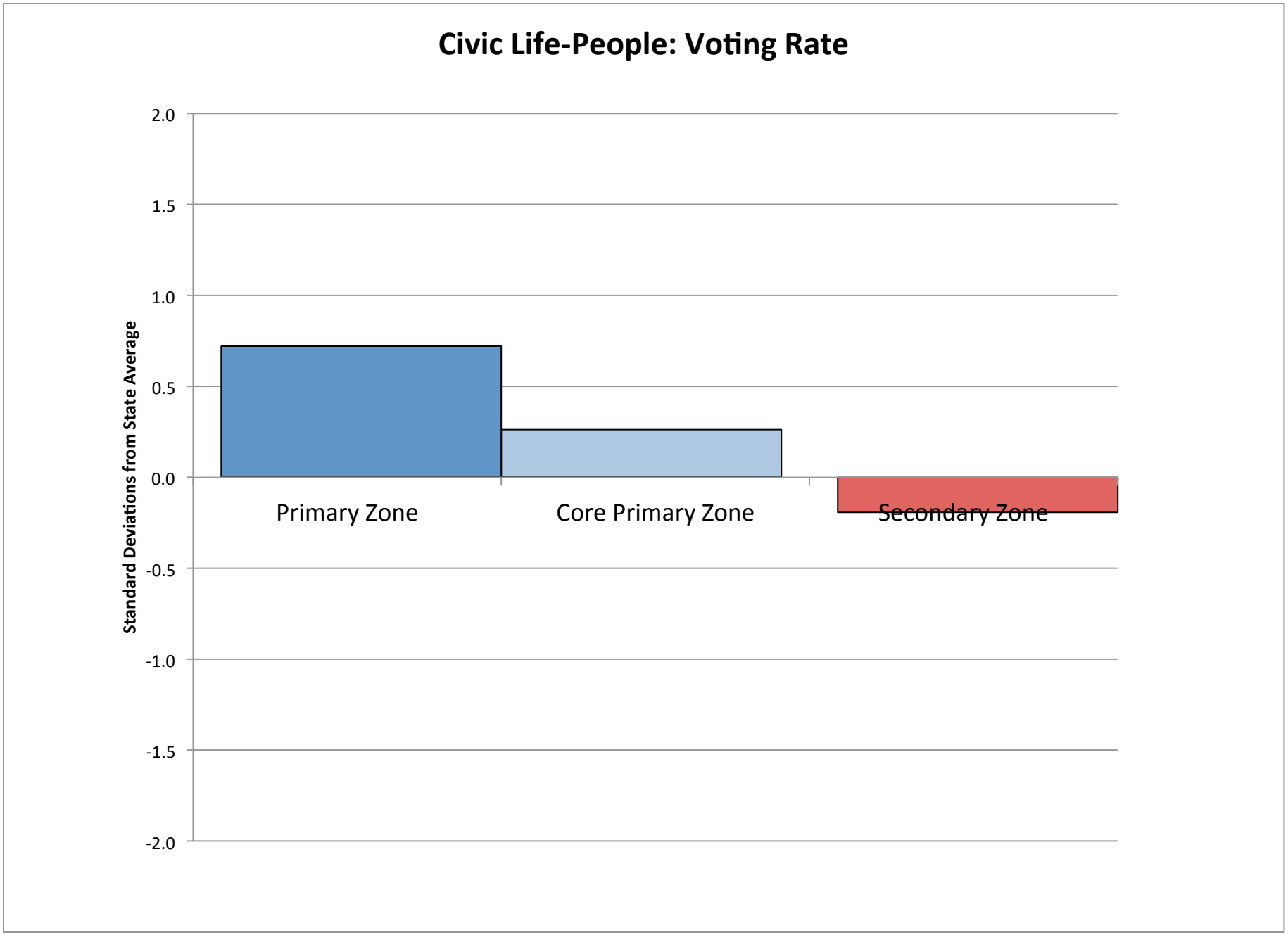

Mobility/Transportation-People: Internet Access
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

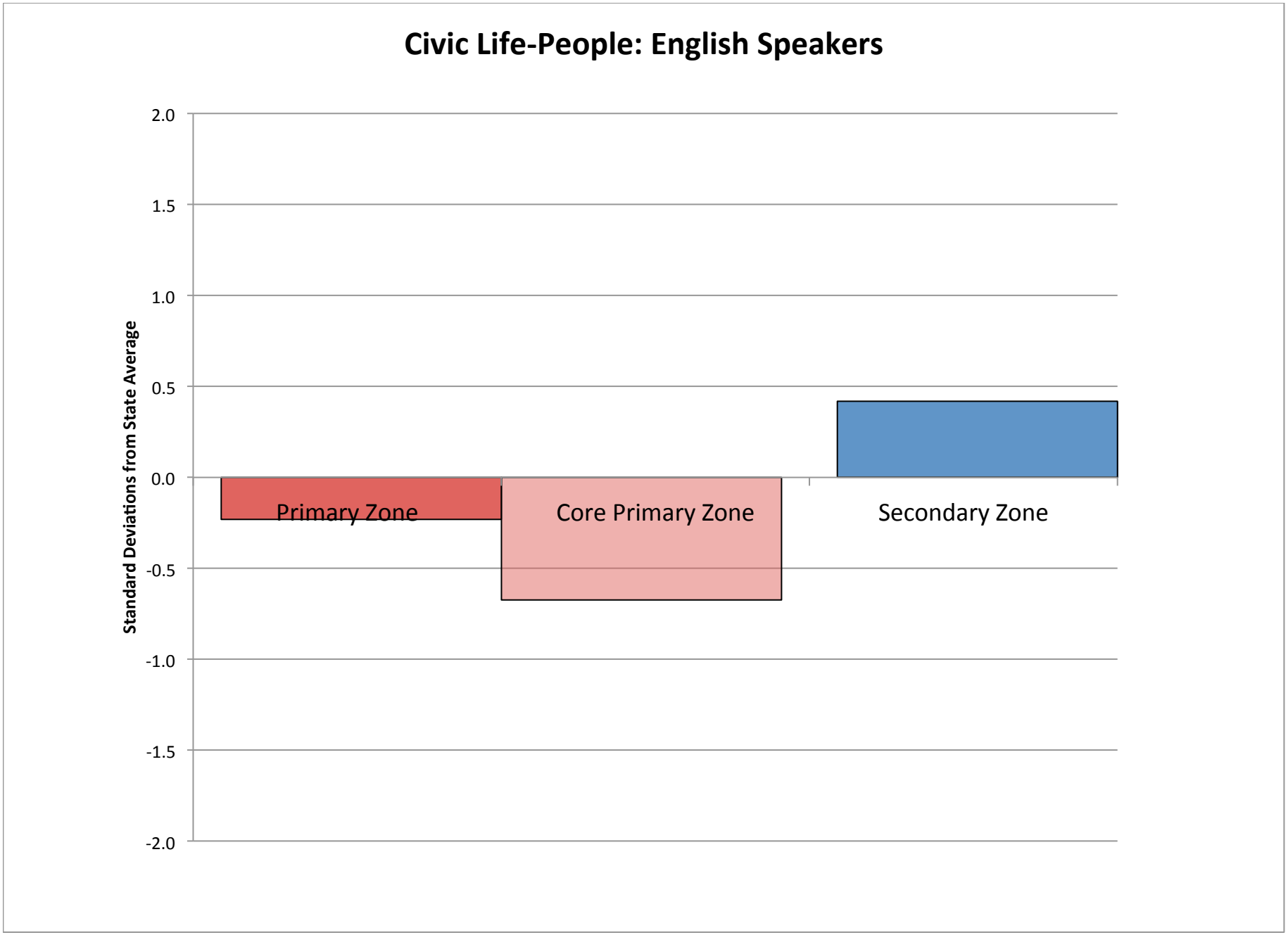

Health/Environment-People: Infant Health
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

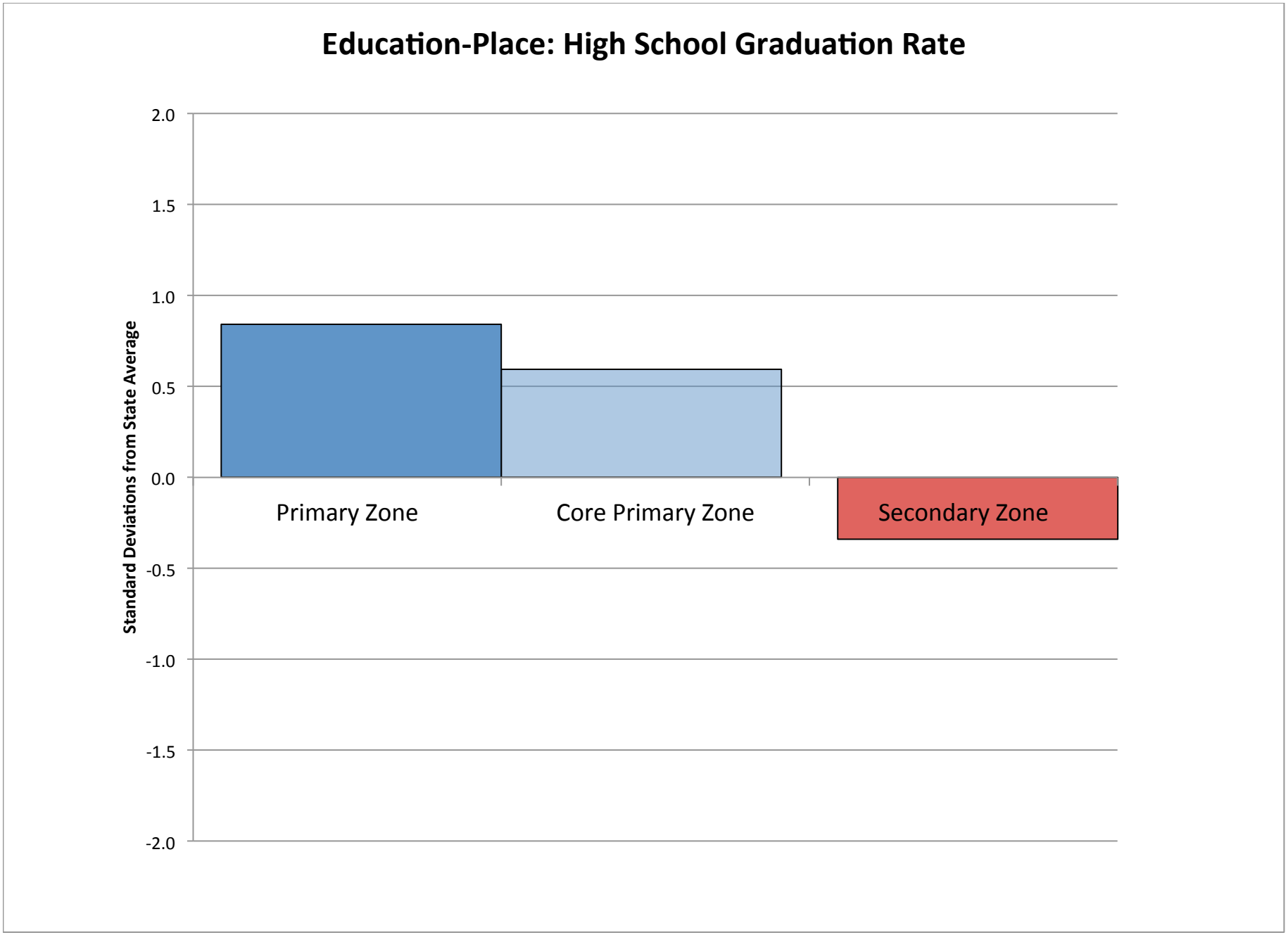
Health/Environment-People: Births to Teens

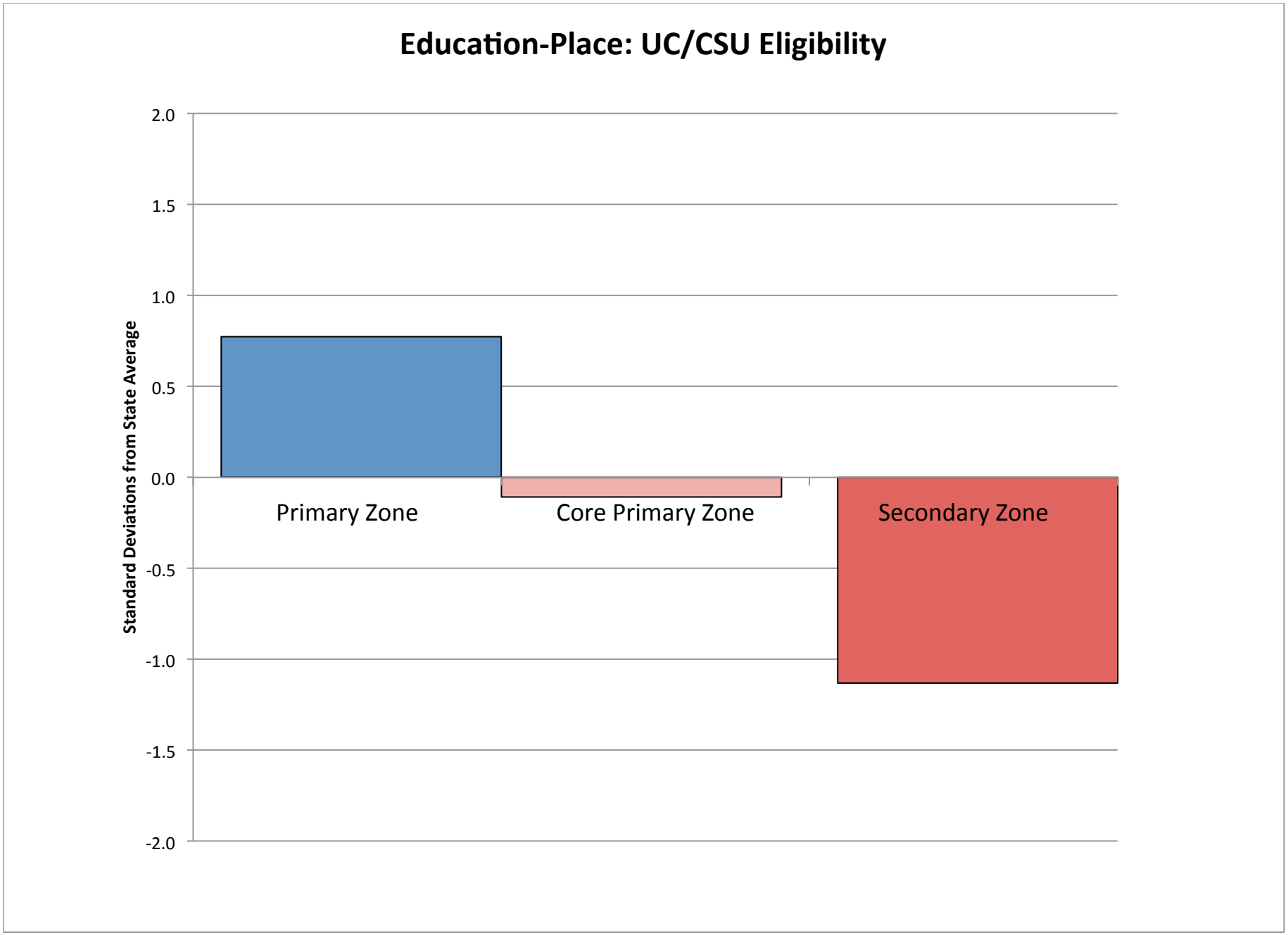


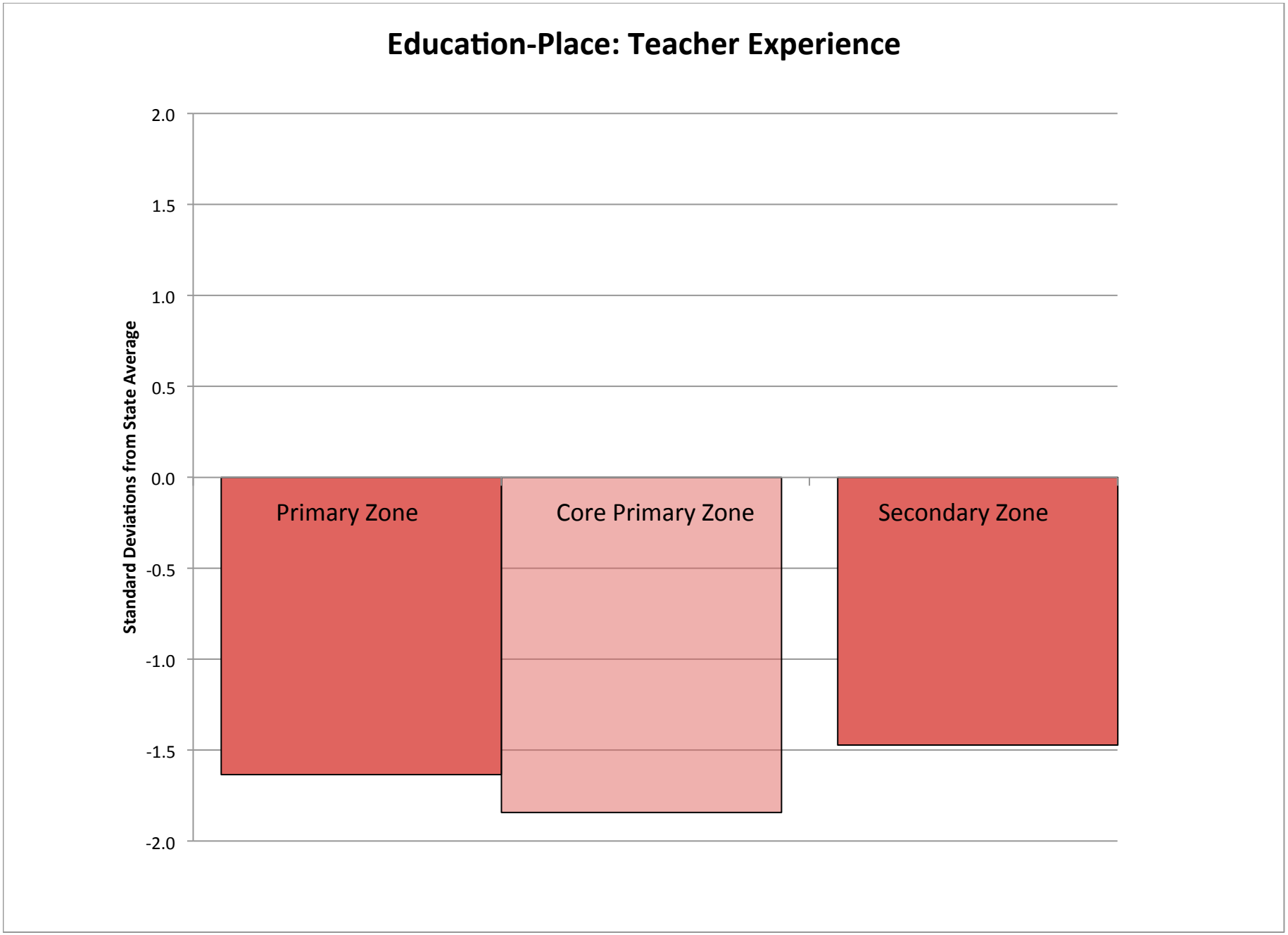

Health/Environment-People: Years of Potential Life Lost
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

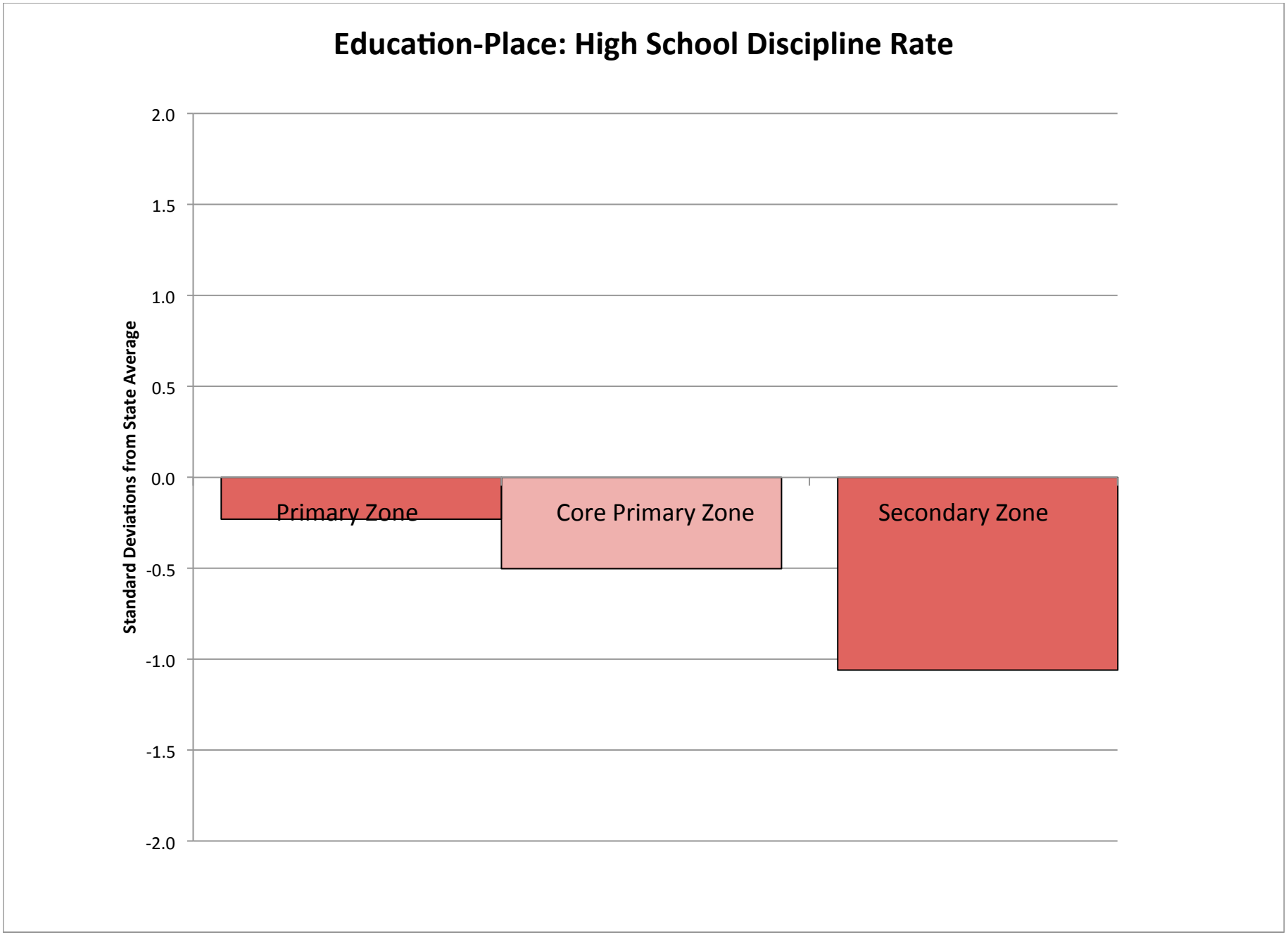

Civic Life-People: Voting Rate
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

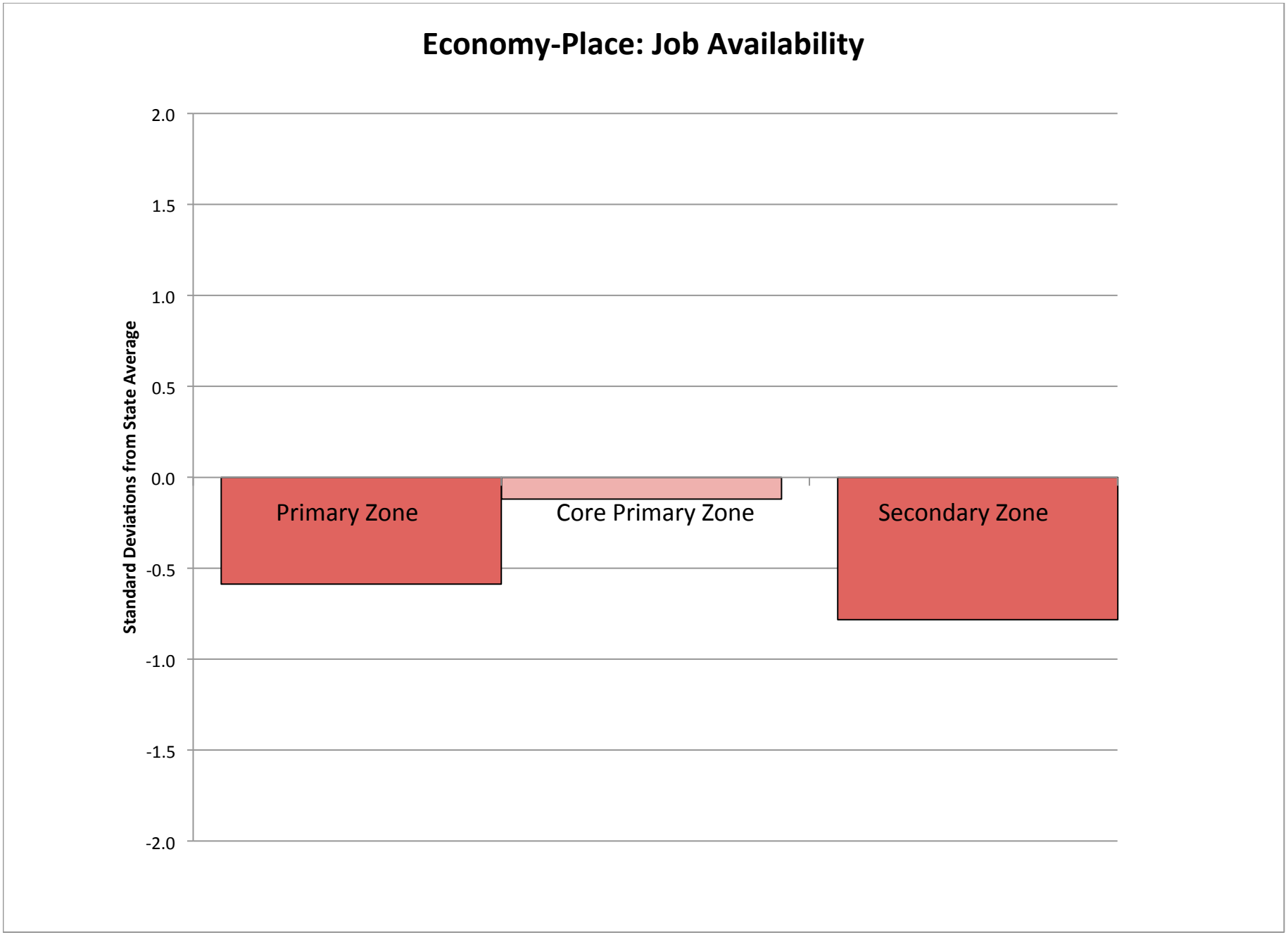

Civic Life-People: English Speakers
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

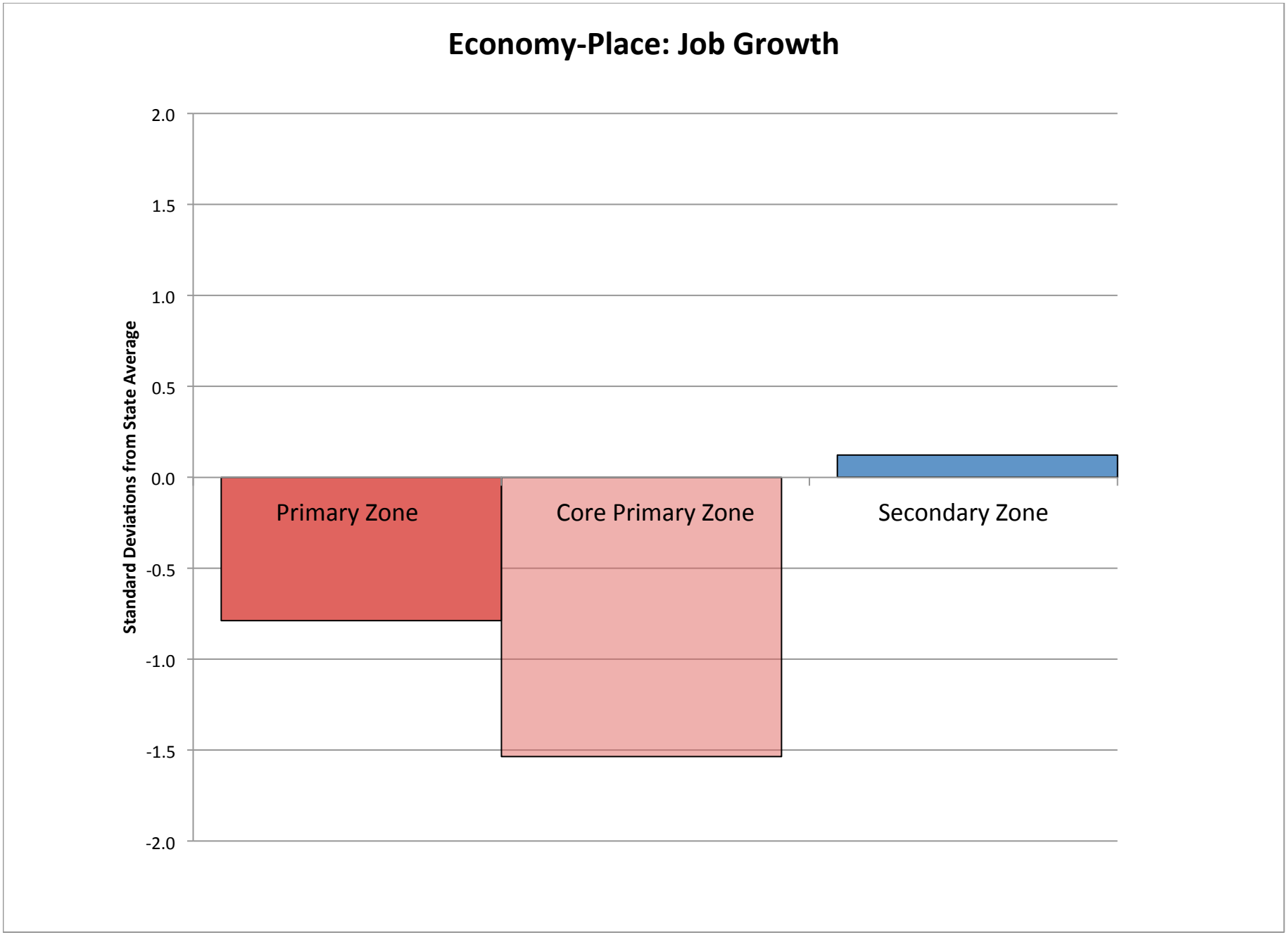

Education-Place: High School Graduation Rate
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Education-Place: UC/CSU Eligibility
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

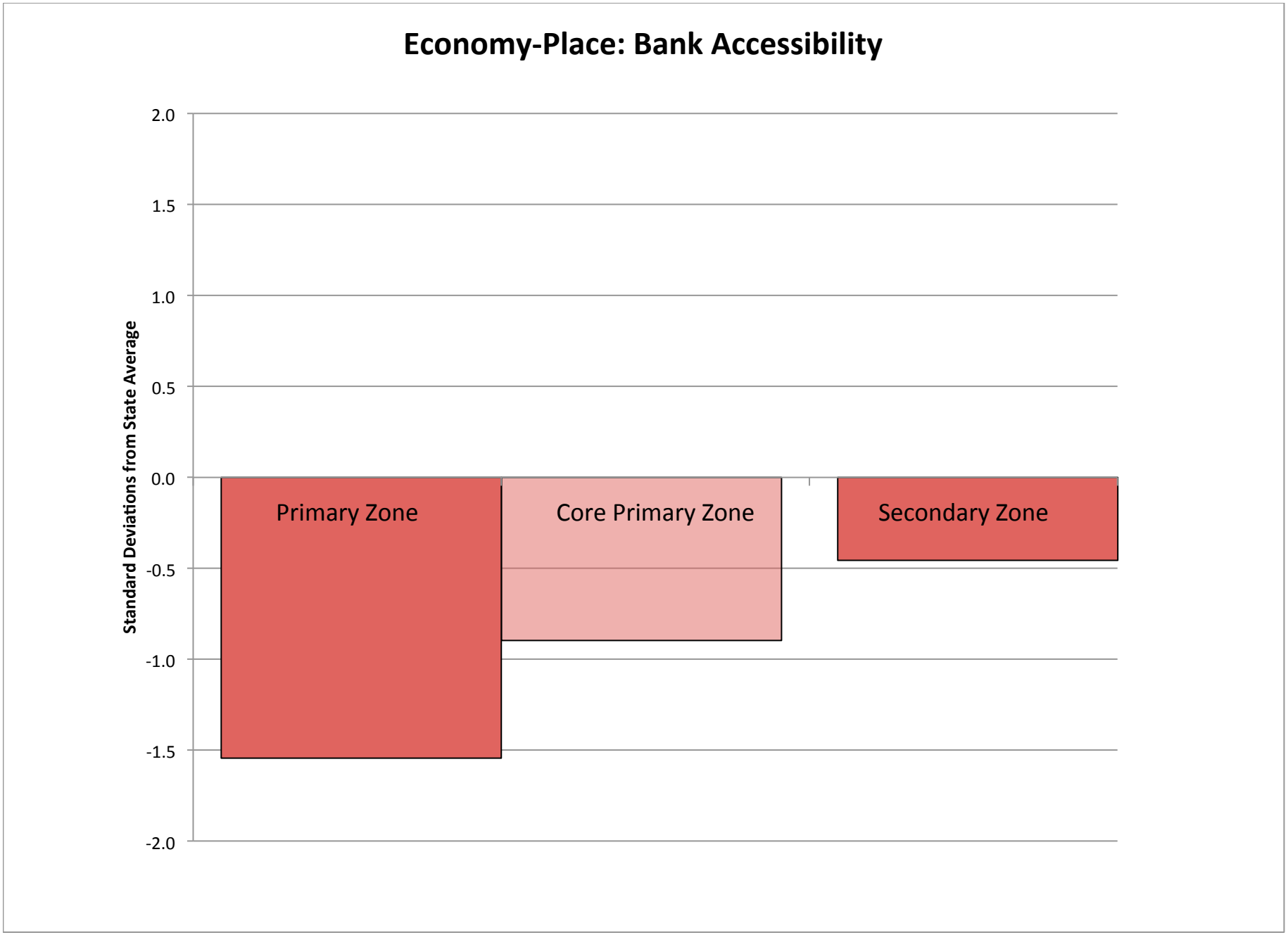

Education-Place: Teacher Experience
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

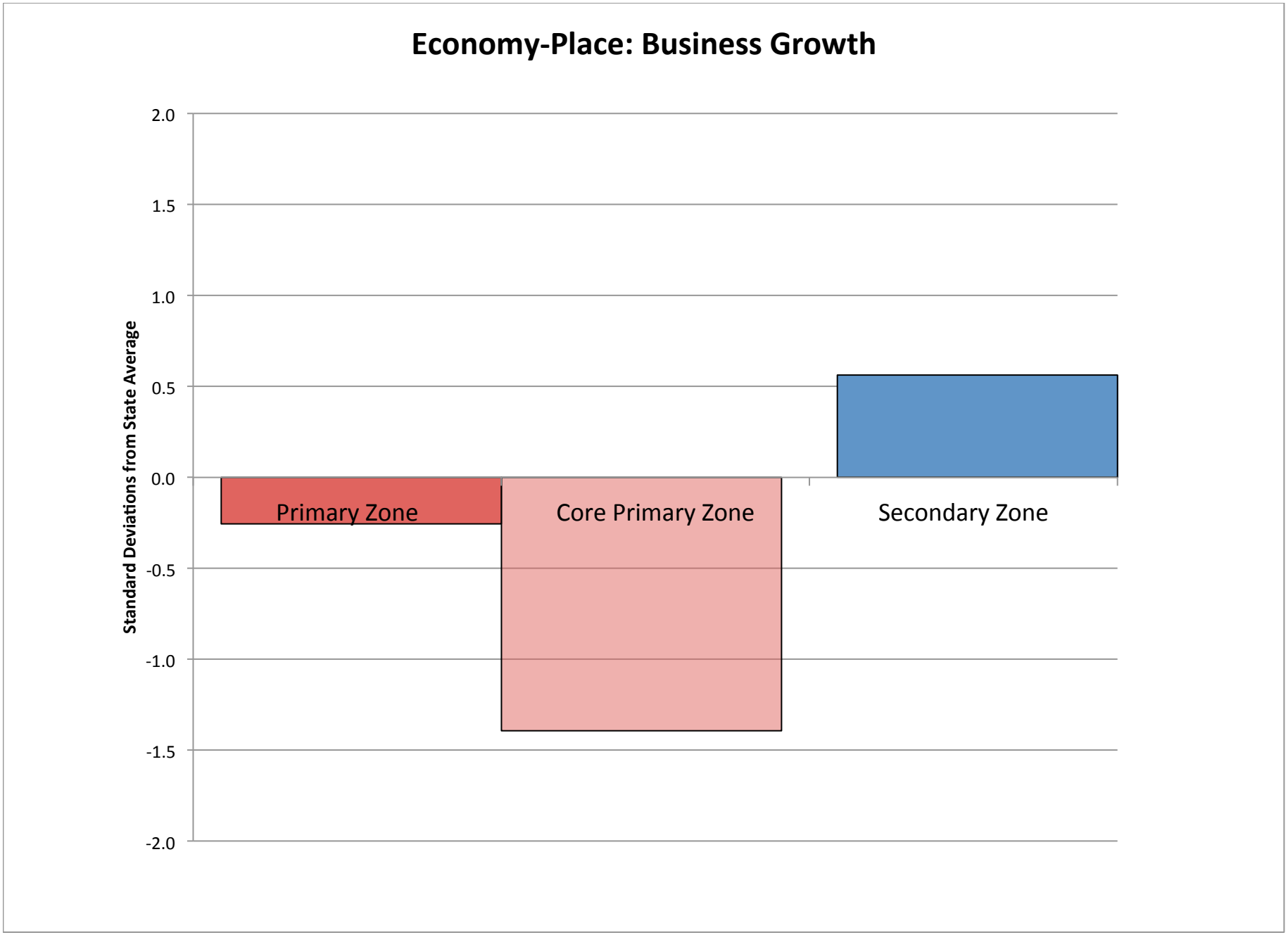

Education-Place: High School Discipline Rate
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

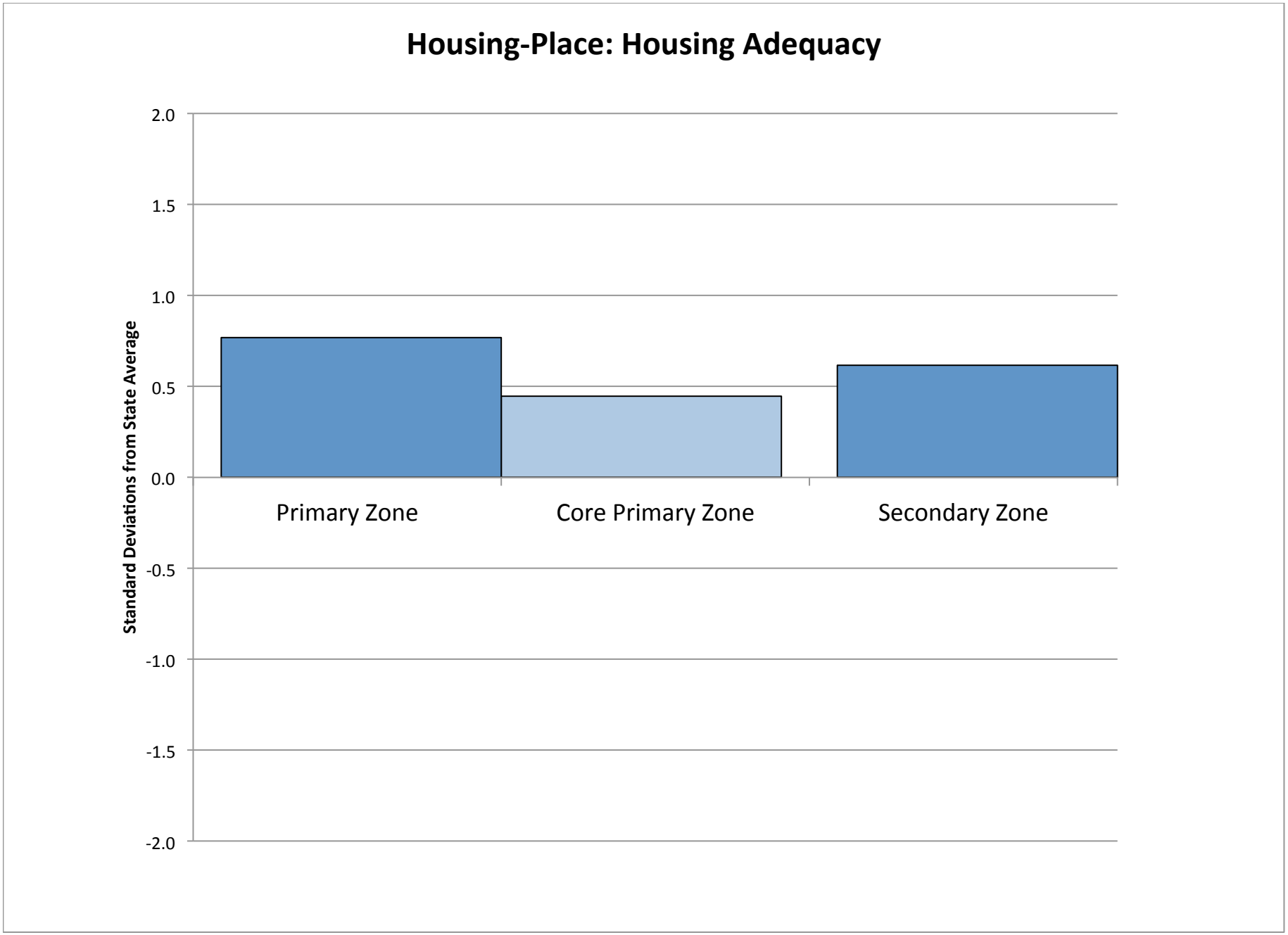

Economy-Place: Job Availability
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Economy-Place: Job Growth
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

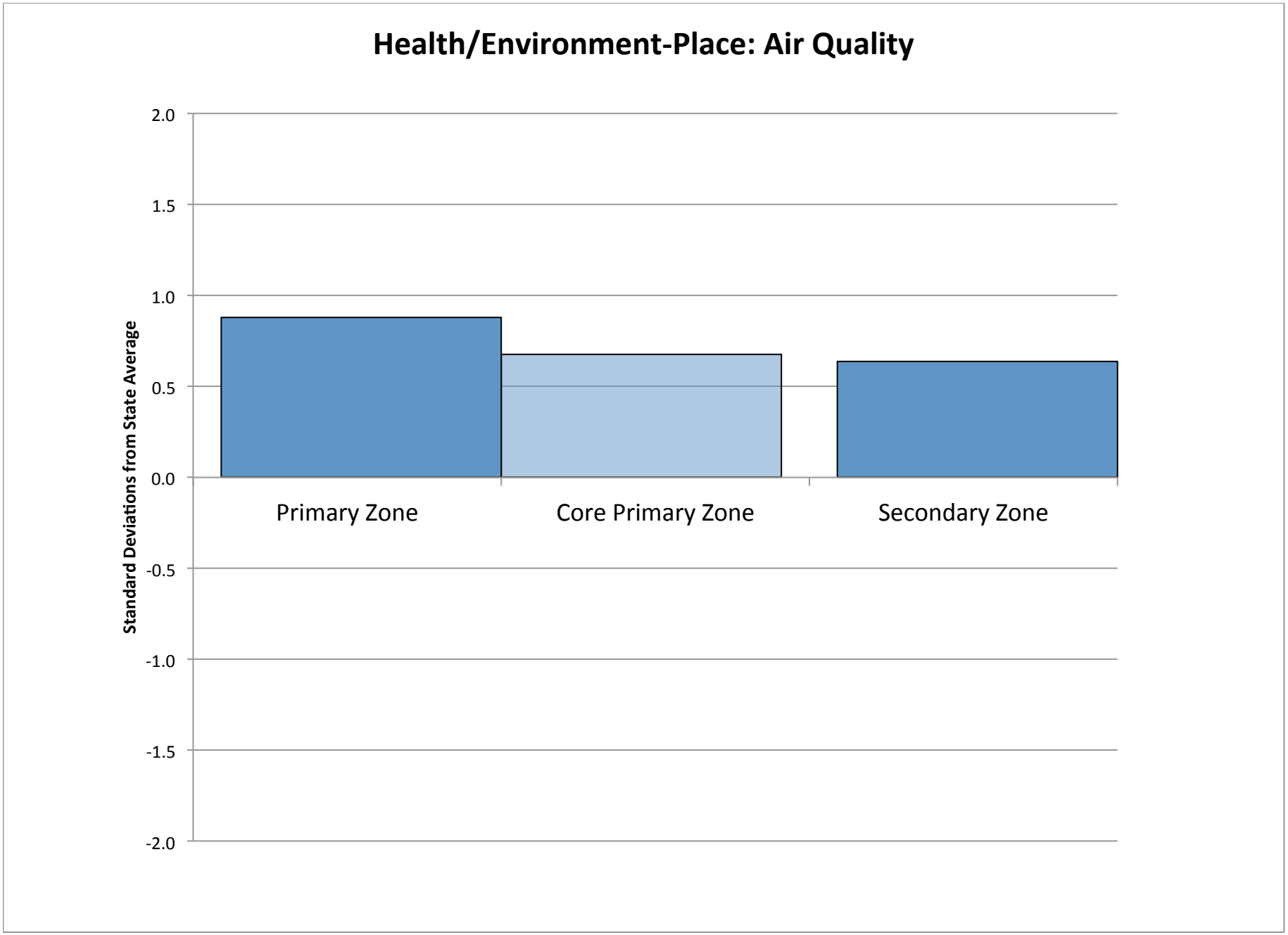

Economy-Place: Job Quality
Standard Deviations from State Average
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
Primary Zone
Core Primary Zone
Secondary Zone

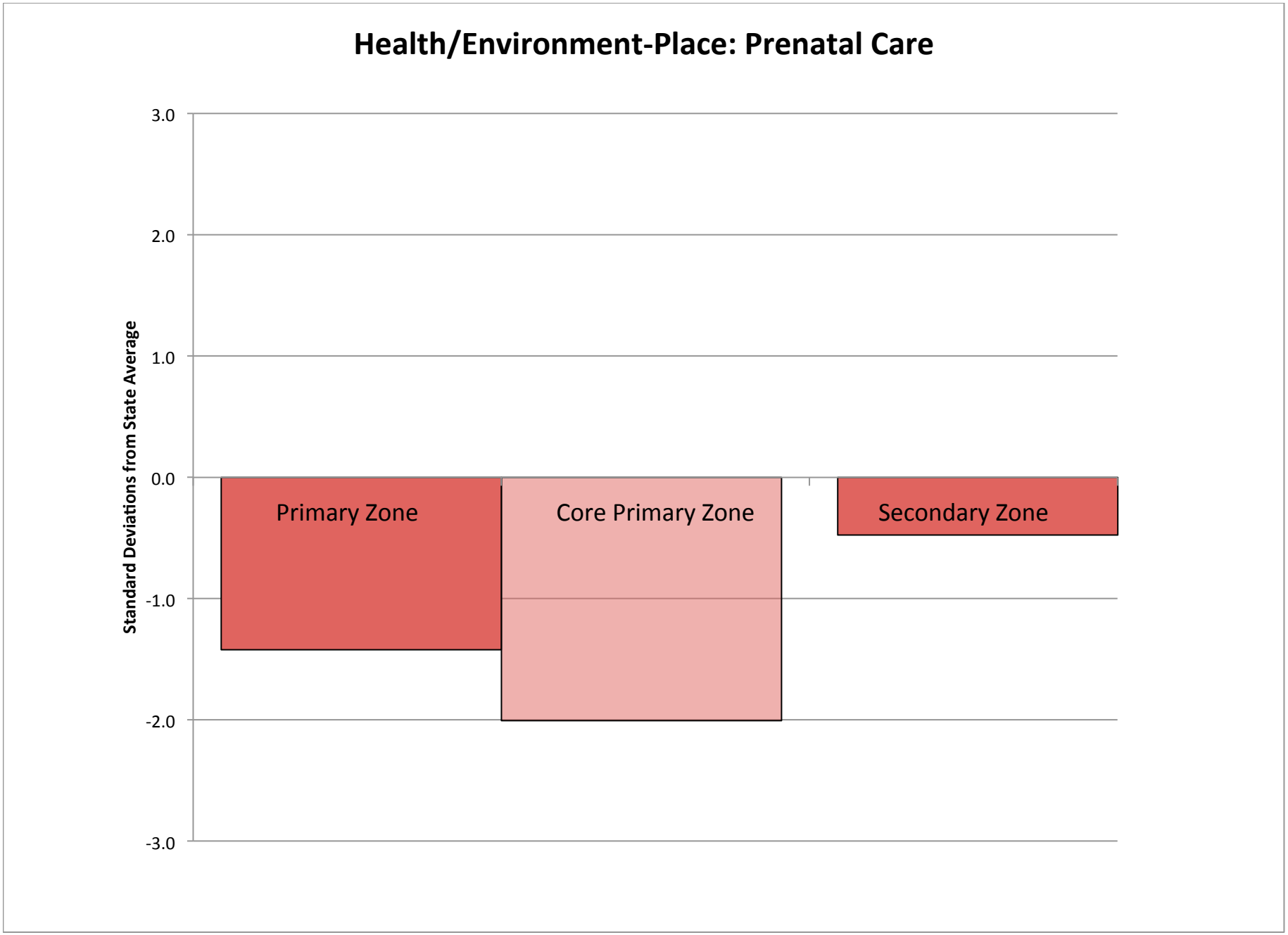

Economy-Place: Bank Accessibility
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

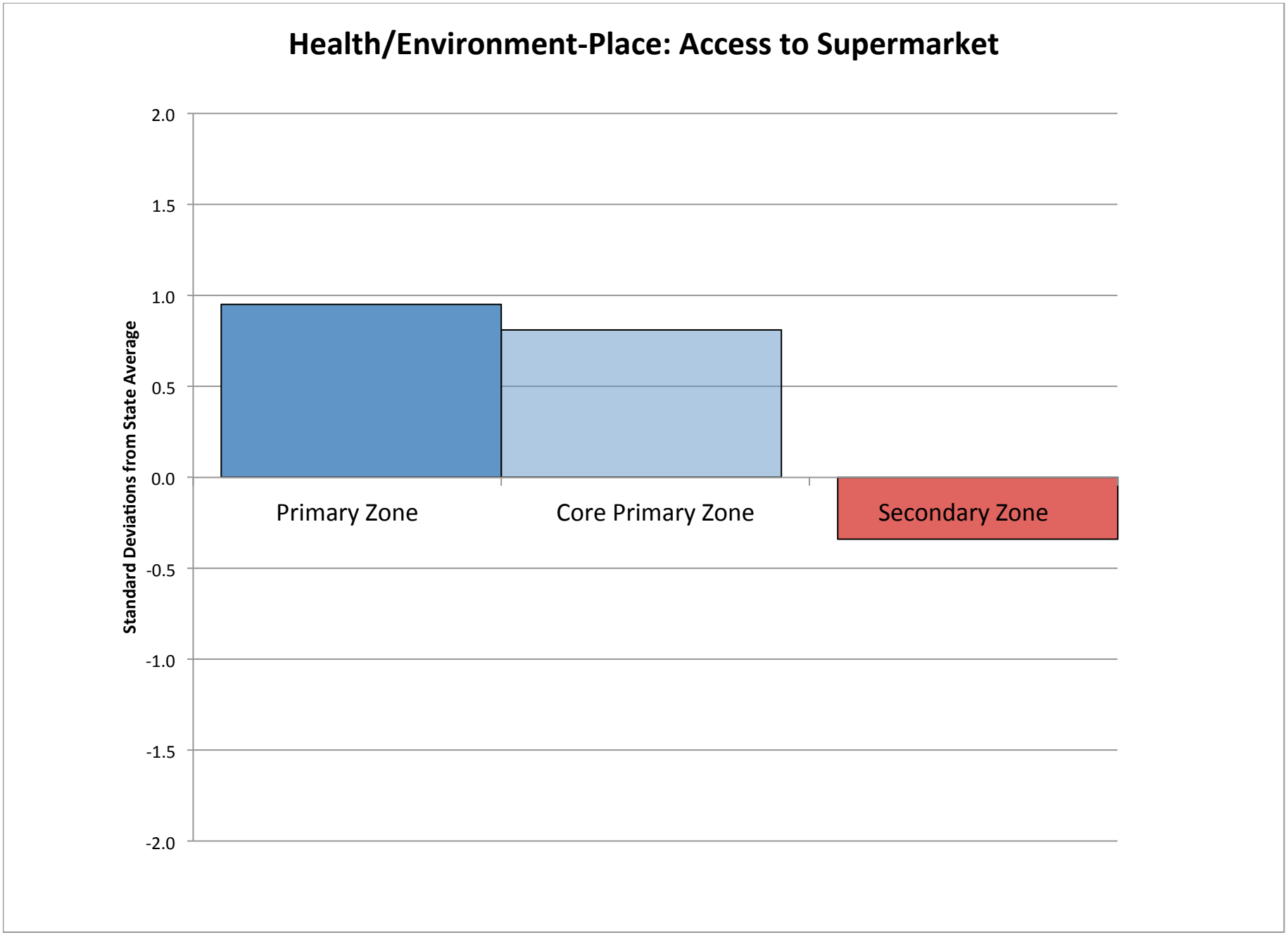

Economy-Place: Business Growth
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

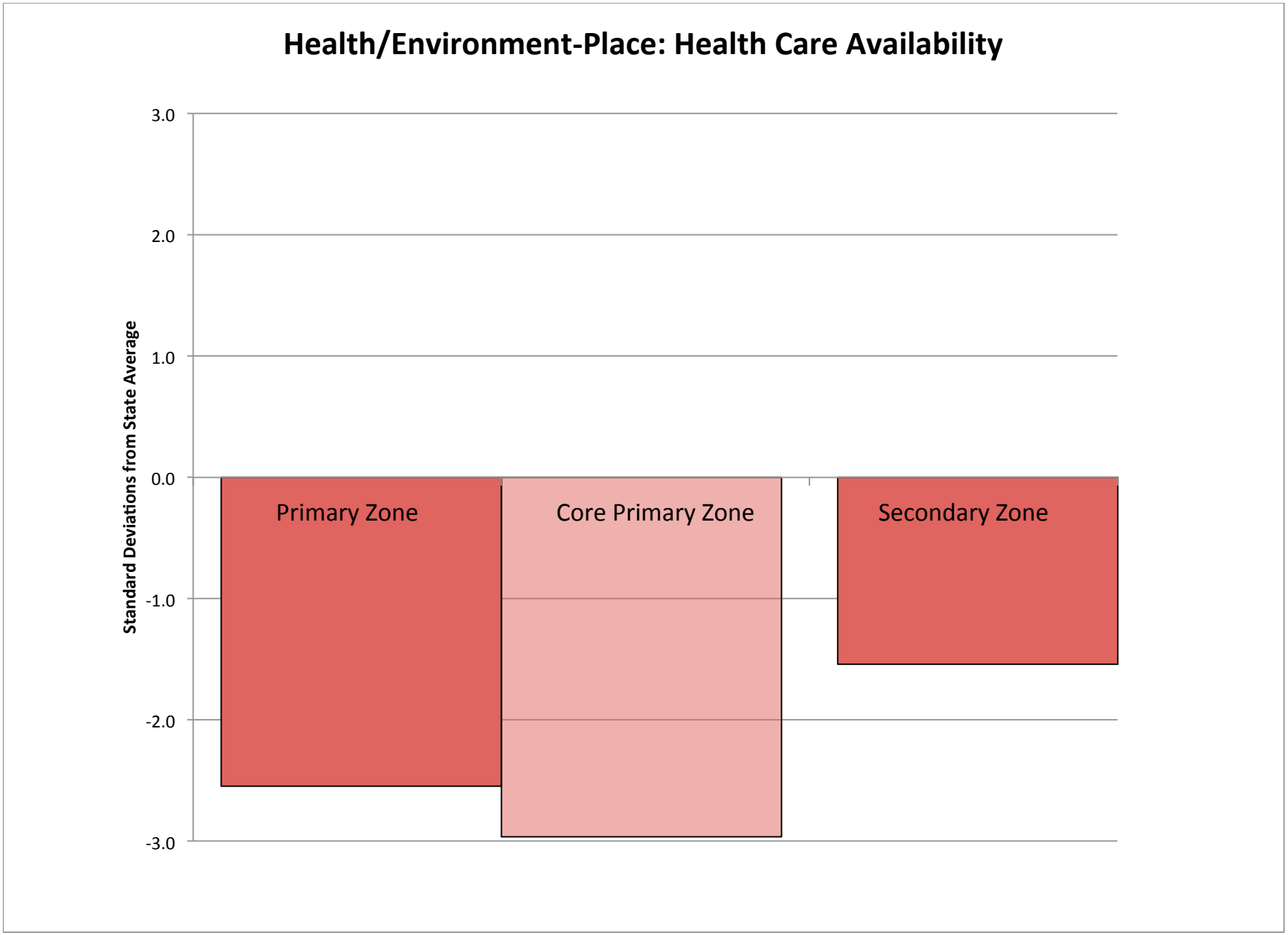

Housing-Place: Housing Adequacy
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

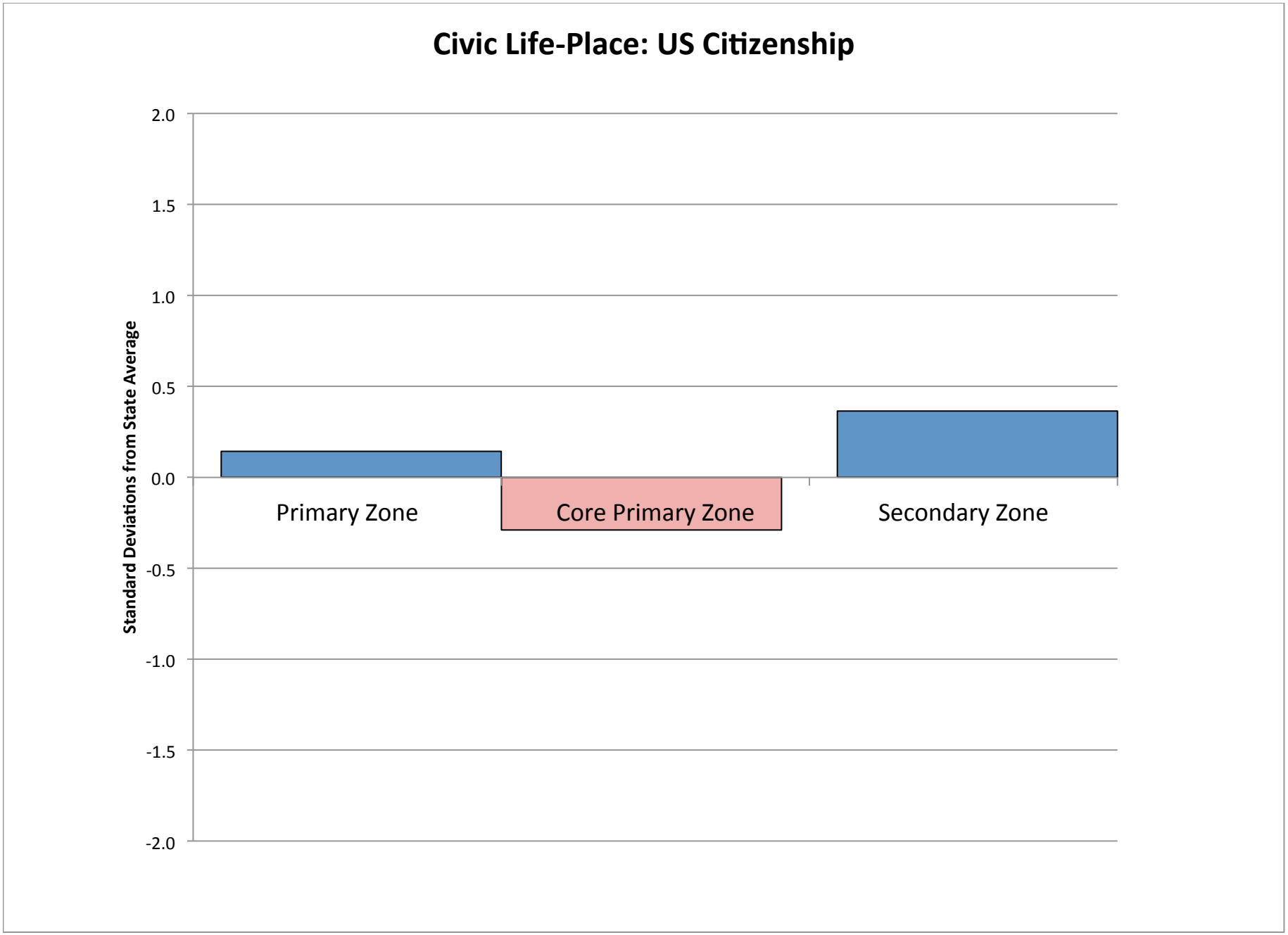

Housing-Place: Housing Affordability
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone

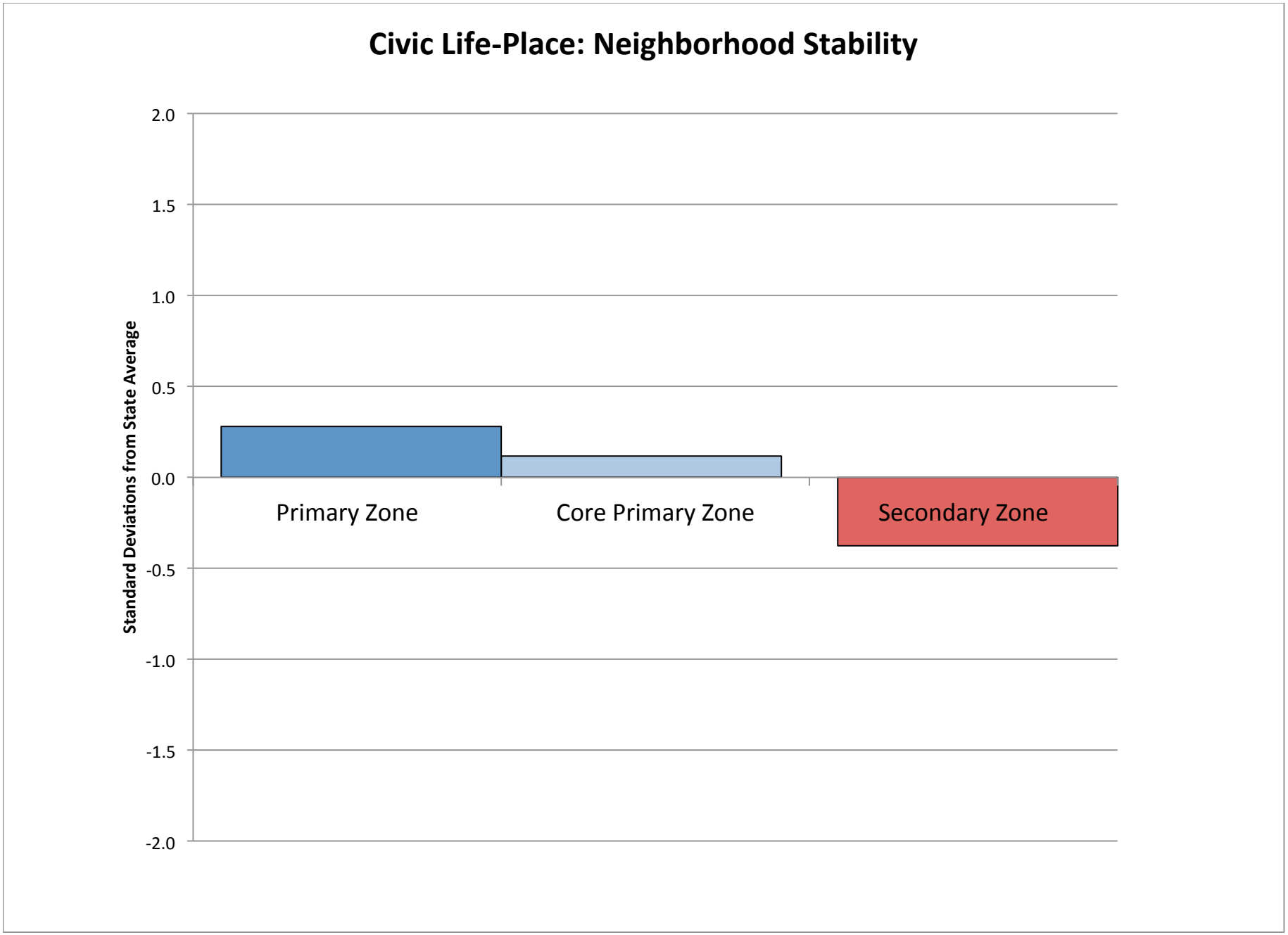

Health/Environment-Place: Air Quality
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Health/Environment-Place: Prenatal Care
Standard Deviations from State Average
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
Primary Zone
Core Primary Zone
Secondary Zone


Health/Environment-Place: Access to Supermarket
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Health/Environment-Place: Health Care Availability
Standard Deviations from State Average
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
Primary Zone
Core Primary Zone
Secondary Zone


Civic Life-Place: US Citizenship
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone


Civic Life-Place: Neighborhood Stability
Standard Deviations from State Average
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Primary Zone
Core Primary Zone
Secondary Zone