

Human Use of Restored and Naturalized Delta Landscapes

**Brett Milligan
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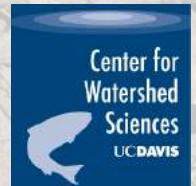
Contents

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Executive Summary

- | | |
|---|----|
| 1. Introduction | 7 |
| 2. What are Restored and Naturalized Landscapes? | 12 |
| 3. Planning Review | 20 |
| 4. Delta Law Review | 26 |
| 5. Law Enforcement Review | 32 |
| 6. Restored and Naturalized Places | 38 |
| 7. Enacting Delta Landscapes: Sanctioned and Unsanctioned Use | 46 |
| 8. Planning and Designing for Delta Wilds | 66 |

References

- | | |
|----|--|
| 1 | |
| 7 | |
| 12 | |
| 20 | |
| 26 | |
| 32 | |
| 38 | |
| 46 | |
| 66 | |
| 73 | |



Cosumnes River Floodplain Restoration

Part of the larger Cosumnes Preserve, this levee setback project sits adjacent to Twin Cities Road, agricultural lands and a sand mining operation

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Brett Milligan and Alejo Kraus-Polk
University of California, Davis
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EXECUTIVE SUMMARY

A photograph of a white boat with a green stripe and a canopy docked at a riverbank. Bare trees are reflected in the calm water. The sky is clear and blue.

APPROACH & PROJECT DESCRIPTION

Current legislation and state plans for the California Delta call for large-scale restoration of aquatic and terrestrial habitats, which will require significant changes in land uses and cultural patterns to achieve. Yet landscapes that are restored for habitat for other-than-human species will remain subject to human uses. This report looks at how human presence can and will continue after restoration, and considers how these uses can be best reconciled with cultural, ecological and adaptive management goals.

Our one year study builds off other research projects that have explored the California Delta from an integrative human-environment perspective. It uses a landscape planning approach that attempts to push beyond single sectoral methods, seeking a holistic integration of multiple goals and land use agendas spanning across ecological, social, economic and political domains.

This report's findings are based on surveys, interviews, review of existing Delta planning literature, field work and specific landscape case studies. In general, our research supports the advancement of a reconciliation approach, which seeks synergies between ecosystem needs and the desires of those who live, work and play in the Delta, both now and in the future.

FINDINGS

Restored and naturalized landscapes are expanding in the Delta.

- Legislation, state plans and regional initiatives all call for large-scale restoration of aquatic and terrestrial habitats to improve ecological health and functioning of the Delta.
- Unplanned events may also contribute to this expansion. Levee failures may convert lands from their reclaimed status. Many of these unplanned landscapes would be different from historical precedents due to changes such as subsidence.

Such rewilded landscapes have always been, and will continue to be strongly affected by human use, presence and management.

- All Delta wilds reflect their former use and domesticated state, which is predominantly agricultural.
- Most of these “restored” landscapes will actually be novel and unprecedented in their ecological assembly given their feral nature, the nearly complete human alteration of the Delta, and accelerated rates of climate change.
- In the future, more people are likely to live near the Delta. Though low in population density, the legal Delta is surrounded by a vast and expanding ring of urbanization.
- These landscapes are human places as much as they are ecosystems. They have a long history of usage for subsistence, recreation, illicit and unregulated activity, and more recently, for science.
- Human uses of these landscapes will remain diverse and pervasive for all these reasons.

Restored and naturalized landscapes are often subject to multiple and conflicting uses and values.

- Human experiences and cultural practices are typically marginalized in restoration planning, yet they have significant ecological effect on these landscapes. Politics, laws, ways of living, and territoriality all play a role in making and enacting what these places will be.
- Science and restoration goals are one set of values among many. What a restored or naturalized landscape means to scientists and researchers can differ from that of Delta farmers, residents and people recreating in the Delta, as meaning and values are based on diverse experiences, needs and practices. Other values need to be factored in, as they directly affect the performance of restoration efforts.
- Accounting for these values and uses is complicated by the unique and dynamic nature of Delta landscapes themselves, and the manner in which we have radically altered them. Rates of geologic, infrastructural and socio-ecological change are accelerated in the Delta, a condition that all human cultures have difficulty reconciling.

Reconciling human uses with ecological restoration will require more comprehensive planning and design.

- Design for multi-purpose/multi-benefit landscapes rather than single purpose projects - not just for other species, but humans as well.
- Plan inclusively for multiple beneficiaries. Community involvement and participation in restoration planning and design is critical for long term success.
- Recreational and other human uses should be integrated into restoration planning from the very beginning, rather than as an afterthought. Recreational uses can increase the value and support for these projects, contribute to the local and regional economy and deter undesirable and unsanctioned uses.
- Plan for regional connectivity (landscape networks): the scale and spatial distribution of restored landscapes matters in terms of access and ecological function, which impact management and design.

Funding for recreation and human uses in restoration planning is an important investment in the long term. It is also recommended in the Delta Plan.

- Design and management choices made at the beginning of a restoration project have a strong bearing on future relationships and conditions that will emerge. Effective planning can anticipate, channel and accommodate human uses. Failing to account for human use and place values tends to lead to problems and unintended uses.
- Planning and designing for human uses at the outset of a project will cost more initially, but should increase return on the investment in the long term.
- Design to accommodate diverse user experiences, desires, and aesthetics. Doing so builds stronger constituency and public appreciation for these landscapes.

Human uses of restored landscapes should be integrated into adaptive management efforts.

- The Delta Independent Science Board Adaptive Management review posits that a, “more holistic and integrated approach to science based adaptive management in the Delta is needed to face both current and future challenges” (DISB 2016).
- Like the dynamic nature of the Delta’s ecology, human uses are not determinate and vary with geographic contexts and across time.
- The Delta’s unique geography necessitates human use studies specific to the Delta’s landscapes.
- Human uses can be compatible with restoration objectives. Through effective and creative management, such uses can actually support and advance restoration efforts.

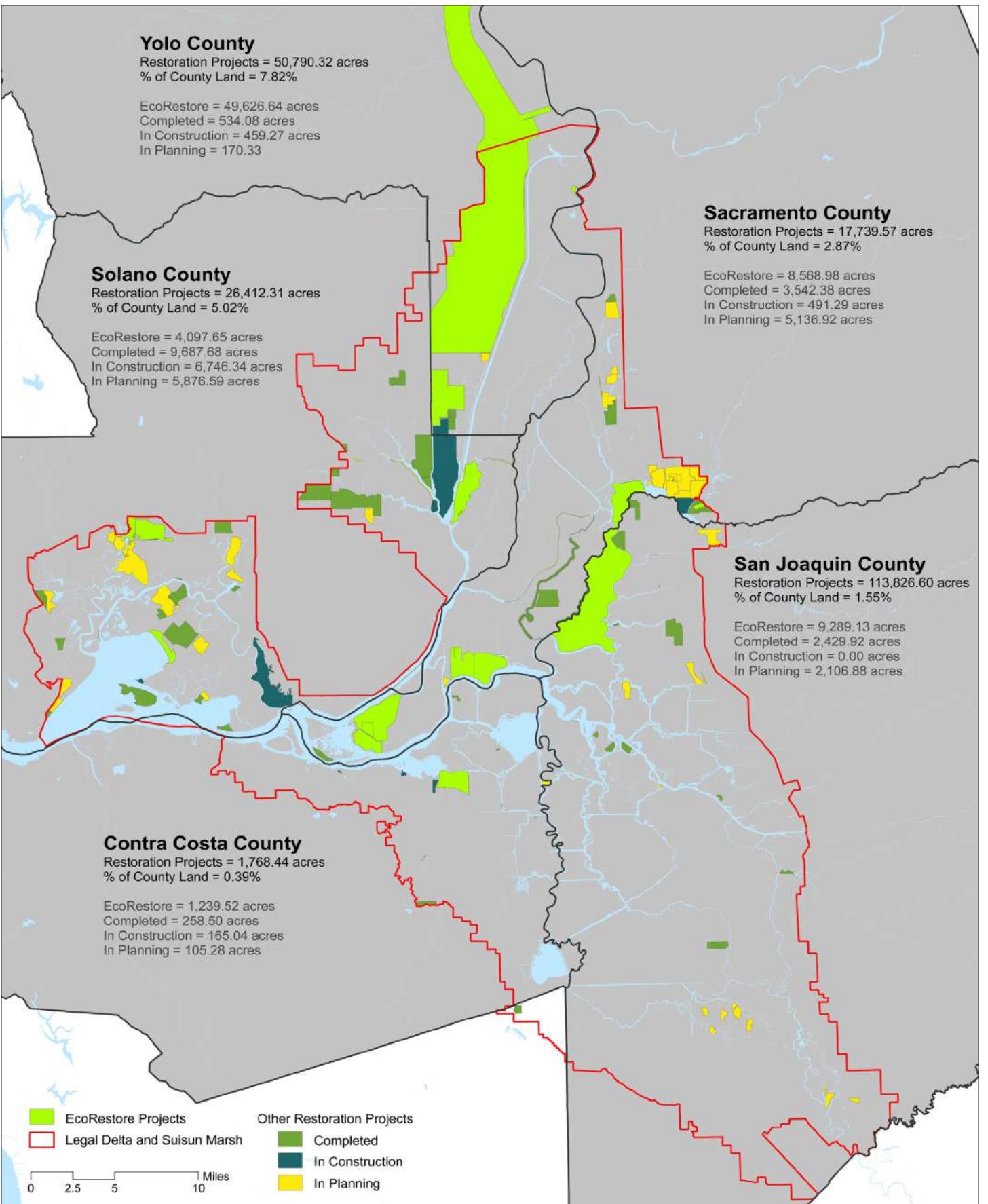
The public is an overlooked asset and advocate for restoring and monitoring Delta landscapes.

- The Delta’s novel ecologies and efforts to guide them, should be highlighted, rather than be obscured in Delta literature, marketing and advertising.
- Citizen science offers a range of win-win methods to collect broader low-cost monitoring data. It offers science an avenue for greater public acceptance and understanding of its goals. Citizen science is almost non-existent in the Delta yet it is widely and successfully practiced in the San Francisco Bay Area. Experimentation with citizen science should be a Delta science priority.
- A variety of interactive, real time, and geolocative digital media is available to users and visitors of the Delta. We could be much more creative in the use and application of such media for fostering awareness and stewardship of Delta restoration efforts.



**Yolo Bypass Wildlife Area,
Fall 2015**

The Yolo Bypass exemplifies a multifunctional restoration landscape, combining flood control with farming, ecological habitat and a variety of recreational opportunities. Efforts are underway to retrofit the floodway infrastructure to allow more frequent and longer flooding to improve habitat for aquatic species. In turn, these changes will affect other uses in the Bypass.



Restored Landscapes in the California Delta: Current and Planned

Map shows proposed EcoRestore projects and all other restoration project that are completed, in progress or in planning. Total acreages within the Delta are divided up by county. Data from the California Department of Water Resources and EcoAtlas.

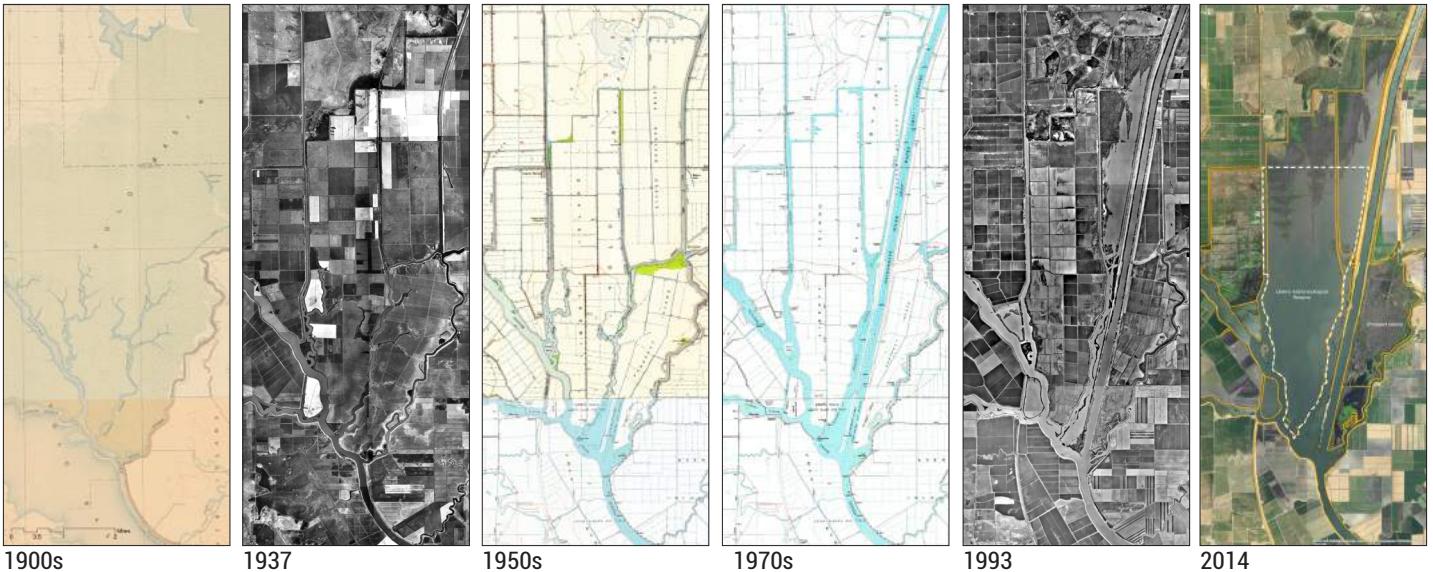
TARGETED RECOMMENDATIONS

At a federal level, government and agencies can facilitate support and funding for restoring landscapes holistically in the Delta. As an example, the potential establishment of a National Heritage Area (currently proposed by the Delta Protection Commission, recommended in the Delta Plan, and now before Congress) could be a significant and long term source of funding for multi-benefit projects. Federal agencies are increasingly called upon to work more collaboratively with one another to generate multi-benefit projects and landscapes. The recent Yolo Bypass and Cache Slough memorandum of understanding (MOU) is a promising example of such increased efforts across agencies with different missions. The US Fish and Wildlife Service and US Army Corps of Engineers could engage in similar MOUs elsewhere in the Delta.

Much of the work of integrating human uses into Delta restoration projects needs to occur at the state and regional level of governance and policy making, as this is where most restoration programs and mandates are housed. We recommend that state government and Delta agencies allocate more funds for human aspects of restoration, which will pay for itself in long term benefits. In particular, more resources need to be set aside and dedicated for planning and implementation of human use within ecological restoration projects. At the highest levels of state planning for the Delta, such as the Delta Stewardship Council, there is no representative, expert, or 'champion' for reconciling human uses within restoration efforts. Thus when these issues arise, they are not addressed internally, but often passed off to other agencies, who are not integrated into top level planning discussions. When proponents of human uses are fragmented between recreation, scientific monitoring, adaptive management, agriculture, etc. the ability to manage for multiple objectives is compromised. There is a strong need for internal and high level expertise able to facilitate and oversee planning for multiple human uses of Delta wilds. Policy for integrating human uses in restoration efforts lack efficacy and implementation in the Delta because they currently exist as recommendations, rather than mandates. The San Francisco Bay and Suisun Marsh provide examples where such policy has more teeth and thus more tangible results and benefits. This same type of integration is needed in adaptive management efforts in the Delta, where entities such as the Interagency Adaptive Management Implementation Team (IAMIT) can strive to include human uses as part of adaptive management efforts.

"Delta as Evolving Place" (CA Water Code 85054) is underconsidered in Delta planning. Within restoration practices and the Delta's novel ecologies - where the evolving and socio-ecological change is happening the quickest - evolving place is more or less non-existent as an area of focused research. This should be changed and human use dimensions of adaptive management and implementation should be advanced in the Delta science agenda.

Recreational use is encouraged in restoration projects by the Delta Plan, yet the language there is thinner than it should be and actual follow through has yet to be significantly realized. Likewise, California State Parks is extremely underfunded. Restoration-oriented monies could be made available based on the understanding that there is an ecological impact to some unsanctioned uses which



Evolution of Liberty Island: 1900 - 2014

The sequential series of maps show Liberty Island's transformation from marshland and sloughs, to reclaimed agricultural fields, to hydro modification by the Sacramento Shipping channel, to re-naturalized landscape "reclaimed" as an ecological reserve. We make a distinction in this report between restored landscapes (those that are deliberately converted to ecological habitat) and those that are naturalized (accidentally or inadvertently rewilded). Liberty Island is a naturalized landscape, as it was created by a levee failure, yet it has become a model for ecological restoration, such as for the McCormack-Williamson Tract. Historic Survey data and 1937 ortho imagery from the San Francisco Estuary Institute.

could be mitigated by enhanced recreational and educational opportunities. Ecological restoration initiatives, such as EcoRestore, should continue to integrate and fund participatory restoration planning, such as the Delta Dialogues and Delta Restoration Network pioneered by the Delta Conservancy, and the current Delta Conservation Framework.

At the County level we recommend increased solicitation for funding for county parks, recreational enhancement projects such as the regional trails initiative (a component of Great California Delta Trails), and local enforcement agencies, such as County Sheriff's Departments. Furthermore, we recommend that counties support volunteer and community based stewardship practices, such as friends groups.

CONCLUSION

We suggest a significant shift in how restored Delta landscapes are conceptualized and considered in planning, policy and design efforts. We advocate for an approach in which human presence is understood as integral to these landscapes. Doing so will make restorative efforts more realistic and effective.

Reconciling human uses with restoration objectives will require a more holistic type of stewardship. These landscapes harbor multiple values – economic, ecological, scientific, and recreational – all of which will need to be effectively integrated within them. Enhancing and planning for human use experiences – both work and play – has the potential to support and reconcile these managerial issues of concern. Adaptive management efforts, combined with adequate resources to perform them, should play a critical role in the present and future of restored and naturalized Delta landscapes.

We believe this shift in approach is timely. As restoration efforts gain momentum and expand through multiple initiatives, it will be needed. A 2016 DISB report on adaptive management and the IEP Delta Science Agenda both signaled the need to integrate human factors as we go forward in designing for ecological recovery in the Delta. Yet there is a considerable void in the literature and in stakeholder conversations on the topic. We hope our study is useful in providing a strong rationale for why human dimensions of adaptive management are needed in these efforts, and why giving them more rigorous consideration can assist in meeting these goals. Additional research and interdisciplinary science is needed to inform decisions on when, where and how human adaptive management can be integrated into larger planning, design, and management frameworks. We see much potential in management and implementation practices to support both "doing" (i.e. recreational enhancements, law enforcement, landscape design, access experiments, etc.) and "learning" (monitoring, in-situ user surveys, and data analysis, etc.). Ideally, the two processes are integrated into a management practice which includes robust feedback between "on the ground" conditions and management strategies and policies.



Entrance Gate to Liberty Island, 2015

Chapter 1: Introduction

SUMMARY

Current legislation and state plans for the California Delta call for large-scale restoration, which will require significant changes in land uses and cultural patterns. Yet landscapes that are restored will involve and alter human uses. This report looks at how human presence and uses can and will continue after restoration, and considers how these uses can be reconciled with ecological and adaptive management goals.

In a year of intensive study, we observed that human use is endemic, plentiful and highly diverse across the Delta's restored and naturalized landscapes, including waterways, levees, and tracts. Activities range from land management, to scientific research and monitoring, to recreation, and a variety of unsanctioned uses and law enforcement efforts. The Delta's restored and naturalized landscapes are unavoidably peopled, both by design and geographic context. Here we define naturalized landscapes as those which have been unintentionally rewilded, such as Liberty Island in the north Delta, flooded since its levee breach of 1998. In contrast, restored landscapes, are areas where the transition to environmental habitat for other species and ecosystem services is intentional and planned.

We examined specific restored and naturalized landscapes in detail, and found a variety of situations where human uses and ecological functions appear to be compatible. We also encountered many cases where uses compete or conflict and degrade the ecological functioning and aesthetics of the environment. In most cases a range of contextual factors could be identified, including some management and planning decisions, which led to the current conditions. Other contributing factors relate to the disposition of plants (such as water hyacinth), animals (including humans) and biogeophysical processes to act in several, sometimes unpredictable, ways.

Perception of human uses spans from necessity, such as the work of doing restoration and monitoring, to undesirable nuisances, such as poaching of wildlife and illegal dumping of refuse. Perceptions can vary considerably depending on the context and the socio-political position of those involved.

Most Delta planning literature lacks depth and specificity with respect to human uses of restored and naturalized landscapes, both currently and for the future. These landscapes are largely envisioned as lands only for endangered fish, threatened wildlife and other non-human organisms. Empirically, this approach is unrealistic. Recreation is sometimes discussed and promoted. But recreation plans are peripheral to many restoration discussions and without substantial funding to plan, design, implement, and support.

Public recreational uses are mandated in the codified Delta Plan, the recent plan of all plans for the Delta. Additionally, given intricacies and public provisions in California's laws, as well as the public monies invested in making restored landscapes, the public arguably has a right to access at least some of them. If not planned and accommodated, public access and uses will likely occur anyway, but in a haphazard and potentially unsafe way. Unsanctioned uses may have more environmental impact than managed use and the construction of dedicated public facilities. Given these findings, there is much room for improvement and greater creativity in designing for human uses of restored landscapes, and to insure that a freedom to enjoy these landscapes is not destroyed by its abuse.

We recommend a more inclusive approach to planning, designing and stewarding these landscapes. This recommendation is based on our findings that those Delta restoration and rewilding projects that emerged out of community and multi-stakeholder engagement often seem to be the most effective across a range of performance criteria, which included human use. We also found that citizen science is nearly non-existent in the Delta, which is remarkable given the Delta's novel, dynamic and much studied ecosystems. In the adjacent and connected San Francisco Bay Area, citizen science, civic ecology has been valuable (Ballard et al. 2016; McKinley et al. 2015). It also might have other benefits, including a "positive bystander effect", the cultivation of land stewardship and land/water ethic, inspiring responsibility, and imbuing a "sense of place" (Smith 2013; Snyder 1993). The Delta has much opportunity (and need) for more creative and multifunctional monitoring of restored landscapes.

Nearly all current marketing for the Delta steers clear of its ecological novelty. This should be significantly changed. By informing the public of the Delta's distinctive and radically altered ecology, and the massive human efforts that go into trying to recover some of its species (along with wine tasting and cultural history), broader public engagement with these efforts might occur. Foregrounding the Delta's complex challenges and connecting this with global issues related to sea level rise, global warming, land use change, species extinction etc. has the potential to mobilize people.

The data gathered in this study suggests some general patterns and trends in human use, which we detail in our discussion. However, this study is preliminary and this topic would benefit from further research. Little is known about how different human activities affect the ecological processes of these landscapes. Some uses, such as illegal marijuana plantings, are ecologically damaging and threaten public safety. Other uses, whether sanctioned or unsanctioned have less clear impacts, such as recreational ATV use within a sandy and seasonally dry river bed, such as the Cosumnes River (just east of the legal boundary of the Delta). In our discussions

Open water of Big Break Regional Shoreline, Summer 2015

Antioch Bridge can be seen in the distance. Formerly reclaimed farmland, this landscape was inundated in 1928 due to a levee failure. It has been a tidal lake ever since.



Navigating the dynamic tidal channels of Liberty Island, Summer 2015

with land managers, park planners and restorationists, questions persist around carrying capacity and bystander effects. There was a general admission that these issues have not been subject to scientific study, and that both qualitative and quantitative data is sparse to nonexistent. However, there were strong feelings that human presence on the landscape can, in places and times, dissuade undesirable activities.

APPROACH

Making conservation sustainable requires casting it in a landscape context, incorporating the places where people live and work as well as those places under protection, and doing so in a way that considers landscape changes over time. This will compel conservationists to work with sociologists, land-use planners, economists, and landscape ecologists to understand the factors that drive land use and land-use change at landscape, regional, and global scales and to define when and where those human actions are compatible with biodiversity conservation and when and where they are not (Wiens 2008).

Our work builds off other work that has explored the California Delta from an integrated human and ecological uses perspective, such as Thompson's Settlement Geography of the Sacramento-San Joaquin Delta, Jane Wolff's Delta Primer, and the Public Policy Institute of California's Envisioning and Comparing Futures for the Sacramento-San Joaquin Delta studies (Thompson 1957; Wolff 2003; Lund et al. 2010; Lund et al. 2007). The Delta Protection Commission's recent Delta Narratives Project, "a collaborative project involving regional academic and cultural institutions" designed to "communicate the historic and cultural importance of the Delta region in California's - and America's - history, through multi-format educational exhibits within and around the Delta" has been particularly strong in the socio-technical histories, multiple place values and cultural legacies that exist in the Delta.¹

This study, takes a comprehensive landscape planning approach. Generally such an approach attempts to go beyond single sectoral approaches to land use activities (predominant in many resource management and conservation fields) and seeks a integration of multiple goals and agendas spanning ecological, social, economic and political aspects (Freeman, Duguma, and Minang 2015). Freeman et al identify 5 general concepts for putting a landscape approach into practice: multifunctionality, transdisciplinarity, participation (by multiple stakeholders), complexity, and sustainability (2015). Sustainability is perhaps the vaguest of these concepts and one that generally places too much emphasis on stable states (the antithesis of what one encounters in the Delta). In place of sustainability we suggest thinking more in terms of resiliency and reconciliation. We see resiliency as preserving options in light of unpredictable socio-ecological changes. We see reconciliation in the context of reconciliation ecology, defined as, "the science of inventing, establishing and maintaining new habitats to conserve species diversity in places where people live, work and play" (Rosenzweig 2003).

The landscape approach has grown in recent years, as evidenced by its discussion in the National Academy of Sciences (Sayer et al. 2013) and its adoption by the U.S. Bureau of Land Management² and forestry agencies. In the Bay-Delta specifically, its application is evidenced in the San Francisco Estuary Institute's Resilient Landscapes Program³ and the Delta Conservancy's Delta Restoration Network/Restoration Hub concept.⁴ The landscape approach employs landscape ecology, an interdisciplinary field, to integrate biophysical and analytical approaches with humanistic and holistic perspectives across the natural sciences and social sciences.



Diagrams of expanding Delta levee design standards and new design prototypes that blend flood control with habitat creation

METHODS

We used various methods for this investigation, including (1) review and analysis of existing relevant Delta planning documents, (2) a questionnaire distributed to Delta land managers, scientific researchers and landowners which asked about the perception of human uses and boundaries of these landscapes, (3) about thirty-five semi-structured interviews with a broad range of Delta land managers, scientists and agency representatives, totaling about fifty hours of material, (4) GIS mapping, (5) case studies of specific local Delta landscapes, and (6) extensive field work. This mixed methods approach allowed for comparison and cross-checking of findings across these research methods. Noteworthy discrepancies in results between these methods are mentioned in the report.

Field work was essential to "ground truth" the research. It is difficult to encounter human use as a detached bystander. Field work consisted of guided tours of landscapes, car trips, walks and kayaking on Delta waterways, marshes and flooded tracts. The field work is documented through photographs and text.

REPORT STRUCTURE

We begin by defining our terminology and what restored and naturalized landscapes are in the California Delta (Chapter 2). We distinguish between *restored* and *naturalized* – between the deliberate and managed versus the inadvertent and feral; a qualitative distinction relevant in the Delta given that it is highly engineered and managed. We then identify three broad restored and naturalized landscape types: waterways, levees and tracts. We use *landscape* broadly to include all Delta habitat types, firm ground as well as watery marshes. Having defined the territory, we then take stock of the variety of Delta science, planning and other literature with direct bearing on the potential futures of these landscapes (Chapters 3, 4, and 5). The importance here is to synthesize current actions, mandates, scenarios and planning propositions that will influence the traits and scale of restored and naturalized landscapes in the Delta. We distill this information to launch a chapter which reframes how these landscapes are typically approached (Chapter 6). This is our most theoretical chapter. Here we situate restored and naturalized landscapes as cultural and socio-ecological spaces, rather than as something "natural" or outside of the human sphere.

Within this frame we present our preliminary findings of the human use of restored and naturalized landscapes in the Delta (Chapter 7). Finally, we discuss implications of these findings for planning and management efforts (Chapter 8).

Notes

1 Delta Protection Commission, http://www.Delta.ca.gov/Delta_Narratives.htm. All essays and other outcomes from this effort are available at this website.

2 U.S. Bureau of Land Management http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach.html#appr

3 San Francisco Estuary Institute <http://www.sfei.org/cb>

4 Delta Restoration Network, Restoration Hub Overview, Delta Conservancy, <http://Deltaconservancy.ca.gov/docs/AI10.1DeltaRestorationNetwork>, RestorationHubOvervieiw.pdf

2: What are Restored and Naturalized Landscapes?



Tidal marsh formation on the former Liberty Island Tract, 2015
Prior to a final levee breach in 1997, all of this landscape was farmland.

CHAPTER 2. WHAT ARE RESTORED AND NATURALIZED LANDSCAPES?

All Delta settings have been highly modified by humans (Norgaard 2013; van Staveren and van Tatenhove 2016; Renaud et al. 2013). Nearly all “naturalized” and “restored” landscapes in the Delta are of a feral quality, meaning they exist in a wild state after intentional release or escape from domestication by human land uses. Domestication has been extreme: 98% of the Delta was transformed from what it was prior to European colonization and land reclamation (Robinson et al. 2014).

Based on this cultural and environmental legacy, we define naturalized landscapes as having been unintentionally or accidentally rewilded, such as Liberty Island in the North Delta, which became a tidal marsh and open water habitat (and recently an ecological reserve) after its final and unrepaired levee breach in 1998. This new landscape was largely unintended, although it has been partially shaped by subsequent restoration and mitigation projects. In contrast, “restored” landscapes, have had intentional and planned transition to environmental habitat for other species and ecosystem services.¹ An example of a restored landscape can be found in the impending conversion of the McCormack-Williamson tract from farmland to floodplain. The McCormack-Williamson tract restoration has been informed by Liberty Island’s naturalized ecology, but rather than happening by accident, the project has been negotiated through nearly two decades of planning and design. Differences in how naturalized and restored landscapes come to be bears strongly on their formative characteristics, such as when or if they occur, the ecological assemblages that develop within them, and whether human uses are planned or emerge spontaneously.

We use *Delta wilds* as shorthand for encompassing both restored and naturalized landscapes. We mean wild in the sense of feral, no longer fully domesticated, and consistent with reconciliation ecology. We broadly categorize Delta wilds by their physical characteristics, ownership, and legal status. These three categories are waterways, levees, and tracts.



Naturalized human-constructed waterway with riparian vegetation, Liberty Cut, summer 2015.

WATERWAYS

Waterways are critical habitat for fish, birds, plants and humans in the Delta, yet the complex of sloughs, channels, marshes and ‘lakes’ of the Delta, are outcomes of the Delta being diked, drained and channelized. Today these waterways are much deeper, wider, straighter, rip-rapped, and much less dendritic than in pre-reclamation times (Robinson et al. 2014).

These altered waterways are now eight to ten percent of the Delta. Due to their navigability and tidal influence, access to Delta waterways is a constitutional right. Such open access contrasts with the drier Delta lands, which are largely private. Given their accessibility, waterways are the most common and densely used of the three types of restored and naturalized landscapes. The Delta’s waterways have evoked comparison to the Bayou country of the Mississippi River Delta. Charles Bohakel in his 1979, The Historic Delta Country: A Guidebook to State Highway 160 - The River Road writes,

Delta Country has the ability to bring forth the memory of steamboats and the adventurous life of Huck Finn. The Delta, with its 700 miles of navigable waterways, has been referred to as the “Everglades of the West”, “America’s Holland”, Slough and Dike Country,” and I would like to call it the Bayou of the West” Life along the Delta has always been associated with water. (3)



Impromptu weekend bank fishing off a Sacramento River project levee, Lower Sherman Island, Fall 2015.

Before reclamation, the Delta was a more dynamic inland sea. The vast riparian floodplain of the Sacramento and San Joaquin Rivers would frequently fill with water during the wet season, flushing fresh water out to San Pablo Bay, and then recede during summer and times of drought. This was an essential dynamic of the former Delta.² California’s extensive water infrastructure, as well as laws intended to balance the protection of native species with reliable water exports, has greatly muted this dynamism, lending current waterways a more fixed presence. An extensive network of levees now firmly separates Delta waterways from spreading back across their former floodplain.

LEVEES (DIKES)

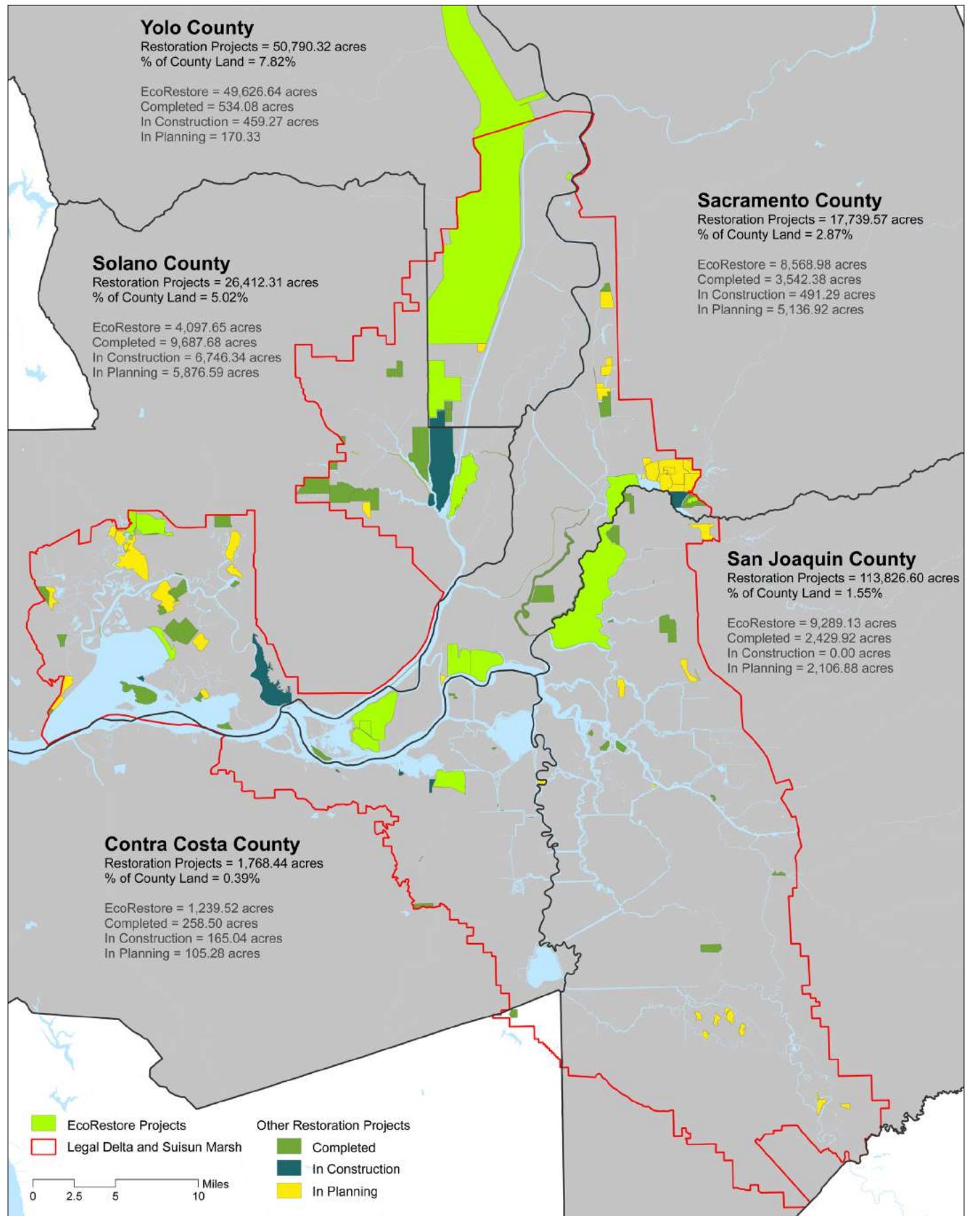
The Delta’s current engineered levees bear little resemblance to their pre-reclamation antecedents. The Delta’s pre-anthropogenic levees were smaller, variable in size, far less extensive, and formed by riparian sediment deposition. This process differed greatly between the Sacramento River system, which had larger and more confining levees, and the San Joaquin, which, due to hydrology, created smaller, less confining levees, leading to more dendritic stream channels (Grossinger, Askevold, and Whipple 2012). Today’s levees are a more homogenous interface between water and land, built and maintained with varying adherence to different levee design specifications.³ These levees create distinct barriers between land and waterways throughout the Delta, with abrupt, steep slopes and rock covered surfaces.

Delta levees are subject to more complex access rules. Most Delta levees, whether “project” or “non-project”, are private property, over which flood control or drainage agencies have only an easement authorizing the levees’ construction and maintenance. Sanctioned use therefore is limited by private property owner to authorized construction and maintenance. Access to Delta levees for recreation remains a persistent issue, as access is generally prohibited.

Recent efforts have sought to broaden the flood reduction and water conveyance benefits of Delta levees to include provisions for aquatic and terrestrial habitat.⁴ New levee designs blur the distinction between land and water, adding complexity through levee setbacks, thickening levees (shallower side slopes), increased vegetation and other intentional designs to improve biological values to fish and terrestrial biota.⁵ With increased multifunctionality of levees comes ambiguity regarding public access and human uses. Levee setbacks expand the area available to tidal inundation and riparian flood waters, returning pre-reclamation public trust assets to public use (as ‘navigable waters’). Revegetation may provide environments for unsanctioned activities and occupations, such as illegal encampments and marijuana plantings, as well as habitat for undesirable species, such as gophers and other burrowing animals, which can threaten levee stability. Recent contention on access and use has coalesced around The Great California Delta Trail plan, which calls for a continuous recreational corridor trail network through all five Delta counties (placed on top of levees), linking the San Francisco Bay Trail system to the planned Sacramento River trails in Yolo and Sacramento Counties, pending funding availability.⁶

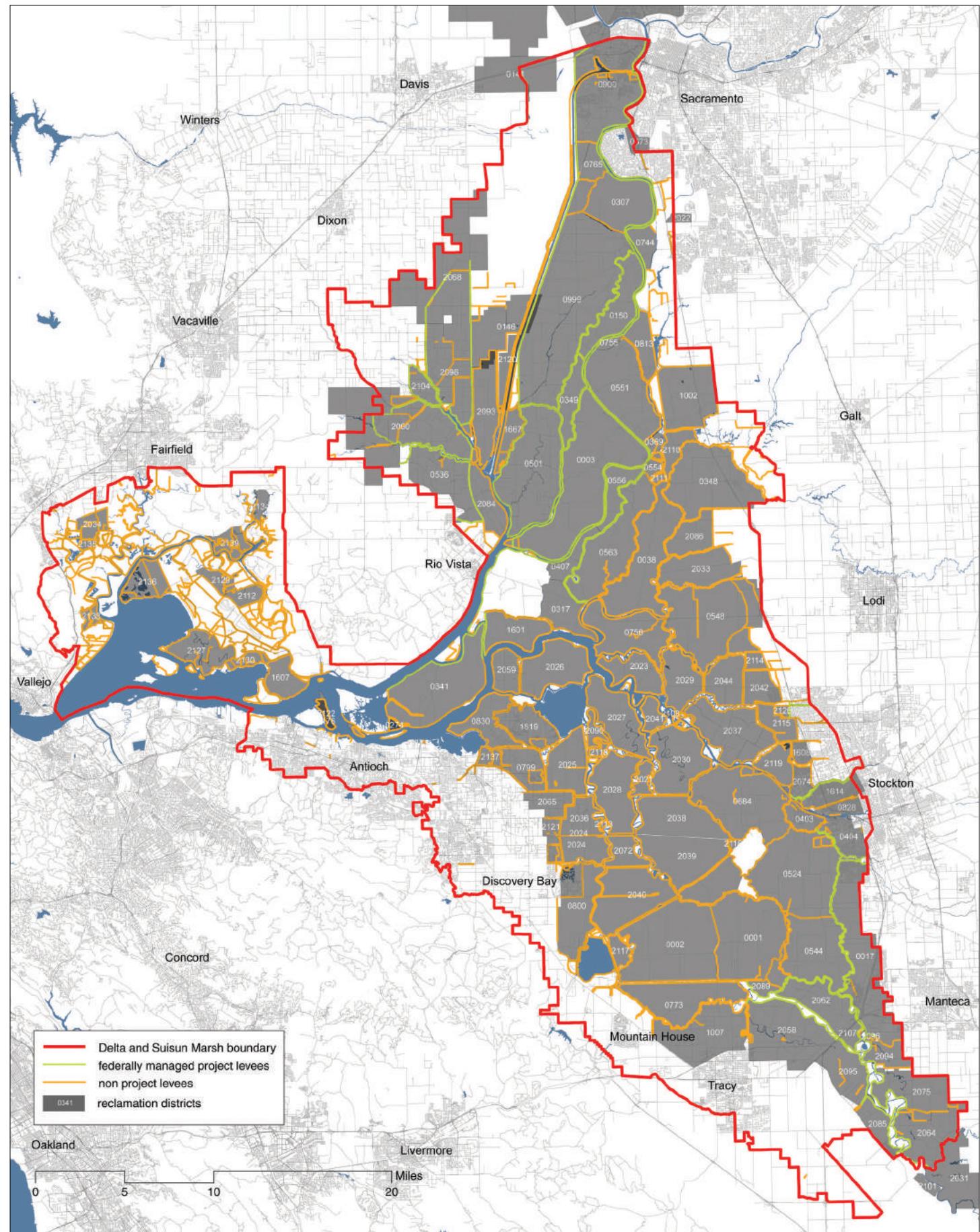
TRACTS AND POLDERS

The tracts are landscapes on the land side of levees, diverse in their ecology, ranging from tidal marsh, to riparian forest, to open water, to wildlife friendly farm field. They also include remnant riparian islands (non-leveed). They are diverse in their ownership, from private individuals and corporations, to public agencies (both State and Federal), and non-profit organizations. Management ranges from daily presence to almost no presence at all (such as on some of the smaller islands). These landscapes are diverse in origin by accident or infrastructural failure (naturalized), or intentional restoration efforts. Many naturalized landscapes are a product of unrepaired levee breaches. These include, Liberty Island, Mildred, Little Sherman Island, and Frank’s Tract. Examples of restored landscapes include, TNC’s Denier-Oneto restored floodplain site; McCormack-Williamson tract, Prospect Island, Dutch Slough and the Cosumnes Floodplain Mitigation Bank.



Restored Landscapes in the California Delta: Current and Planned

Map shows proposed EcoRestore projects and all other restoration project that are completed, in progress or in planning. Total acreages within the Delta are divided up by county. Data from the California Department of Water Resources and EcoAtlas.



Levees, Waterways and Urbanization

This map depicts the distribution and types of levees and reclamation districts within the Delta and Suisun Marsh, and their relationship to waterways, urbanized areas and roadways.



Engineered riparian channel and emergent floodplain habitat (left) and mature riparian forest (right), Cosumnes Floodplain Mitigation Bank.



Cranes on flood irrigated wetlands and lakes, Stone Lakes National Wildlife Refuge

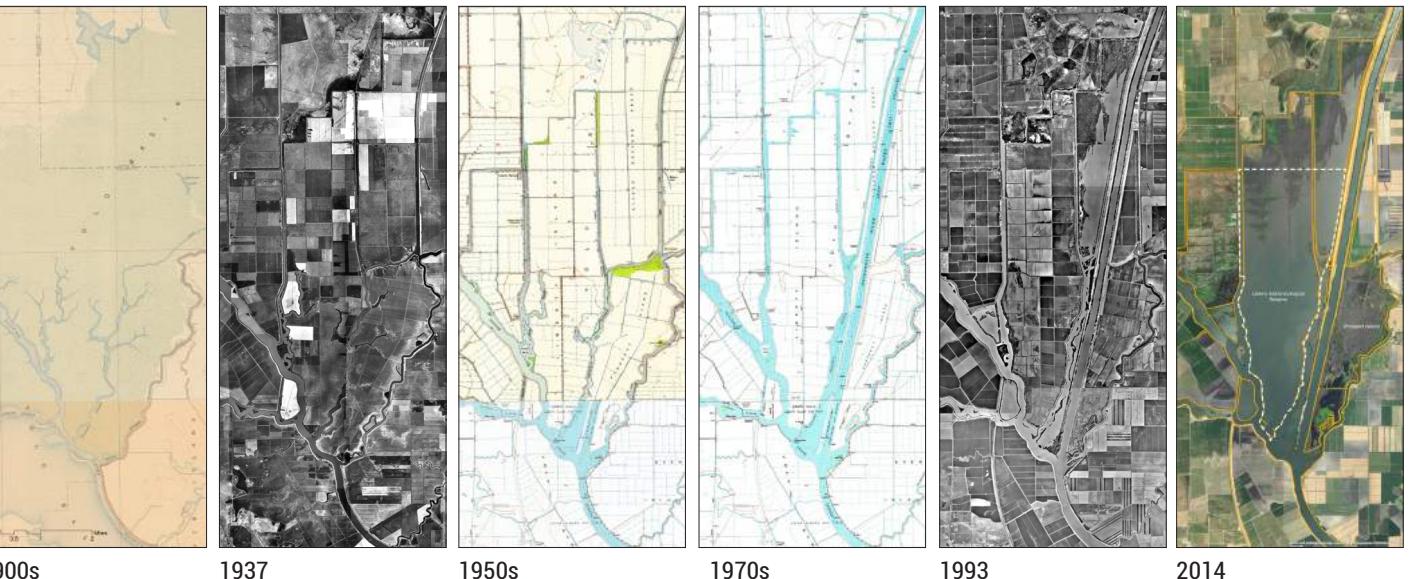


Urbanized edge of Bethel Island where it joins the inland lake/sea of Frank's Tract with remnants of former levees

SUMMARY

Delta waterways, levees and tracts are all subject to considerable change. The quality and quantity of water in the waterways will be influenced by climate change, sea level rise, drought, levee failures and repair, restoration activities and water export protocols. The geometry of the waterways may change due to tidal marsh restoration, levee setbacks, sedimentation, and dredging to further deepen shipping channels. New design and maintenance protocols for levees are embracing their multi-functional potential, and some levees are likely to be breached - deliberately or unintentionally - allowing the waterways to flow into tracts.

Overall, restoration and naturalization are likely to blur distinctions of landscape types, creating new hybrid conditions. For example, Frank's Tract is a vast open water body due to the subsided surface elevation of the landscape, ringed by feral remnants of former perimeter levees. Frank's Tract is managed as a recreation area by California State Parks, but it is also a part of the Delta's waterways. By design restoration will erode distinctions through efforts to hydrologically reconnect that which was made separate and distinct



1900s 1937 1950s 1970s 1993 2014

Evolution of Liberty Island: 1900 - 2014

The sequential series of maps show Liberty Island's transformation from marshland and sloughs, to reclaimed agricultural fields, to hydro modification by the Sacramento Shipping channel, to re-naturalized landscape "reclaimed" as an ecological reserve. We make a distinction in this report between restored landscapes (those that are deliberately converted to ecological habitat) and those that are naturalized (accidentally or inadvertently rewilded). Liberty Island is a naturalized landscape, as it was created by a levee failure, yet it has become a model for ecological restoration, such as for the McCormack-Williamson Tract. Historic Survey data and 1937 ortho imagery from the San Francisco Estuary Institute.

by levees. This restoration trend is not universal (subsidence reversal projects, tule farming, and irrigated duck clubs within leveed areas are contrary examples) but the trend is significant. Expanded transition zones or ecotones, such as those augmented by levee setbacks and restored floodplains, have significant ecological value (Opperman et al. 2010; Poff et al. 1997). These ecotones are also subject to fluctuation (i.e., episodic flooding, tidal movements) which determine access. Accidental naturalization due to levee failures, sea level rise, flooding or some combination thereof also may expand these hybrid zones. As implicated in our discussion of levees, these transition zones often correspond to ownership boundaries, where there are typically differences in management practices and protocols related to public accessibility, which may create new ambiguities and challenges for these boundaries.

This report assumes that restoration and naturalization of the Delta will expand in the coming decades, whether by regional planning initiatives, state mandates, impending infrastructural propositions (all expanded upon in the following chapter) or a transformative environmental event, such as a major flood or earthquake. We cannot predict these potential changes exactly. But we can look closely at the nature of the Delta's current restored and naturalized landscapes to speculate on how we might design and plan for their effective expansion. We hope that researching human use of restored and naturalized landscapes will support a reconciliation approach, which strives to find ways for humans and other species to beneficially share landscapes (Moyle et al. 2012).

Notes

1 Restoration practices specify varying levels of human intervention. Currently there is much discussion in restoration about heavy-handed approaches versus facilitating processes within the landscape to restore itself, such as the distinctions between horticultural and process-oriented restoration (Higgs 1997; Ehrenfeld 2000; Higgs 2003).

2 The earliest salinity measurements in the Delta were recorded by the California & Hawaiian Sugar Refining Corporation (C&H) from 1908 to 1929. C&H obtained fresh water by sending barges that traveled upstream along Suisun Bay and into the Delta until they reached water with a chloride concentration of less than 50 milligrams per liter (mg/L). The distance the barges traveled has been used as a measure of historic salinity intrusion (Lund et al. 2007; Lund et al. 2010).

3 http://www.Deltacouncil.ca.gov/sites/default/files/documents/files/Item_6b_Attach_3_Delta_Wide_PL_84_99_Compliance_Map.pdf

4 Efforts to increase the habitat value of levees been at odds with flood control objectives. The USACE declared in 2009 that vegetation on levees was incompatible with levee stability and must be removed. The action generated considerable controversy, negotiation and legal action. The Corps later amended their decision to allow for some vegetation in certain circumstances. (<http://www.watereducation.org/aquapedia/state-liability-flood-protection-and-paterno-decision>)

5 "The development of CMH [channel margin habitat] with maximum biological values requires a significantly wider water-to-land transition zone than is typically available in many Delta channels that are bordered by heavily riprapped levees. Given this reality, the Program has developed a Delta-specific CMH definition for waterside habitat that is created as an additional non-structural component of an existing levee structure. Delta-specific CMH that is designed to benefit native fish species within the confines of an existing levee system is henceforth being referred to as "Fish Friendly Levee Habitat (FFLH)." http://www.water.ca.gov/floodsafe/fessro/docs/special_PSP2014.pdf

6 <http://www.Delta.ca.gov/trail.htm>

3: Planning Review



Ponds #9-13 of the White Slough Wildlife Area

These Ponds are the borrow pits from the building of the nearby I-5 embankment. The ponds were dug in this linear fashion to strategically begin excavation of the proposed Delta peripheral canal. When the peripheral canal was voted down in 1982, these lands were retained by the state of California and turned over to the California Department of Fish and Wildlife for management under "interim" status. Today, as part of the White Slough Wildlife Area, they still retain this interim status. Fishing, hunting, wildlife viewing and a variety of other recreational activities occur within the area.

CHAPTER 3. PLANNING REVIEW

More than 230 federal, state and local agencies, institutions and stakeholders are involved in defining, envisioning and regulating the Sacramento-San Joaquin Delta (Luoma et al. 2015).¹ This complex institutional ecology² includes disparate core interests, conflicting visions, and competing priorities for human use of restored and naturalized landscapes. The recent [Delta Challenges](#) report by lead Delta scientists concluded that institutional fragmentation slows decision-making and confounds collaborative management (Luoma et al. 2015). Despite the challenges, these agencies continue to attempt to improve planning processes that affect human uses of restored and naturalized Delta landscapes.

This chapter distills Delta policies, infrastructure propositions and planning frameworks with significant bearing on restored and naturalized Delta landscapes (defined in Chapter 2) and the nature of human use within them. We examine six categories of interrelated planning actions: Infrastructure Futures, Scientific Mandates, Adaptive Management, Economic Development and Sustainability, Recreation and Public Access, and Law Enforcement. A more detailed version of this chapter is available in the appendices.

Broadly speaking, the *coequal goals* of water supply reliability and protecting, restoring, and enhancing the Delta ecosystem established by the Delta Reform Act of 2009 has become the State's guiding concept for Delta planning. The Delta Plan, effective as of September 1, 2013, is the first document developed with this explicit mandate. As the current plan overlaying all other plans, it references and is referenced by many planning documents discussed in forthcoming sections. The Delta Plan specifies recommendations and performance measures related to water management, land use, environmental restoration and enhancing public recreation and access to such landscapes. The appendix to this chapter provides a more in-depth discussion of the relevant planning processes.

INFRASTRUCTURE FUTURES

The Delta is an infrastructural landscape in terms of land reclamation, water supply, and now habitat restoration. Infrastructure has dictated the form and functioning of the Delta since it was reclaimed, and will continue to have a strong bearing on the future of ecological restoration, indeterminate as that future infrastructure is. For example, a critical management concern for the future Delta is whether, where, and how much export of Delta waters should occur (Lund et al. 2010). Our study began under the auspices of the Bay-Delta Conservation Plan (BDCP) and its creation of 145,000 acres of restored lands, framed as, "a 50-year, ecosystem-based plan designed to restore fish and wildlife species in the Delta in a way that also protects California's water supplies while minimizing impacts to Delta communities and farms" (BDCP 2013). Revision of the BDCP led to the creation of WaterFix, the most recent preferred alternative 4a of the BDCP SEIS/DEIR. This transition was precipitated by a lack of scientific consensus around the 50 year Section 10³ permitting processes that would have accompanied approval as a HCP (Habitat Conservation Plan) and NCCP (Natural Communities Conservation Plan). In its place emerged EcoRestore, a scaled-down, but sped-up plan to implement a suite of habitat restoration actions to support the long-term health of native fish and wildlife species. This plan will streamline at least 30,000 acres of habitat restoration already underway over the next four years.⁴ The California Department of Fish and Wildlife (CDFW) is inviting agencies and stakeholders to help develop a high level 25-year Delta Conservation Framework for the Delta and Suisun Marsh by 2017. The Delta Conservation Framework will serve as the continuation of EcoRestore and does not specify acreage targets.

The Delta's levees define its reclaimed lands, and are a critical feature of the State and Central Valley Water Projects (SWP and CVP). The future of this levee network - its potential failures, maintenance and improvements - directly impacts what the future Delta will look like and how it will perform in ecological, economic and socio-political terms. Proposed changes in this infrastructure, such as *Delta Wetlands*, the North Delta Flood Control Project and the Delta Levees Special Flood Control Projects also will affect human use of restored and naturalized lands.

Two general conclusions can be drawn regarding infrastructure and restored landscapes: (1) all current schemes and protocols will increase the acreage of restored and rewilded landscapes, via the projects themselves or the ecological mitigation they entail, and (2) these plans, initiatives, propositions, and their timelines, are uncertain and may be superseded by new propositions.

SCIENTIFIC MANDATES

Scientific mandates to restore Delta landscapes are at the heart of the Delta's 'devilishly wicked' problems (Luoma et al. 2015). Imbued in these landscapes are attempts to meet state and federal regulatory requirements, mitigate for environmental modifications (past, present and future), and adapt to accelerated rates of biogeophysical change. These changes are understood not as symptoms of ecosystem collapse⁵, but rather as indications of new species assemblages and corresponding novel ecologies and ecosystem functions. Such conditions generate significant uncertainty in designing for restoration and setting specific performance criteria for such landscapes. These changes in understanding can be seen in the emergence of the concept of reconciliation ecology, defined by Rosenzweig as, "the science of inventing, establishing and maintaining new habitats to conserve species diversity in places where people live, work or play".⁶ Together, concepts of reconciliation ecology and socio-ecological systems have implications for human use in restored and naturalized landscapes in the Delta.



Calhoun Cut Ecological Reserve, Summer 2016. Calhoun Cut -the straight channel in the distance- was excavated around 1913 for shipping and transport infrastructure for the proposed 'Solano City', a speculative urban scheme that never came to be.

ADAPTIVE MANAGEMENT

Adaptive management has potential to circumvent the common paralysis with decision making under uncertainty. However, how adaptive management theory is put into practice in the Delta remains an open question (Lund and Moyle 2013; DISB 2016). Such questions are particularly relevant to human use of restored and naturalized landscapes, for as we discuss in later chapters, adaptive management of a broader spectrum of Delta ecology that includes human factors might offer solutions with added benefits for all involved. One of the big challenges for adaptive management is determining the public benefit versus the investment in advance, which many funding sources require. Integrating human uses into adaptive management frameworks add another dimension to the challenge.

ECONOMIC DEVELOPMENT AND SUSTAINABILITY

Delta economic development planning documents seek to bring more visibility and allure to the Delta, and more financial sustainability to Delta communities. With respect to restored and naturalized landscapes, these plans and initiatives could lead to more funding for cultural and recreational resources within the Delta and more people visiting and using these places. These plans include the National Heritage Area (NHA) proposal, the Delta Branding and Marketing Project, the DPC's Vision 2020 Strategic Plan, and Economic Sustainability Plan (ESP), the Sacramento Area Council of Governments (DPC sponsored) Local Food System Assessment for Yolo and Sacramento County Delta Communities, and the Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh. A recent Delta Regional Opportunity Index (ROI) revealed that socio-economic opportunity in the legally-defined Delta (primary and secondary) was substantially below the State averages, driven by education, the economy and health (CRC, 2015). These findings could lead to incentives to improve the socio-economic condition of Delta communities via improvements to their environs and development of recreational resources.

RECREATION AND PUBLIC ACCESS

The DSC's Delta Plan, the DPC's Economic Sustainability Plan, and the [Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh](#), a collaboration between the DPC and the California Department of Parks and Recreation (DPR), are the primary documents which emphasize the compatibility between ecological restoration and recreation. The Delta Plan recommends that agencies provide recreation opportunities at new habitat areas whenever feasible, and protect existing recreational facilities. The Plan also has a related performance measure that will track the percent of new ecosystem restoration projects that include recreational facilities. However, unlike the adjacent San Francisco Bay Plan, the Delta Plan does not have a regulatory policy requiring restoration projects to provide maximum feasible public access to the Delta's channels, shorelines, or wetlands.

SUISUN MARSH: PLANNING FOR MULTIPLE USES IN RESTORATION

Suisun Marsh is located in the physical and jurisdictional boundary of the San Francisco Bay-Delta. The primary planning document for the Marsh - the Suisun Marsh Habitat Management, Preservation, and Restoration Plan (SMP) - is, “intended to address the full range of issues in the Marsh, which are linked geographically, ecologically, and ideologically” (BOR et al. 2011). The SMP emerged from the CALFED Record of Decision (ROD) and was developed by a subset of a charter group, which includes local, state, and federal agencies that have jurisdiction or interest in the Marsh. The SMP was developed in consultation with the San Francisco Bay Conservation and Development Commission (BCDC). Restoration in Suisun Marsh is also integrated into the Delta Plan. Both planning processes call for the maximization of public access, however the BCDC has placed a greater emphasis on public access, along with access specific funding requirements. Advocates for public access and human use values in the SMP were well represented by a strong constituency of duck hunters.

As such, the SMP plan objectives and regulations specifically include public and private land use. The SMP identifies the need to, “improve public stewardship of the Marsh to ensure that the implementation of restoration and managed wetland activities is understood and valued for both public and private land uses” (BOR et al. 2011). Although the current adaptive management plan component of the SMP does not discuss monitoring human uses, the 1976 Suisun Marsh Protection Plan suggests that, “levels of use should also be monitored to insure that their intensity is compatible with other recreation activities and with protection of the Marsh environment” (SFBCDC 1976). The Marsh provides an example of successful planning for multiple human uses in restored landscapes and illustrates what can be accomplished when a strong public access mandate is combined with the participation of an organized stakeholder group advocating for the integration of a variety of human uses.

Integrating recreation and public access into restoration and infrastructure projects is a challenge, particularly for funding. The Delta is not alone in this; reduced funds and low priority for public access and cultural concerns in large-scale restoration efforts is a national problem (Ogden 2008). The Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh lays out a range of reasons why planning for human use in restored and naturalized landscapes leads to broader socio-ecological benefits. The land ownership mosaic of the Delta necessitates cooperative, cross-boundary management to achieve large-scale ecosystem restoration efforts which develop a more resilient landscape and contribute to socio-economic vitality of nearby communities (Kelly, Kusel, and Others 2015).

LAW ENFORCEMENT

Law Enforcement issues are primarily addressed by the DPC’s Economic Sustainability Plan (ESP), Aquatic Recreation Component of the Delta Recreation Strategy Plan, and the Land Use & Resource Management Plan for the Primary Zone of the Delta section on Recreation and Access: Including Marine Patrol, Boater Education, and Safety Programs. By and large the concerns raised in these planning documents relate to public safety. Recommendations from these plans include:

- Establish Delta-wide law enforcement protocols for local public nuisance and safety issues, such as trespassing, littering, and theft
- Develop a strategic plan, in consultation with relevant law enforcement to improve law enforcement and the use of available resources to ensure an adequate level of public safety
- Increase public funding for law enforcement and operations and maintenance of public facilities as a having a negative effect on recreation and its economic potential.

As restored and naturalized lands expand so will demands for public safety, law and resource enforcement. Resource enforcement is specifically concerned with upholding laws, such as those within the California Public Resource Code, that serve to protect, conserve and manage unique and limited natural resources held in public trust for current and future generations. Planning recommendations are particularly lacking in explicit support of resource enforcement. Both law and law enforcement will be discussed in the following two chapters.

CONCLUSIONS

The recent Delta Challenges report outlines a potential useful direction for Delta planning: *“As we enter an era of increasing uncertainty about climate, water supply, the fate of the Delta’s native ecosystem, and institutional complexity, multi-institutional collaborative approaches will become increasingly important”* (Luoma et al. 2015). The future of restored and naturalized Delta landscapes depends on a stew of policy and planning protocols in the region. The most influential of these plans concern the future of Delta water conveyance infrastructure, its levee system, and scientific mandates for its ecology. The main challenge with all three of these areas is that they are uncertain and interrelated. Of less prominence - and often subservient to these planning areas - are economic sustainability within the Delta (and ‘Delta as Evolving Place’), recreation and public access, and law enforcement. Planning effectively for human uses of restored and naturalized landscapes will require that these sectors receive more consideration. By looking at these interrelated planning sectors in combination, we may find reasons to revise these protocols to support their integration.



Managed wetlands within the Yolo Bypass Wildlife Area, Fall 2015

The Yolo Bypass exemplifies a multifunctional restoration landscape, combining flood control with farming, ecological habitat and a variety of recreational opportunities. Efforts are underway to retrofit the flood way’infrastructure to allow more frequent and longer flooding to improve habitat for aquatic species. In turn, these changes will affect other uses and processes in the Bypass, requiring integrative planning across multiple stakeholders

Notes

- 1 Delta Vision Context Memorandum: Historic and Current Governance in the Delta Region: Water Quality, Environment and Species Protection and Land Use Controls
- 2 As illustrated by the cover image, created by Mark Lubell, Policy Director at the UC Davis Center for Environmental Policy and Behavior, which depicts the network of actors involved in Delta governance.
- 3 Section 10 of the Endangered Species Act is designed to regulate a wide range of activities affecting plants and animals designated as endangered or threatened, and the habitats upon which they depend. With some exceptions, the ESA prohibits activities affecting these protected species and their habitats unless authorized by a permit from the Service or the National Oceanic and Atmospheric Administration - Fisheries. Permitted activities are designed to be consistent with the conservation of the species.
- 4 <http://resources.ca.gov/ecorestore/>
- 5 Moyle and Lund debunk the imminent collapse narrative in their May 23, 2015 Op-Ed in the Sacramento Bee entitled, Delta ecosystem is in a constant state of change (<http://www.sacbee.com/opinion/california-forum/article21621063.html>). Despite this debunking, the narrative imminent ecological collapse is still being used by advocates of large scale infrastructure projects such as the BDCP or Delta Wetlands, who position their projects as necessary and remediative.
- 6 <http://reconciliationecology.com/definition.html>

4: Delta Law Review



Overlook next to the Sacramento Bypass

The 360-acre Sacramento Bypass Wildlife Area is an important cover and feeding area for wildlife during late fall, winter, and early spring. It is an attractive fishing area. The Tule Canal has white sturgeon, white catfish and black crappie while the nearby borrow pits have largemouth bass, bluegill and white catfish. The bypass is flooded roughly every 5 years, during which access is limited.

CHAPTER 4. DELTA LAW REVIEW¹

...law is the tendon that connects imagination and materiality when it comes to landscapes...

- Jeremiah Purdy, *After Nature* (2015)

INTRODUCTION

Activities in the Delta must navigate a dense web of laws, policies and codes which regulate relationships between humans and the larger ecology. From a legal perspective, the Delta's restored and naturalized landscapes cover a range of unique situations since most are largely composed of water, are part of a navigable waterway, or occupy a dynamic interface between land and water. Areas of law most relevant for human use in the Delta include the public trust doctrine, state ownership, navigability, public access, recreation, water diversion, allocation and quality, trespass, and endangered species protection. Secondary themes concern flood control and the human right to water. These are covered by federal and state constitutional, statutory and common law. This chapter provides a synthesis of these laws, with the understanding that evolution of laws and court rulings is ongoing, as exemplified by the recognition that public uses of and desires for state lands can and should be adaptive, which is particularly relevant to a changing Delta.² The appendix to this chapter provides more documentation of all these laws, policies and codes.

PUBLIC TRUST DOCTRINE

Under the public trust doctrine (PTD) the state must protect navigable waters and state properties for their common use and long-term preservation. For restored and naturalized Delta landscapes (Chapter 2), this includes waterways and tidal marshlands held 'in common'. Additionally, the 2009 Delta Reform Act states that, "the public trust shall be the foundation of state water management policy and [is] particularly important and applicable to the Delta".⁴

The PTD establishes the California Department of Parks and Recreation (State Parks) as a trustee agency in regards to State Parks lands. Additional trustee agencies include: The California Department of Fish and Wildlife (CDFW) with regard to the fish and wildlife of the state, and to wildlife refuges, ecological reserves, and other areas administered by the department; the State Lands Commission (SLC) with regard to state-owned "sovereign" lands, such as the beds of navigable waters; and the University of California with regard to sites within the Natural Land and Water Reserves (though there are currently no reserves within the legally-defined Delta). These trustee agencies are required to protect and preserve sanctioned uses. In practice this means that trustee agencies, such as State Parks cannot fully restrict access and use within their lands. This remains their mandate even if insufficient resources are available to operate the facilities of park land, as in the case of the Delta Meadows state park property (see Delta Meadows case study in appendix).

STATE OWNERSHIP

State ownership of submerged land is based on tidal influence and navigability.⁵ As nearly all Delta waterways are subject to tidal influence, navigability should be of minor importance in the determination of state ownership. Section 670 of the California Civil Code defines state ownership of tidally influenced waters, "*the State is the owner of all land below tide water, and below ordinary high-water mark, bordering upon tide water within the State; of all land below the water of a navigable lake or stream...*" Determinations of navigability are less straightforward.

Former Assistant Attorney General Jan S. Stevens wrote the definitive piece on the public right of navigation. His Common Highways, and Forever Free: The Public Right of Navigation⁶ outlines the three dominant definitions of navigability:

- Navigability for Federal commerce clause jurisdiction. Rivers are navigable if, "used or susceptible to being used in their natural condition 'or with reasonable improvements' for purposes of trade and commerce." U.S. v. Appalachian Power Co., 311 U. S. 377, 406-409.
- Navigability for the purposes of state ownership. A waterway must have been susceptible to commercial navigation at the time of admission of the state to the United States (1850).
- State supplements federal law as relates to the public's right to navigate the river. The state may adopt its own test as relates to the public's right to navigate a waterway. "The states are free to prescribe their own definitions of navigability," and when not in conflict with the federal jurisdiction, "the exclusive control of waters is vested in the state, whether the waters are deemed navigable in the federal sense or in any other sense." Hitchings v. Del Rio Woods Recreation and Parks District, 55 Cal. App. 3d 560, 567 (1976)

Stevens concludes by acknowledging that, "Public recreational pressures are steadily rising.... The solution cannot be to close these common highways. It must be to plan and regulate intelligently, on a statewide basis, to ensure that the freedom of navigation is not destroyed by its abuse [emphasis added]."

Determinations of navigability interact with public access, recreation and trespass. This is especially so at the water-land interface, which in the Delta is usually a levee. Section 4 of the California Constitution establishes a constitutional right of access to navigable waters, and case law has clarified this to include purposes incident to navigation such as boating, fishing, swimming, hunting and

other recreational uses. However, this right of access can be limited by private property rights and government restrictions based on health and safety. Several outstanding questions related to navigability will be decided in the courtroom. According to Stevens, these questions include:

- To what extent may the public's right of navigation be restricted for health and safety purposes?
- What is the effect of human-induced changes in water levels (i.e. sea level rise)?
- What are the purposes incident to navigation that accompany the navigational easement?
- To what extent may general-purpose (county, municipal, and township) governments restrict access to navigable waters?
- Will the public be able to access flooded Delta islands, whether product of intentional or unintentional levee breaching?

As social and environmental conditions change, state actors will have to "plan and regulate intelligently" to balance competing and sometimes contradictory mandates and minimize future conflicts.



Bethel Island levee, adjacent to Frank's tract

PUBLIC ACCESS

Section 4 of article 10 of the California State Constitution states that, "*No individual, partnership, or corporation ... shall be permitted to exclude the right of way to such water whenever it is required for any public purpose, nor to destroy or obstruct the free navigation of such water; and the Legislature shall enact such laws as will give the most liberal construction to this provision, so that access to the navigable waters of this State shall be always attainable for the people thereof* [emphasis added]." This is reinforced by the Congressional Act of Admission, which declares that "*all the navigable waters within the said state shall be common highways, and forever free ... to the inhabitants of said state as to the citizens of the United States, without any tax, impost or duty therefor*" (Stevens [date unknown]).

Recreational access is further protected and encouraged by other state laws in California, including:

- The Delta Reform Act of 2009 states that a fundamental goal for managing land in the Delta is to "[m]aximize public access to Delta resources and maximize public recreational opportunities in the Delta" (California Water Code [CWC] Section 85022[d][3]). However, the Delta Plan does not have a regulatory policy requiring covered actions to provide maximum feasible public access to the Delta's channels, shorelines, or wetlands.
- The Integrated Regional Water Management Planning Act requires integrated regional water management plans (IRWMPS) consider California Water Plan recommendations related to recreational access (CWC Section 10541[e][1]).
- The California Coastal Act, managed by the California Coastal Commission, protects public access to the coastline and tidelands. This act's jurisdiction does not cover Suisun Marsh nor the Legal Delta.
- The PTD recognizes recreation as a public trust use of water that must be considered when managing tidelands and navigable waters and their tributaries (California State Lands Commission 2001, 2010).
- The McAtee-Petris Act (1965), which established the San Francisco Bay Conservation and Development Commission (BCDC) contains regulatory policy requiring covered actions to provide maximum feasible public access to the Bay (not the Delta).



Restricted beach access, Big Break Regional Shoreline

MULTI-BENEFIT FLOOD MANAGEMENT

Flood management is a major issue in the Delta and several restoration landscapes are components of the region's flood control infrastructure. A new approach to flood management, designed to reduce flood risk and enhance fish and wildlife habitat by allowing rivers and floodplains to function more naturally, has been adopted by the Central Valley Flood Protection Plan (CVFPP). This approach emerged from the experience of farmers, fish advocates, duck hunters, and flood managers in the Yolo Bypass and other areas, who have successfully managed for multiple functions. There are several opportunities to implement this new approach to flood management in the Delta, including a lower San Joaquin flood bypass (Paradise Cut), and in the ongoing restoration of the McCormack-Williamson tract.

BENEFICIARIES PAY AND DAVIS-DOLWIG ACT

In 2013, The Delta Plan adopted a 'beneficiaries pays' principle, "that costs of measures designed to improve the Delta ecosystem should generally be borne by state and federal taxpayers, except that mitigation for negative impacts on the Delta ecosystem resulting from past, present, and future exports of water from the Delta should be borne by those directly benefiting from those exports, and any costs of measures designed to improve reliability of water supply should be borne by those directly benefiting from that water supply" (DSC 2013). Likewise payees should benefit; i.e., those paying, whether State water contractors, private landowners, or the general public should see benefits. This concept has its legal basis in the California State Constitution, which allows for the levying of regulatory fees to support legitimate state regulatory programs, such as those that manage fish populations, levee maintenance, ecological health, and water deliveries. This concept is related to the Davis-Dolwig act, which in 1961 established the state policy that the costs of preservation (considered similar to mitigation) of fish and wildlife within the State Water Project (SWP), in which the Delta is a part, are to be paid by water supply contractors. This act grants California DWR authority to include fish preservation costs in its charges for water. The act distinguishes between these preservation measures and recreation and "enhancement of fish and wildlife", which was to be paid by the state general fund as benefits available to the general public. Publicly funded projects have mostly focused on the ecological enhancements. However, recreational and access enhancements also are supported by law and may be desirable in meeting a variety of landscape performance objectives.

TRESPASS, ENVIRONMENTAL PROTECTION, AND THE HUMAN RIGHT TO WATER

Laws and policies relevant to trespass in the Delta are mostly contained in the California Penal Code, which emphasizes signage, boundary limits, and trespass on agricultural land and malicious interference with water-related infrastructure.⁸ Foremost amongst "environmental" provisions are the federal and state Endangered Species Acts (ESAs). The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) creates a state system of water quality standards and permit requirements. The Federal Clean Water Act (CWA), also establishes water quality standards of considerable relevance to the Delta. In general, water quality, specifically salinity, in the Delta is of great concern to those who live, work and play in the region.

Effective January 1, 2013, the California Water Code (Division 1, Section 106.3) on the Human Right to Water establishes that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. California is the first state in the nation to legally recognize this right. With this recognition comes the obligation for State agencies to this right, specifically the factors of safety, affordability, and accessibility in all relevant policy and planning activities, which includes those in the Delta.

CONCLUSIONS

California's evolving legal terrain has tangible effects on how people use and inhabit the Delta's restored and naturalized landscapes. The legal basis exists for a variety of different future landscapes and human uses, based on how laws and regulations are interpreted and pursued. Expanding restoration in the Delta, involving tidal marsh and floodplain generation, will generally complicate public access and legal protocols because of the more fluid boundaries they create; akin to the dynamic hydrologic conditions of the pre-reclamation Delta. Restoration and naturalization will entail the expansion of a commons to which citizens have legal access. Specifically, "recommoning" will test definitions of state ownership and interpretations of the public trust doctrine. Uncertainties around water rights, flow criteria, endangered species protection, and the definition of beneficiaries and benefits will continue to bring legal contention. The desires of the public will be manifest through enacting of supportive laws as well as legal adaptations.

Notes

1 Reviewed by Richard Frank, Professor of Environmental Practice and Director of the California Environmental Law & Policy Center (CELPC); Curtis Fossum, Attorney, retired annuitant at California State Lands Commission; Paul Thayer, Former Executive officer of the California State Lands Commission Jeff Loux, Director, Land Use and Natural Resource Program, UC Davis Extension; Adjunct Assistant Professor, Landscape Architecture; Chair, Department of Science, Agriculture and Natural Resources at UC Davis Extension; Osha Meserve, Environmental Attorney, Soluri Meserve; Antonio Rossman, Land use attorney, Rossmann and Moore LLP

2 "Courts have found that the public uses to which sovereign lands are subject are sufficiently flexible to encompass changing public needs."http://www.slc.ca.gov/About/Public_Trust.html

3 http://www.slc.ca.gov/About/Public_Trust.html

4 California Water Code § 85023.

5 Phillips Petroleum Co. v. Mississippi 484 U.S. 469 (1988) held that States, upon entering the Union, were given ownership over all lands beneath waters subject to the tide's influence, regardless as to whether they were navigable in fact.

6 <http://www.dbw.ca.gov/PDF/PublicTrustDoctrine.pdf>

7 <http://www.dbw.ca.gov/PDF/PublicTrustDoctrine.pdf>

8 Additional policy relevant to trespass in regards to liability can be found in the California Recreational Use Statute (RUS), which limits private landowner liability, where no fee is charged for use. The California Tort Claims (CTC) act extends the RUS to public entities. Both are relevant to planning and implementation related to the Great California Delta Trail act and other recreational and access enhancements.

9 See law review in the appendix for full text from the relevant sections of the California Water Code.

5: Law Enforcement Review



Making Contact

Fish and Wildlife resource enforcement officer inspecting the weapon of recreational target shooters. Image by Alejo Kraus-Polk

CHAPTER 5. LAW ENFORCEMENT REVIEW¹

INTRODUCTION

Enforcing laws in the Delta is challenging due to the region's unique geography, its legal and social complexity, and limited resources. Our literature review located only one previous study on law enforcement in the Delta. Published in 2012, [Law Enforcement in the Sacramento-San Joaquin Delta Region](#), was prepared for the Delta Conservancy by Executive Fellows from California State University, Sacramento. This report serves as a baseline on the scope of law enforcement in the Delta, and the enforcement challenges should there be an increase in Delta recreation and tourism.² Conclusions based on the responses of law enforcement entities determined that most safety concerns in the Delta regard trespassing, theft, boating safety, and overall law enforcement coverage.³ This study served as a starting point for our more specific focus on law enforcement practices and challenges for current and future restored and naturalized landscapes.

Our research and outreach activities included interviews with representatives of the California Highway Patrol (CHP), all five county sheriff's departments and their marine patrols, the law enforcement division of the California Department of Fish and Wildlife (CDFW) and their Delta-relevant special operations units, US Fish and Wildlife Service (USFWS), US Coast Guard (USCG), National Marine Fisheries Service (NMFS) as well as land managers, scientists, and Delta agency staff. Interview responses were augmented by relevant documents, such as Land Use Management plans for specific parcels, the Delta Plan, BDCP/Water Fix EIR/EIS and associated comments, agency specific crime reports, laws and legal codes, news reports, internal agency memorandum, agency websites, etc. From this information we have constructed a summary of law enforcement for the Delta's restored and naturalized landscapes. This summary examines jurisdictions and boundaries, division of responsibilities, interagency coordination, and current law enforcement challenges, and presents an inventory of new and innovative solutions. A more extensive and detailed account of this information can be found in the appendix to this chapter.

MULTIPLE JURISDICTIONS AND BOUNDARIES

The restored and naturalized areas of the Delta encompass five counties, which contributes to the fragmentation of law enforcement, as does the complex ownership mosaic and regulatory environment. Law enforcement is primarily carried out by county sheriff's departments. However, the resources of these departments are pulled from the relatively unpopulated inner Delta areas to the larger population centers on its edges.

Specific forms of ownership, whether Federal, state, or private, each have a different legal framework, some of which, such as the Federal and California Endangered Species Act, transcend ownership boundaries. Efforts of local law enforcement agencies are primarily assisted by the Law Enforcement Division of the California Department of Fish and Wildlife (CDFW LED). Regular presence of federal law enforcement in terrestrial landscapes is minimal.⁴ California State Parks had a law enforcement presence in the Delta in the form of State Park Peace Officer Rangers. However, in recent years the management of all Delta facilities has been contracted out to concessionaires and ranger presence reduced. The tidally-influenced waterways of the Delta are subject to joint federal and state jurisdiction. The US Coast Guard (USCG) is the primary federal personnel presence on Delta waterways. The USCG is the main enforcement partner for the National Marine Fisheries Service (NMFS). The state and local presence is comprised of CDFW law enforcement and dwindling County Sheriff's Marine patrols.

Division of Responsibilities

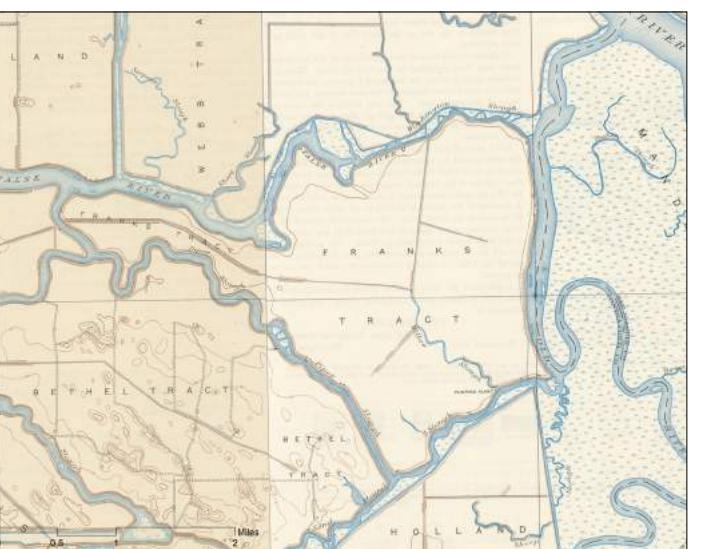
Jurisdictional boundaries are complicated by the myriad responsibilities of law enforcement agencies and mandated collaboration in and between agencies. The California Highway Patrol (CHP) provides a good example. The primary responsibility of the CHP is traffic and highway safety in the region, in which they assist local law enforcement agencies. However, State Security Division (SSD) of the CHP also coordinates the collection of all reports on crimes and criminally caused property damage occurring on state owned or leased properties.⁵ The CHP is then required to compile all information received and report to the state Legislature when requested.⁶

Interagency Coordination

Additional state and federal law enforcement agencies such as the Federal Bureau of Investigation (FBI), USCG, Drug Enforcement Agency (DEA), and California Department of Justice (DOJ) often collaborate with regional law enforcement agencies on drug-related operations. Drug related intelligence sharing among Federal, state, and local law enforcement agencies is coordinated by the Central Valley California (CVC) High Intensity Drug Trafficking Areas (HIDTA) program.⁷ Coordination between agencies is differentiated by the issue. Drug-related issues, boater safety, and search and rescue (SAR) operations are subject to a high degree of interagency coordination. However, other issues, such as dumping and theft, are more likely to be pursued by a single agency.

Informality

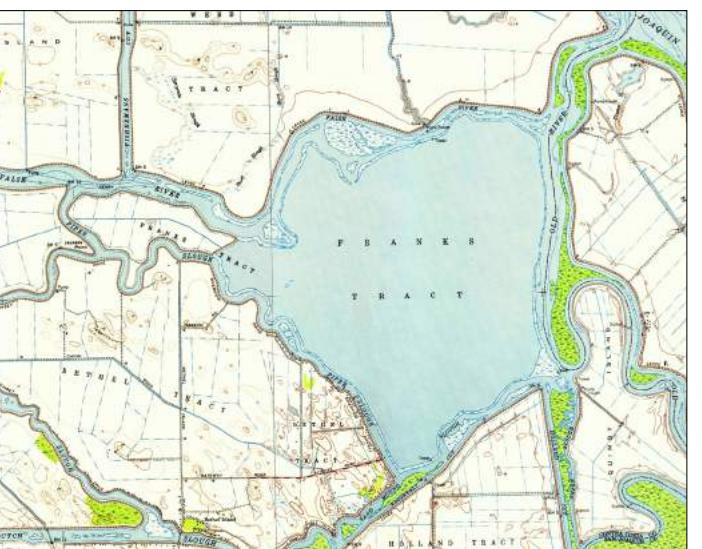
Enforcement must navigate disjointed physical and overlapping legal protocols (see Law Review - Chapter 4). Users may have informal understanding regarding rights of access which can conflict with relevant legal codes, resulting in ambiguity that increases enforcement challenges.



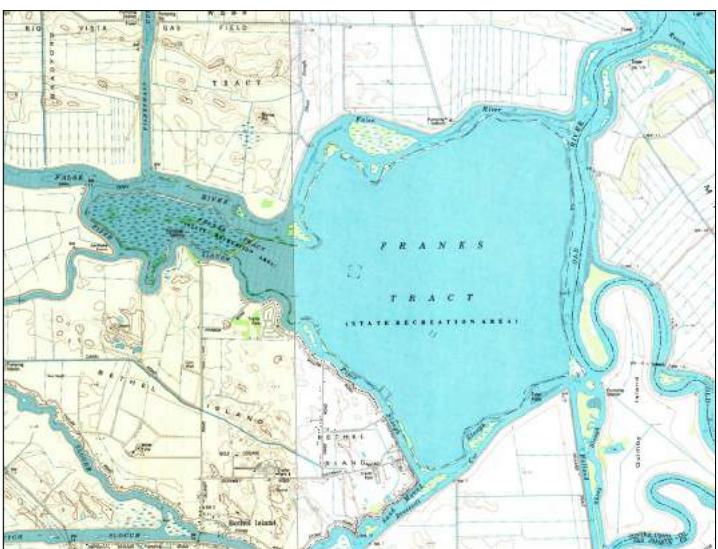
Early 1900s (reclaimed for farming between 1902 and 1906)



1937 (levee breaches in 1936 and 1938. 1938 breach was never repaired)



1950s (used as Navy bombing target from 1943 and 1952)



1970s (CA State Park established in 1959)



1993 (Urbanization of adjacent Bethel Island)



2014. (Levees (orange) and grid of regulated hunting blind locations)

Evolution of Frank's Tract: 1900 - 2014

Over the last century, Frank's Tract has changed from tidal marsh, to reclaimed farmland, to open water Navy bombing range (Antioch Bombing Target), to an officially designated California State Park used for boating, fishing and waterfowl hunting. Each transformation has entailed changing jurisdictions and law enforcement protocols, spanning private, federal and state entities. Historic Survey data and 1937 ortho imagery from the San Francisco Estuary Institute.



A morning scene from Ephemisle 2015. Image: Alejo Kraus-Polk

PREDOMINANT LAW ENFORCEMENT CHALLENGES

Funding and resources

The 2012 Law Enforcement in the Sacramento-San Joaquin Delta Region study highlights; trespassing and liability, theft, boater safety, and the, “vast, remote, and difficult to access nature of the region... compounded by the diminishing budget and personnel resources law enforcement agencies are facing due to the economic downturn.”⁸ Our research confirmed their findings.

All of the law enforcement agencies operating in the Delta face budget constraints. Many representatives of these agencies express they have been continually asked to do more with less.⁹ This situation is exacerbated by the expansion of restored and naturalized areas. Despite economic growth in California, budgets for resource enforcement continue to shrink. Triage is required, as recently exemplified by the reassignment of the Contra Costa Marine Patrol. This division, which was previously one of the largest in the Delta with 5 full time and 4 part time deputies, is now one of the smallest, with only 4 part time deputies and a sergeant. With the reassignment of the full time deputies there has come a significant increase in criminal activity, such as boat theft.¹⁰

Illegal marijuana cultivation and Poaching

Our conversations with CDFW emphasized the illegal commercialization of wildlife and the expanding illegal cultivation of marijuana. Neither were addressed in the 2012 study. CDFW LED is the primary agency tasked with addressing these issues in the Delta. The Delta-Bay Enhanced Enforcement Program (DBEEP)¹¹, a subdivision of LED, has recognized widespread illegal marijuana cultivation in the Delta in recent years and engages this issue due to its ecological effects on the anadromous fish and the Delta ecosystem in general. When we spoke with DBEEP Lt. Stephen Johnson in early July of 2015, they were aware of approximately 20 plantings within an hour of Davis, California that ranged from 1,000 to 10,000 plants.¹²¹³ Marijuana is of primary concern for April - late October. State properties (i.e., public lands) are the main geographic focus. In addition to their ecological impact, plantings are a serious public safety concern; as many (~80%) are actively patrolled by armed guards.¹⁴

DBEEP works closely with the Special Operations Unit (SOU) of the CDFW, which was formed for “investigating, infiltrating and apprehending those who steal California’s natural resources for profit”.¹⁵ One task assigned to SOU is to work in coordination with DBEEP, given the critical impact that illegal commercialization has on salmon and sturgeon¹⁶ within the Delta.

New and Innovative Solutions

In some restored and naturalized Delta landscapes, limited funding has led to creative practices to enforce law and order, protect natural resources and provide public safety. These programs include the Natural Resource Volunteer Program (NRVP) in the Yolo Bypass Wildlife Area, which trains volunteers to observe and report unsanctioned activity, functioning as eyes and ears for enforcement personnel. This program is the first of its kind in California and is used as a model throughout the state.¹⁷ The USCG has a similar volunteer program to assist in their mission. The USCG auxiliary of the Rio Vista station is composed of local volunteers and actively promotes recreational boating safety, and supports general Coast Guard operational, administrative, and logistical requirements.¹⁸

¹⁹ Other programs of community engaged law enforcement include CalTIP (Californians Turn In Poachers and Polluters), an anonymous witness program which encourages the collection and exchange of information on natural resource crimes by the general public.

CONCLUSIONS AND POLICY IMPLICATIONS

Our research indicated that the issues raised in the 2012 Law Enforcement in the Sacramento-San Joaquin Delta Region study, such as trespassing and liability, theft, boater safety, and funding constraints, remain concerns for law enforcement in the Delta, in spite of policy efforts directed at addressing them. Our research also explored additional challenges of illegal marijuana cultivation and the illegal commercialization of wildlife.

As law enforcement continues to adapt to an evolving Delta the distinctions between those involved in resource enforcement, traditionally USFWS, NMFS, and CDFW, and those involved in non-resource enforcement, such as the County Sheriff Departments, CHP, and USCG will grow murkier. The expansion of land undergoing intentional ecological restoration and accidental or intentional naturalization will realign law enforcement jurisdictions.

Law enforcement agencies in the Delta are underfunded, which puts them in the position to react to problems as they arise. Preemptive action and policy is rare, and increasingly elusive. From our conversation with law enforcement personnel, they are not lacking in ideas or even formalized plans, but rather a lack of resources to put these ideas, plans, and policies into practice. According to agency staff, coordination between the law enforcement division of CDFW and those divisions involved in ecological monitoring, species management and habitat conservation could be improved.²⁰ Benefits could include a more comprehensive understanding of the movement of species threatened by poaching, such as sturgeon and salmon, clarification as to the magnitude of effect of poaching on species abundance, and strengthened ties and relationships with Delta communities.

Law enforcement agencies also lack representation in political deliberations regarding large-scale plans that would affect the Delta, such as BDCP/Waterfix, EcoRestore, and the Delta Conservation Framework. The systemic nature of unsanctioned human use in restoration areas demands a structural response, in which unique and specific law enforcement needs are factored in.

Notes

1 Reviewed by Tony Warrington, Assistant Chief of Law Enforcement Division, CDFW Law Enforcement Division (LED); Nathaniel Arnold, Captain, CDFW LED, DBEEP, MET, Special Operations Unit, WET
Nancy Foley, Former chief of CDFW LED.

2 The Delta Conservancy and the Delta Protection Commission were planning to produce a follow-up to this report that identifies how to address some of these issues. As of October 2015 there is no process to produce this report (conversation with Jennifer Ruffolo, DPC).

3 Law Enforcement in the Sacramento-San Joaquin Delta Region, Delta Conservancy, 2012.

4 Within the Delta, the sole National Marine Fisheries Service (NMFS) administration staff member is focused on the illegal commercialization, import and export of wildlife.

5 Government Code; Section 14613.7. (<http://law.onecle.com/california/government/14613.7.html>)

6 A formal request for this information was filed. A paper copy of the data was given for the five Delta Counties. The Data was of little use to the project, however, the process of obtaining the data provided insight into the SSD.

7 The HIDTA program is overseen by the Office of National Drug Control Policy (ONDCP), within the Executive Office of the President. <https://www.cvcaliforniahidta.org/overview.html>

8 Law Enforcement in the Sacramento-San Joaquin Delta Region, Delta Conservancy, 2012.

9 Conversation with Nancy Foley, etc.

10 Conversation with Contra Costa Marine patrol deputy.

11 This team is under Special Operations of the Law Enforcement Division. The Marijuana Enforcement Team (MET), Special Operations Unit (SOU), and the Watershed Enforcement Team (WET) are also under Special Operations but their investigations span throughout California, including collaborative operations in the Delta.

12 Conversation with Lt. Stephen Johnson, DBEEP

13 This hour radius from Davis includes, but is not specific to, the Delta.

14 Conversation with Lt. Stephen Johnson, DBEEP

15 <http://www.californiafishandgamedepartments.com/specops.htm>

16 The sDPS green sturgeon is federally listed as threatened and listed in California as a species of special concern. The white sturgeon has neither a state nor federal listing, however the illegal commercialization of white sturgeon caviar, more prized than that of the green sturgeon, is a priority issue for DBEEP as well as USFWS and NMFS enforcement,

17 <https://www.wildlife.ca.gov/Explore/Volunteering/NRVP>

18 <http://cgaux.org/about.php>

19 <http://resource.d11nuscgaux.info/public/meminfo.html>

20 Conversation with Ted Sommer, Program Manager, DWR Aquatic Ecology Section.

6: Restored and Naturalized Places



Entrance Gate to Liberty Island

CHAPTER 6. RESTORED AND NATURALIZED PLACES

The evolving is the tricky part, isn't it? [The Delta] has to change. It will change because of sea level rise if no other reason and because of continuing drought and possibly super floods from El Niños. Things are going to change. How it changes, whether it is a well thought out incremental program of change where people are convinced to participate, or whether it gets done to people through catastrophe, I don't know...a lot of people just want to see it stay the way it is, and who think the way it is the best way it should be or could be...So what is the nature of the evolution?

- Jennifer Ruffolo, Delta Protection Commission

The California Delta is a unique and distinctive landscape. Its physical geography of constructed dikes (levees), polders (islands) and a labyrinth of navigable waterways are without parallel on the western coast of the Americas. The infrastructural landscape that has developed since the Delta was reclaimed - approximately a century and a half ago - has been recognized as a unique place by The Delta Protection Act (1992), a recognition that has been carried through in the more recent Delta Reform Act (2009) and the Delta Plan (2013). The Delta Protection Act states:

The Delta is a natural resource of statewide, national, and international significance, containing irreplaceable resources, and it is State policy to recognize, preserve, and protect those resources for current and future generations, in a way that protects and enhances the unique values of the Delta as an evolving place (Public Resources Code sections 29701-2)

This was further articulated by the Blue Ribbon Task Force and referenced in the Delta Plan:

Protecting the Delta as an evolving place means accepting that change will not stop, but that the fundamental characteristics and values that contribute to the Delta's special qualities and that distinguish it from other places can be preserved and enhanced while accommodating these changes (Delta Vision Blue Ribbon Task Force 2008). It does not mean that the Delta should be a fortress, a preserve, or a museum.

"Delta as Evolving Place" defines the Delta as more than just water infrastructure or environmental habitat. It articulates the Delta as a distinct cultural landscape with unique values. The passage of these acts and the adoption of the Delta Plan acknowledge the importance of social and cultural attributes of the Delta in relation to pressing and controversial decisions that will affect the region, including water management and exports, land management and habitat restoration (Luoma, 2015). How "Delta as Evolving Place" is developed, researched and articulated, per these mandates, remains undetermined, as recently expressed by the Delta Independent Science Board. In their recent prospectus The Values of the Delta as an Evolving Place: Diverse, Elusive, and Understudied (2015) they state the following:

...decisions concerning Delta as an evolving place cannot be made on the basis of objective, scientifically determined, information alone. For example, the question of which levees to invest in, depends not only on existing economic and social values, but also on how Delta residents and the State as a whole envision the Delta "should" evolve to protect and enhance its diverse values...a rational Delta research program should attempt to reduce the greatest uncertainties about the Delta as an evolving place, or at least try to understand the greatest uncertainties better. The Board is concerned with how little research is being undertaken on what Delta values are and how they might be protected and enhanced in the context of the Delta as an evolving place...given that Delta social scientists are few and that few Delta natural scientists have worked explicitly on coupled human-natural systems research, considerable groundwork is needed to prepare the Delta scientific community to work effectively in this area. Given that the Delta is among the most humanly transformed rural landscapes in the world and that understanding the future requires a coupled systems approach, this should be a Delta Science Program funding priority.

These conclusions resonate with our own findings of restored and naturalized landscapes as unique and dynamic places within the Delta. In viewing the Delta as a reclaimed geography, we acknowledge that humans significantly shape its restored and naturalized landscapes. As others have put it more specific to policy and science, the Delta's recent history can be seen as a "coevolutionary process between science, governance and ecosystems" (Norgaard, Kallis, and Kiparsky 2009). Here, humans are not simply ecological 'stressors' (common terminology often found in restoration literature) but are also integral to the design, creation, habitation and evolution of what these landscapes will be. Adopting such an integrative conception could improve planning and policy processes for these landscapes.

Our review of Delta planning literature (see Planning Review - Chapter 3) found that restored and naturalized landscapes are often situated as peripheral to Delta culture and sense of place; as spaces to be occupied only by non-human species. Delta residents have concerns regarding ecological and economic impacts of restoration, as the conversion of land to habitats like tidal marsh might affect agricultural production. The Delta Stewardship Council's Issue paper: Restoring Habitat with Science and Society in Mind details these concerns and highlights a range of efforts to overcome and plan for these challenges. These efforts include the creation of the DWR Agricultural and Land Stewardship Workgroup, The Delta Conservancy's Land Management Working Group, The Delta Conservancy's Land Management Working Group, the Delta Dialogues program, the Delta Restoration Hub, and the Delta



Walnut Grove, 2015.

Conservation Framework. The Delta Conservancy in particular has been quite robust in working with diverse stakeholders to plan for effective restoration – culturally and environmentally – at the boundaries between restored lands and agricultural communities. However, significant socio-ecological research gaps remain within restored and naturalized landscapes themselves.

Our findings show that restored and naturalized landscapes in the Delta, as they currently exist, are very much peopled, as discussed in subsequent chapters. From ecological and socio-ecological perspectives, critical questions concern how diverse human practices interact with one another and with other organisms and processes that make up the physical landscape. Human uses significantly affect restoration planning, implementation and metrics of success. Here we outline three Delta conditions which should be considered in approaching restored and naturalized landscapes as unique places: the highly dynamic nature of the Delta, the Delta's territoriality, and the pleasures and politics of experience.

THE CHALLENGES OF 'DELTA AS EVOLVING PLACE'

The Delta ecosystem of today will not be the Delta ecosystem of tomorrow. The only constant is change, which we are not good at anticipating or embracing (Moyle and Lund, 2015).

Defining "Delta as Evolving Place" presents spatial and cultural challenges, since the human conception of place depends on consistency over time, a quality that isn't a characteristic of the region (Smith 2013). The Delta's history of transformations and accelerated rates of change, leads to a remarkable diversity of place definitions. The recent Delta Dialogues project, funded by the Delta Protection Commission, delineated a variety of contemporary and historic place descriptions for the Delta. The project was based on the premise that the Delta's history is, "illustrative of important trends in regional and American history" and that "[t]he Delta is one of the most historically important areas in the West, or even the country" The project produced a map of the Delta as a "Cultural and Historical District". In addition to historic towns, this maps displays the protected areas and waterways of relevance to our study. Essays prepared for the project describe the significance of the Delta in terms of its interrelated human and non-human environmental history.

Philip Garrone's, Managing the Garden: Agriculture, Reclamation, and Restoration in the Sacramento-San Joaquin Delta, is particularly relevant to our study. In his essay, Garrone describes the rise and fall of the salmon fishery and cannery trade in the Delta as a relatively brief event, the collapse of which brought about the first stirrings for aquatic restoration efforts:

The presence of four salmon runs—spring, fall, late fall, and winter—gave rise during the last third of the nineteenth century to a thriving fishery and a cannery industry, before the fishery collapsed dramatically by 1900. Nearly a century later, when conservationist impulses were ascendant, concern over threatened salmon runs would give rise to important restoration measures for the Delta's rivers and floodplains (Garrone 2015, 50).

Garrone continues with a description of the role of hunters in the evolution of protected areas in the Delta;

The succession of state protected-area designations from waterfowl refuge, to waterfowl management area, to wildlife area is meaningful. Hunting was banned on the first state refuges (as it would be on the first national wildlife refuges), so they truly were waterfowl “refuges.” When hunters demanded access to the refuges, which were being supported almost entirely by their fees, parts of the refuges were opened to sport hunting, and hence they became waterfowl “management areas.” By around 1970, these refuges were redesignated as “wildlife areas,” reflecting a more expansive notion of conservation that had moved beyond a singular focus on waterfowl to other species of birds and other animals as well (Garrone 2015, 66–67).

The ecological significance of the Delta as “a natural resource of statewide, national, and international significance” is inscribed in the language of the Delta Reform Act (Delta Protection Act, 2009). Garrone contextualizes this act by providing a history of environmental protection in the region. He notes,

By the late twentieth century refuges and preserves in the Central Valley would include protection of entire ecosystems, with all their biodiversity. These transitions are illustrative of a profound shift in the way humans have perceived their relationship to the natural world. They also provide context for the protected areas that have been created in and around the Delta in recent years (Garrone 2015, 66–67)

The Delta narratives project provides perspectives on particular trends in regional and American history and advocates mobilization of Delta groups to promote the region’s culture and history. However, the stories portray the arc of history ending in the 90’s. Criticism on the present and speculations regarding the future fell outside the historical scope of the project.

As part of the interviews we conducted, we asked representatives from a variety of state and Delta agencies how they define “Delta as Evolving Place”, or to talk about what it means to them for guiding governance of the Delta. This question was often met with a blank expression, a laugh or a smile, a shift into another topic, or a statement about general uncertainty. We also were met with some focused efforts to try to articulate an answer. We began this chapter with Jennifer Ruffalo’s (Delta Protection Commission) response to the question, which seems to get at the difficulty and elusiveness of the concept.

Combining “place” with accelerated rates of environmental change that “evolving” entails is not just a legislative conundrum, it is also a physical and political one. Human colonization and wholesale transformation of the Delta has been rapid in social, technological and geographic terms, only slightly over a century in progress, and being played out concurrently in large Delta estuaries around the world (Tessler et al. 2015; Renaud et al. 2013; Vörösmarty et al. 2009). As Jennifer Ruffolo remarked, the California Delta will continue to rapidly change, whether we want it to or not, due to actions we have already taken.

Thus in addition to speaking of “Delta as Evolving Place”, it may be more useful to speak specifically of emplacements and displacements (for both humans and non-humans) over time, which speaks more specifically to changes in form and occupancy (Drenthen 2009). In the Delta, the definition of place and its evolution are inherently political and economic and tied to these shifting territorial claims. Restoration efforts, as a form of deliberate landscape change, are firmly embedded in this territoriality.

DELTA AS TERRITORY AND PERENNIAL FRONTIER

Water solutions almost always have both winners and losers. This is obvious in a case like the Delta, where it’s simply not possible to find a fix that will make everyone better off. That’s because every available option involves tradeoffs in which at least one party doesn’t fare as well, whether it’s farmers in the Delta, farmers in the San Joaquin Valley, urban residents south of the Delta, or the Delta’s native fish and wildlife...As a society, we can aim for solutions that get the most benefits per dollar spent, but we also need to consider how to soften the blow if some groups are disproportionately bearing the costs (Hanak 2015)

...it might be wise to start thinking whether slowing down the drivers of change might be more appropriate rather than attempting to live with optimized but imperfect governance. Stakeholders in the Bay-Delta have reached the painful realization that they cannot have it all. Environmental conservation or restoration and further growth appear fundamentally at odds (Norgaard et al. 2009).

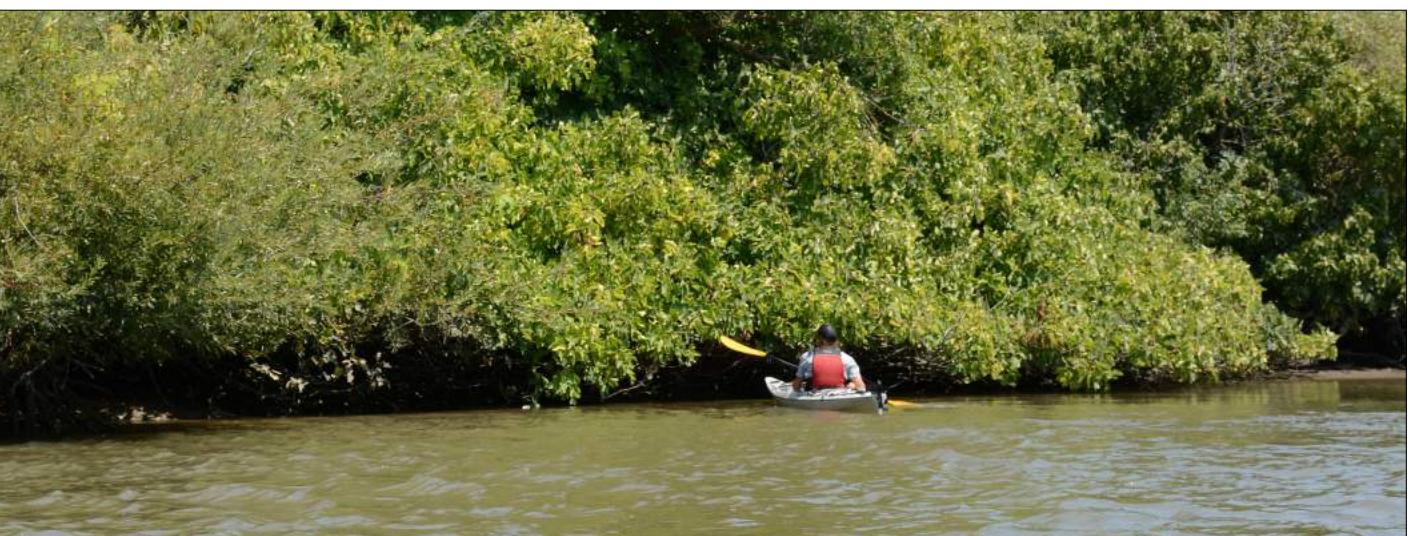
Dating before the region was reclaimed up to the present, the Delta has persisted as a frontier. Prior to European contact, Native Americans inhabited the Delta’s intermittent inland sea through nomadic lifestyles, moving according to changes in the landscape. Spanish missionaries gave the Delta wide berth, inadvertently rendering it refuge for Yokuts, Miwoks and Chochenyo escaping colonial rule (Helzer 2015). Soon after, mining and reclamation radically altered the form of the Delta to construct the current earthworks, situated within a massive floodplain threatened by sea level rise and land subsidence. While flood risk restrictions on development have largely preserved its rural and sparsely inhabited qualities (Smith 2013), its edges are characterized by extensive and expanding urbanization.



Fishing at Big Break, Summer 2015.



Fyke net deployed on the Cosumnes River, Summer 2015.



Harvesting naturalized figs while kayaking, Liberty Island, Summer 2015.

As Jane Wolff states in Delta Primer: A Field Guide to the California Delta, “*The Delta is full of multiple readings*” (Wolff 2003, 45): “*The range of people who want something from the Delta has grown...their goals for the landscape are different; they understand it in different ways; and they imagine its future differently. The fault lines among the Delta's constituents are complicated, variable, and sometimes counterintuitive*” (Wolff 2003, 40).

Delta restoration, and human presence therein, is inherently territorial, as such efforts require the conversion of landscapes from existing uses and purposes (such as productive farmland) into new uses and landscapes, such as tidal marsh. For some ecologists, restored tracts support an aspiration to recover a lost ecosystem. Within scientific discourse there is debate regarding the definition and status of the current Delta ecosystem, the past to which it is compared and what it might and should become in the future. Ecologists, such as Dr. Peter Moyle, sees the Delta as containing a novel ecosystem in which an unprecedented combination of species (including humans) interact in its highly altered environments in a manner that is often irreversible (Moyle and Lund, 2015). Much contention stems from the ‘baselines’ used by diverse stakeholders to define preferred and desirable states for the Delta, both “natural” (ecosystem) as well as “cultural” (place).

Current state efforts to brand the Delta and create a system of public Delta trails aim to encourage more people to enter and spend time in the region with recreational and tourism activities that support economic development. Such initiatives have been challenged by Delta residents and farmers concerned about the potential for increased impacts on agriculture and local landowners, including trespassing, dumping, vandalism, and theft. The Delta Conservancy is investigating recommendations on how best to mitigate these impacts through ongoing public meetings. Above all other factors, the implementation of the Delta trail is a sophisticated political undertaking, requiring negotiating a territorial shift in the Delta, creating paths of public access through a landscape and culture of fully privatized ownership.

As both territory and frontier, there are many prognostications, concerns and controversies regarding how the Delta will be settled in the near future, be it tourism, water exports, invasive or native species, and the potential large-scale transformation (naturalization) of subsided Delta tracts to navigable open water lakes (see recommending box). These potential futures are characterized by varying degrees of social equity in decision making processes (Sze et al. 2009) informed by different desires and user experiences.

PHENOMENOLOGY, PLEASURE AND THE POLITICS OF EXPERIENCE

All types of Delta wilds (restored and naturalized landscapes) are feral, having emerged from a state of domestication and former land uses. Rather than just simply being made, these transitions occur through various practices, whether action or inaction. How a person experiences and interprets such rewilded landscapes is tied to their life experience and interests. Land managers and scientists working in Delta landscapes experience them differently than a Bay Area resident, who might visit the Delta every couple of years for water-based recreation; or to “dawdle”, and use the Delta as “*a place of escape, a hideout, a place to drop out of the modern world...*” (Helzer 2015, 40).

Compared to the sporadic recreationist, the land manager and the scientist’s perception of restored or naturalized landscapes is developed through more habitual immersion within the landscape, based on specific professional tasks and interests. These relationships are distinct and varied, such as monitoring fish populations through sampling and collection, creating elevational surveys of a restored floodplain, and monitoring the growth of plants on restoration test plots. Such professionals likely have a more embodied and intimate relationship with these landscapes and what occurs within them. The same might be said of resource enforcement officers, local users, farmers, farm workers, landowners and itinerants.

The distinction between ‘work’ and ‘recreation’ can be quite blurry. Most people who work in these landscapes are themselves fond of being within them (Eliason 2006). In our interviews we asked scientists, researchers and land managers how they got into the field-oriented work they do. Nearly all of them responded by speaking to a general desire to regularly experience these landscapes. Others stated that such daily experiences were the payoff or privileges of such work. Many also lamented moving into higher paid management positions, which forced them to spend more time indoors behind desks. Respondents also spoke of connections to their upbringing, spending time in similar landscapes, engaged in activities such as hunting, camping, and fishing.

Consider how qualitatively different these field experiences are from a GIS mapping technician, who encounters these landscapes through spatial analysis of remotely sensed data. Or how different the experience is for someone trying to covertly subsist and live within a naturalized Delta landscape (by necessity or preference), such as Delta Meadows, where many do. Contrast that experience to that of law enforcement officers required to cite or remove such inhabitants. In envisioning these perspectives, we do not intend to infer better or less favorable experiences. Rather these differences are indicative of diversity and emerge from different life experiences, cultures and modes of existence (Latour 2013), which in turn lead to different notions of place and value. Restoration is never a neutral activity, and in the Delta multiple interpretations of ‘nature’ “wild” and “restored” will need to find ways to coexist (Clemmensen 2014).

Anthropologist Tim Ingold refers to “patterns of dwelling activity” as *taskscapes* (Ingold 1993, 153), which may be a useful way to consider restored and naturalized landscapes in the Delta. For Ingold, a taskscape encompasses the range of activities performed within a landscape: “*The activities that comprise the taskscape are unending, the landscape is never complete: neither 'built' nor 'unbuilt', it is perpetually under construction. This is why the conventional dichotomy between natural and artificial (or 'man-made') components of the landscape is so problematic*” (Ingold 1993, 162). Taskscapes include everyday life: work, play, leisure and survival. Over time, these everyday practices affect and are affected by the landscape medium itself, rendering them inseparable. In other words, people and landscapes co-evolve and co-create one another, which is particularly evident in the Delta.

For planning and designing for restoration, user experiences matter. Human use entails presences that enact and create these landscapes through diverse practices, protocols, encounters, and desires. How these practices interrelate determines the qualities and functions of these places. In terms of diversity, the Bureau of Reclamation gets this undeniably right - “The average visitor [or user] does not exist”:

Recreation science has revealed the great diversity in what outdoor recreationists expect upon arriving at a recreation site. It also reveals a particular recreation experience they desire, perceive, and enjoy while recreating. Not only is there diversity between the participants in different recreation activities, such as boaters, anglers, and campers, there is also diversity among participants within each activity itself (BOR. 2011, p.3)

This statement alludes to the complexities of planning for conventionalized types of outdoor recreation, via assessing user needs and their anticipated effects on landscapes. But recreation - defined as what people do specifically for fun and entertainment - is inherently vague and broad, transcending the simplified conventions often ascribed to it. Further, recreation is only one sector among a much broader range of human uses that span the scientific, management practices, and a much broader spectrum of sanctioned and unsanctioned activities. All of these human activities, desires and practices occur in the Delta’s rewilded landscapes and should be integrated into restoration planning.

CONCLUSIONS

Three qualities of the Delta - accelerated rates of landscape change, territoriality, and diversity of user experiences - all have significant bearing on its restored and naturalized landscapes. Understanding the “Delta as Evolving Place” is a state mandate, yet it is currently poorly articulated in general and vague in application. This is particularly true for the Delta’s restored and naturalized landscapes, which are often treated instrumentally as strictly habitat and space for other species; an approach that is untenable in the Delta context, as elsewhere.

“Delta as Evolving Place” is difficult to articulate because it must contend with how fast the Delta changes and the territoriality that change engenders across a diversity of stakeholders, from salmonids to civil engineering firms. There is no way to avoid these issues and complexities in efforts to expand restoration in the Delta, since the work of restoration by design entails landscape and territorial change. The question of concern is how to evolve and for whom.

For planning, policy and design to be effective in these realms, these socio-ecological factors (often pushed to the sidelines in restoration) should be more integral. Specific questions to consider include; what is actually occurring in these landscapes in terms of all human uses and presences? How do such uses interact with one another and in what ways are they conflictual or mutually enhancing? What effects do they have on the landscape? What uses are categorized as sanctioned and unsanctioned, and should such designations be revisited based on empirical data? What human uses might we introduce or promote that might actually assist with restoration, management and monitoring efforts? And most importantly, how might we more creatively and inclusively plan for human uses of restored and naturalized landscapes, which will occur regardless of whether we plan for it? To answer these questions more empirical data on the social qualities of human uses is required, which leads us to the subject of the next chapter.

7: Enacting Delta Landscapes Sanctioned and Unsanctioned Uses



Floating Duck Blind, Franks Tract

California State Parks manages a duck hunting program on Franks Tract. Hunters apply for permits to set up hunting blinds at specific coordinates within a grid of evenly spaced locations across the lake. The blinds are custom built by the hunters and must be removed at the end of the hunting season.

CHAPTER 7. ENACTING DELTA LANDSCAPES: SANCTIONED AND UNSANCTIONED USE

It is hard to tell people how they can experience wildlife
-Bart McDermott, USFWS

This chapter gives an overview of our observations on human uses of restored and naturalized landscapes in the Delta. The chapter synthesizes data from our survey, interviews, extensive field work, and findings from our literature review. Data encompasses both perceptions of human use as well as actual observed activity.

SANCTIONED AND UNSANCTIONED HUMAN USES

We use ‘sanctioned use’ to refer to activity that conforms to official usage protocols in place for specific landscapes. These protocols vary by user. For example, permitted uses by scientific researchers (such as installing monitoring equipment or biotic sampling) differ from usage protocols for the general public. Such protocols are intended to guide, promote and restrict human activity, based on meeting landscape-specific management goals. Thus the uses and activities considered sanctioned within different landscapes are variable and time dependent. In contrast, **unsanctioned use** departs from official usage protocols for users within designated landscapes. These include activities interpreted as illegal, as well as activities with tenuous legality, but are outside the set of sanctioned practices. For access-restricted landscapes, the presence of some users is illegal trespass regardless of activity.

We use sanctioned and unsanctioned to refer to all varieties of human activity occurring on restored and naturalized lands. These terms speak more specifically to management intentions while avoiding legal and illegal, which are value-laden terms. Most importantly, sanctioned and unsanctioned afford flexibility to consider future adjustments in use designations, based upon research findings, in accordance with an adaptive management approach.

Distinctions between sanctioned and unsanctioned uses are often grey rather than absolute. In practice, management personnel often acknowledge the shortcomings and imperfections of the letter of the law and formal usage protocols. “Thresholds of acceptability” are used to navigate some situations that are codified in law as black and white (Fischhoff and Lichtenstein 1984). These thresholds are a product of perceived realities, and improvised responses to surprising, unpredictable and “weird” things people do on the landscape¹, which cannot be fully encompassed by laws and codes. These thresholds also reflect the realities of the scant resources currently allocated to enforcing laws in the Delta.² Resource scarcity requires that management pick their battles and in some cases turn a blind eye to transgressions deemed relatively benign or infeasible to address given resource constraints. The acceptance of some transgressions and informality can become locally normalized resulting in significant differences in how sanctioned and unsanctioned uses are perceived by different users across landscapes and locales.

These investigations are complicated because what various people do on the landscape is not always observed, and in many cases, occurs without leaving visible or comprehended traces (Thrift 2008). In our interviews, scientists and land managers generally expressed that they are unaware of all that goes on in these landscapes, given the breadth of human activity and that they are not always in these landscapes. Future interviews and surveys of users from the general public could complement our initial understanding of the use of these landscapes.



Duck hunters on their hand crafted floating blind, Franks Tract, Winter 2016.

SURVEY OF HUMAN USE IN RESTORED AND NATURALIZED LANDSCAPES OF THE DELTA

We conducted a survey with individuals who have experience in restored and naturalized landscapes of the Delta and knowledge of established management protocols and ecological agendas (a copy of the survey and survey appears as an appendix). Although our group of 35 participants is relatively small, it includes a sizable sample of land managers. A diverse array of landscape types are represented including, federal and state lands, regional parks, mitigation banks and other private conservation land. We did not get significant participation from private landowners or members of the general public who use these landscapes, as participation from these groups would require a deeper ethnographic or sociological research approach for which we lacked time and resources. We recommend pursuing such information in future studies.

Survey Findings

Most landscapes in the survey were described as semi to highly restricted in official regulations for public access. Levels of sanctioned use within these landscapes were variable. Respondents indicated that benefits of sanctioned use come mainly from hunting, scientific monitoring, public education and creating a human presence in the landscape. For sanctioned uses, the human presence and ‘eyes on the landscape’ they foster was perceived as a potential asset in reducing undesirable and unsanctioned uses. Respondent comments to this effect included:

People on the property participating in sanctioned activities reduces occurrences of unsanctioned activities.

Visitors accessing the property to participate in sanctioned activities minimizes the occurrence {sic} of those wishing to participate in illegal or unsanctioned activities.

Hunting benefits included reducing the potential spread of avian diseases and revenue streams from duck stamps and licenses: *“Hunting seems to keep birds from forming large groups and seems to keep disease spread from avian cholera down. We have seen when the area has closed to hunting during flood events that disease outbreaks worsen.”* In particular, duck clubs were identified as playing a positive role in maintaining marsh habitat and it was noted that management strategies often benefit non-waterfowl species such as songbirds and fish.

Scientific monitoring is perceived as beneficial for informing current management and future habitat restoration projects. Public education and service learning had direct benefits related to monitoring and restoration, as well as indirect benefits related to increased public awareness:

Our work includes research and monitoring of aquatic species in the system. This information is used to help manage water supply, water quality, and species such as fish (e.g. game and threatened species). In addition, we do work on habitat restoration studies to evaluate their effectiveness. This information helps guide future habitat restoration projects.

Landscape Boundaries and Borders

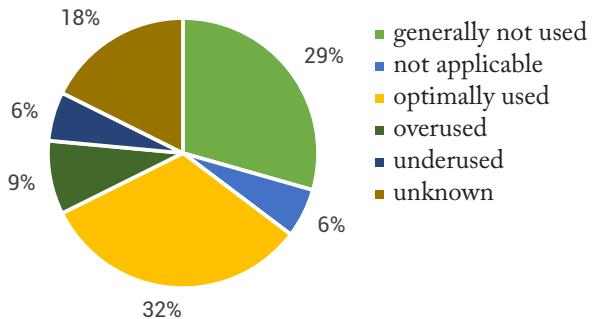
Half of all respondents indicated a clear difference in land use, and/or differences in physical appearance between the restored or naturalized landscape and adjacent land. However, only 30% thought these boundaries were ‘very clear’; approximately 40% ‘somewhat clear’ and 25% not clear and indistinct. Also significant, around 70% replied that there was a variable degree of clarity along the boundaries edge. When clearly demarcated and/or physical boundaries exist, they can serve as a filter for both human and non-human species. Research on reserve design has shown that boundary conditions influence and is influenced by surrounding land use and human communities (Schonewald-Cox and Bayless 1986; Machlis, Tichnell, and Others 1985). As these landscapes expand and change, so too will their boundary conditions.

Unsanctioned Use

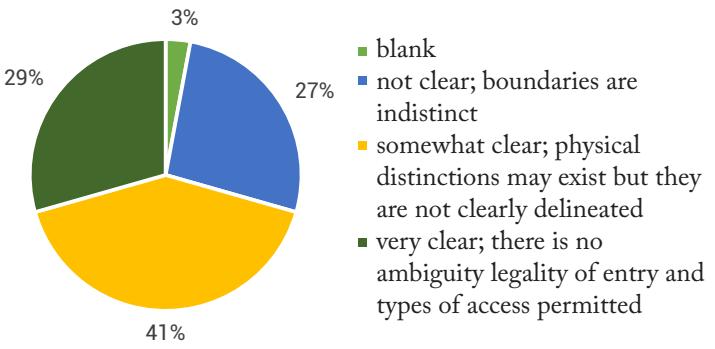
According to our survey, illegal hunting/poaching, littering/dumping, vandalism and destruction of property, illegal use of motorized vehicles, and shooting of firearms are the five most prominent unsanctioned uses. However, the range of activity reported is quite diverse. Where unsanctioned use occurs, it is considered a moderate (45%) to severe problem (30%). Surprisingly, 58% were unsure if unsanctioned uses were benign or beneficial in effect on the ecology of the landscape (even though many of these survey participants were land managers and scientists!). Only 7% said that unsanctioned uses were benign or beneficial where they occur. This differs from interviews, in which we discussed a variety of unsanctioned activities that had little to marginal effect on the landscape in most instances.

The large majority of participants (73%) responded that unsanctioned uses are a concern regardless of effect. Concerns may emerge from some combination of the following factors; issues related to legality and the law abiding stance of participants, an adherence to specific landscape protocols, a need for fully controlled management of these lands to be effective and accountable or concerns about liability and public safety. Interviews generally confirmed that primary concerns about unsanctioned uses are related to either ecological impact or public safety. Interviewees also stressed the notion of setting a poor precedence, resonant with the “broken windows” theory (Kelling and Coles 1997), which posits a causal link between a disordered, unmaintained environment and increased levels of criminal activity.³

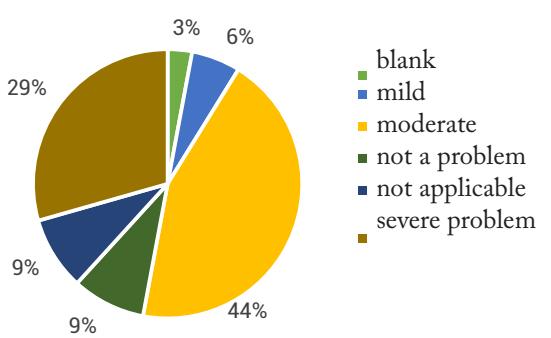
If sanctioned public use is permitted in this landscape, what level of public use currently occurs:



How clearly is the landscape's geographic boundary demarcated (i.e. via signs, fences, gates, etc) to anyone approaching it?



If unsanctioned human uses occur within this landscape, do they conflict with prescribed uses and restoration objectives for the landscape?



Sample of Survey Results

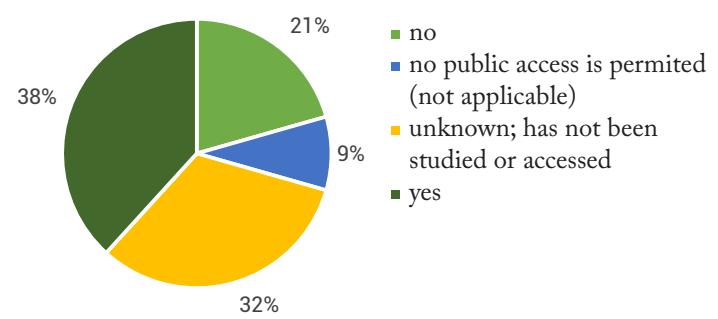
COMBINED RESULTS FROM INTERVIEWS AND FIELD WORK

In addition to the survey, we interviewed land managers, resource enforcement personnel, restoration ecologists, environmental planners, Delta agency staff, and scientific field researchers working in the Delta's restored and naturalized landscapes. These voluntary interviews, nearly 50 in total, were semi-structured and varied in length (see appendix for discussion of methodology). Many interviews were conducted during tours of the landscapes being discussed. Additional field work, by kayak, foot, and car, allowed for active and embodied interaction with these landscapes as a user and additional presence. In the following sections, we grouped findings around the commonalities and contrasts encountered across these methods.

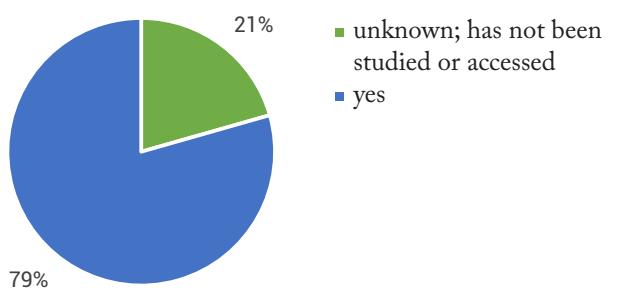
1. Human use of restored and naturalized landscapes is widespread within the Delta.

No restored or naturalized landscapes is entirely devoid of people and human activity. Interviews and fieldwork showed that these landscapes are used by both residents of the legal Delta and non-residents. However, due to the lack of user data, such as park attendance, the demographic and other composition of users remains unknown.

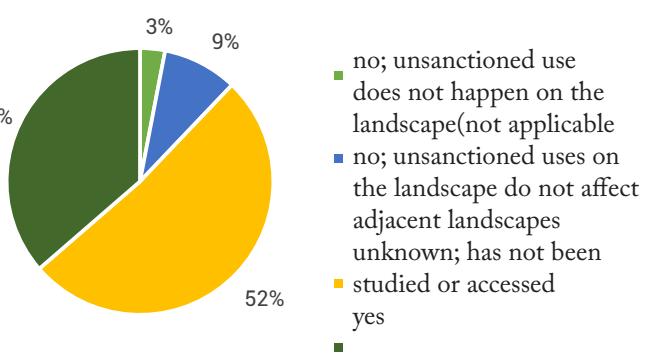
Are any sanctioned public uses beneficial to the ecology and functioning of the landscape?



Does unsanctioned human use occur within this landscape?



Does unsanctioned use of this landscape affect adjacent properties and landscapes?



Fishing and signage along the northern tip of the Sacramento deep water shipping channel across from the Port of West Sacramento. Spring, 2015



2. Human activity within these landscapes is diverse and dynamic across space and time.

Interviews, survey results, and field work consistently showed that human use and activity occurs in a wide variety of forms. Broadly identified uses include:

- **Restoration** - Human activities to deliberately create restored landscapes. This works includes surveying, data gathering, earthworks, seeding, planting, irrigation, weeding and other maintenance practices. Restoration varies considerably in the specificity of desired outcomes (performance metrics) and the intensity of work (i.e., the difference between process-based restoration and horticultural restoration).
- **Science and Scientific monitoring** - Activities used to understand processes, change and emergence in the landscape through scientific methods. Monitoring is vital to assess how these (largely experimental) landscapes are performing, and to inform adaptive management. Yet these activities often go unrecognized as a significant and regular use with unique needs. These needs include both the physical presence of scientific researchers and the multitude of sensing instruments and other equipment such operations require, such as water gauges, fish traps, vehicles and other technologies deployed in the landscape.
- **Land management** - Management practices include wildlife friendly farming, invasive and weed eradication, habitat maintenance, and the managing of the public. These activities are undertaken by growers, volunteers, as well as public agency, NGO and private company personnel.
- **Infrastructural operations and maintenance** - Routine dredging, levee maintenance and associated habitat mitigation, gate and pumping operations, and construction and deconstruction of temporary salinity barriers, etc.
- **Recreation** - The human need for leisure activities, or activities done for pleasure, takes a variety of forms in these landscapes including hunting, fishing, foraging, sailing, boating (motorized and human-powered), kiteboarding, houseboating, biking, walking, running, driving, sunbathing, dog-walking, wildlife observation, artistic expression, meditation, etc. (see section below).
- **Unsanctioned and Illegal activities** - These include illicit drug production and consumption, illegal habitation, vandalism, theft, trespassing, and illegal recreation such as poaching, mudding (driving trucks on muddy roads), target shooting, etc. Survey responses indicated unsanctioned use was widespread and diverse. Unsanctioned use will be discussed more in forthcoming sections.
- **Resource enforcement** - Tasks include, "making contact" with fisherfolk and hunters to check compliance, patrolling, responding to reported incidences, and organized operations to address problems such as illegal cultivation of marijuana and poaching.
- **Land surveying operations** - Various personnel are involved in surveying landscapes for potential modifications, such as the construction of new water conveyance infrastructure.⁴

Despite this diverse human use, planners and policymakers typically think of human use of restored lands predominantly in terms of sanctioned public recreation. Restoration activity and the other uses listed above are often overlooked entirely and are considered apart from those uses and occupations of the general public. Public use is typically considered optional, peripheral or detrimental to restoration objectives, and thus pursuant to compatibility with higher priority objectives (such as endangered species protection or flood control); whereas the tasks of paid, non-public personnel are presented as mandatory. It is worth dwelling a moment on the diversity of these uses and the distinct users who engage in the landscapes in particular ways.



North End of Delta Meadows photographed mid-summer, 2015. Note the houseboats moored along Meadows Slough (middle ground), a naturalized 'Delta hideaway'. An informal agreement with the owner of the adjacent land between the levee and the water (next to and north of the boats) allows these boaters to set up communal recreational areas for play and socializing during the summer months. In the foreground, water hyacinth completely covers the waterways, preventing boat access.



Recreational walking along the project levee on the western edge of the Yolo Bypass adjacent to the wildlife area. When the wildlife area is closed due to flooding, many people walk along the levee, which affords views into the intentionally inundated landscape.

Jeff Stoddard, a Wildlife Area Manager, describes a diversity of uses in Yolo Bypass Wildlife Area (YBWA), which include: bat/bird watching, music, painting, photography, target shooting, sunbathing, hiking, walking, volunteer watch group, mudding, foraging, illegal beekeeping, and poaching. He has observed that people engage in activities as ways of connecting with the landscape: i.e. going barefoot in the mud. In Stoddard's view,

A lot of people just want to connect to nature and this is the closest thing they can get to...I had a guy ask if he could just walk out and stand barefoot in one of the ponds because it made him feel closer to nature. And I said 'sure, just try not to disturb the birds because people want to watch them'. So he walked to the edge of the pond and stood barefoot in the muck and ended up sitting down out there. I came back in an hour and he was just sitting there... I'm like alright. You know, there is a nice connection to earth that you can feel.

Bill Wells, Executive Director of Delta Chambers of Commerce and Visitor's Bureau, describes the differentiated habits of users of the Delta waterways in particular: "Yacht club people [are] obviously affluent - like to come up a cruise to a resort, tie up to dock and enjoy the restaurant and bar.... Kayakers, SUP's, i.e. REI crowd, are generally affluent. Like to go in to secluded places. Do use resorts sometimes... Generally don't spend as much money as the 'yacht people'"

Bill is also responsible for compiling an extensive list of 'Delta fishing holes' which he hosts on the Delta Chamber of Commerce website (<http://californiadelta.org/fishing/delta-fishing-holes/>). The "seat of the pants" list speaks to the vernacular language that is used to describe these fishing holes:

Anglers give their favorite fishing spots and waterways descriptive names which most often you will not find on Delta maps and charts... A place on the San Joaquin River where long ago there was a sounding board for the paddlewheeler captains to bounce the sounds of their steam whistles to help them be sure of their location on the waterway now becomes "The Sounding Board," even though there has not been a sounding board located there in decades.⁶

These rich descriptions provide a unique, fisherfolk's perspective on the landscape. The descriptions require some familiarity with the region:

Lost Slough is one serious place to catch Bass all during the year, and when the Stripers are running you can find a few lurking around there. We call it "The Kitchen" because you can go in there and come out of there with a nice limit of Bass, Catfish, Blue Gill, and Stripers. There are two legs to travel down, one is on the left as you come out of the Meadows and the other to the Right that leads you down to Highway 5. A lot of Boats tie up in that area on weekends and there are a few Houseboats that are lodged there throughout the year. There is only one time of the year that you really have to be careful and that is in the summer (End of June and most of July) when the Moss Pads grow thick. You can use the Plastic Frogs for some serious Top Water action but it can get rough trying to navigate through the muck. Other than that it is really one of the better places to fish on the Delta.

The waterways of the Delta host several large events worth mentioning. These include approximately 250 CDFW approved fishing tournaments⁷, the Barron Hilton Fourth of July Fireworks display, and Ephemerisle. Fishing tournaments occur throughout the year but are mostly in the summer. Black bass is the predominant target species. The tournaments are sponsored by a variety of Bass and Angling clubs and related organizations. The Barron Hilton Fireworks display, now in its 58th year, is an annual gathering of boats near Mandeville Tip. Hundreds of boats anchor in the area to view the fireworks, with some staking out a spot a week or two in advance. The event has been described as the "largest gathering of private pleasure boats in Northern California".⁸ Ephemerisle is a grassroots annual festival of temporary living on the water, which began in 2009. In recent years the event has been held in July, also at Mandeville Tip. Ephemerisle has been likened to "Burning Man on the water". Activities include creating floating platforms, various forms of water play, micro-talks, dance parties, knowledge sharing, and community cooking. Ephemerisle was started by The Seasteading Institute, a nonprofit organization devoted to the creation of long-term human communities on the water (aka seasteading).⁹

This relatively small sample of the recreational uses found on the Delta's waterways provides a sense of their diversity and breadth, which is only one sector of human use among many. Also on the waterways (to continue with that particular landscape) are scientists monitoring the status of various fish species, large cargo ships transporting goods to and from the Port of Stockton and West Sacramento, clamshell and hydraulic dredgers maintaining or deepening channels, weed eradication teams spraying herbicides, unsanctioned marijuana growers stealthily crisscrossing the waterways before dawn to access their plots, and Coast Guard patrols responding to emergencies. How all these uses interrelate is largely unexamined.

THE RISE OF NON-MOTORIZED BOATING

Several people we talked with mentioned the rise of kayaks, stand up paddleboards (SUP's), and other non-motorized (human powered) vessels. According to Bill Wells, "10 years ago there wasn't any place in the Delta where you could rent a kayak or a SUP, and now I don't think you could go 10 miles without finding a place"

The users of human-powered vessel represent a distinct type of boater (i.e., the 'REI crowd') whom take advantage of the access benefits of smaller, non-motorized vessels to explore more secluded places. Wells added that a non-motorized vessel, "...makes you slow down and take a look at the beauty, birds, fish, etc." Some users are attracted to non-motorized, human-powered vessels specifically because they grant access to secluded places and allow for quiet, unobtrusive observation of these spaces. Some of these activities gain in popularity and become established, whereas others are in the category of fleeting fads, which come and go. According to Cheryl Essex there have been observable fads in novel forms of recreation such as windsurfing, wakeboarding, and SUP. The result has been a growth in establishments which offer instruction and rentals of these vessels.



Kayaking the navigable waters of Big Break, an open water environment produced by a sequence of reclamation, subsidence, levee breach, inundation and colonization by exotic floating aquatic plants. Summer 2015.

Most human uses and activity are seasonal and change in with the rhythms and dynamics of the physical landscape.

"It's all seasonal to be honest with you" – Jeff Stoddard

Living, working, and playing in the Delta is dictated by a variety of biophysical rhythms, which occur over myriad timescales. Daily tidal changes affect use and access in certain areas, and is of greatest consequence to water-based activities. Some areas, such as Liberty Island, are only accessible at high tides. Seasonal changes affect waterfowl, fish migration, aquatic weeds and associated human activities (hunting, birding, fishing, boating, etc.). The heat of the summer draws people to the Delta who seek relief in its waterways, breezes and shaded riparian areas. Sanctioned moorings of houseboats increases in summer along with illegal habitation. Marijuana cultivation also increases with the summer (April - late October). Irregular winter and spring flooding affects human use within waterways and hydrologically connected floodplains.¹⁰

Periods of drought and major flooding substantially alter flows into, out of, and within the Delta. Altered flows affect species presence, distribution and abundance. The health of fish may also be of concern as in the case of consumption advisories, which are in effect for bass, striped bass, sturgeon, and pikeminnow. Navigability likewise depends on interrelated biogeophysical factors such as waterweed presence and water quantity and quality.

Bill Wells, executive director of the Delta Chambers of Commerce and Visitor's Bureau, describes a common sentiment about the long term trends in the Delta, specifically related to fish abundance:

Well another thing is with the water hyacinth and the drought and the amount of water being exported, I mean it is basically lowering fish populations. Fish ain't that good this year. This probably used to be one of the best places in the US for striped bass fishing and they have pretty much, lets not say died out, but it's not like it used to be ... Same with salmon, I mean they are holding their own but it is not anywhere like it used to be.

These comments reflect an understanding of a 'regime shift' or 'new normal'. These concepts have been introduced by scientists studying the Delta to describe changes observed in biogeophysical components of the Delta (Mount et al. 2012; Cloern et al. 2011; Moyle and Bennett 2008). The implications for human use are rarely discussed. These comments also speak to coupled biogeophysical and human/cultural changes. Environmental changes related to sea-level rise and more prevalent drought conditions have created challenging conditions for private investment in marina and recreational services.¹¹

Cultural preferences and practices of what people do in the landscape also change over time. Even those activities that have been around for generations, such as waterfowl hunting, undergo shifts in practices and regulations (Garrone 2015). Preferences shift with economic and policy conditions as well as longer term, nonhuman environmental change. Changing preferences related to water-based recreation are a clear example of the convergence of political, economic, and biogeophysical factors. Restoration activities and processes of naturalization will continue to transform the landscape, interacting with cultural preferences in ways that will shift user opportunities and activities. For example, marsh restoration will expand opportunities for non-motorized recreation such as, kayaking, canoeing, and SUPing. Updated user surveys are needed to capture increased interest in these activities and inform policies and management to foster their desirable growth (see box above).

3. Recreational services and facilities lag far behind demand. These public services are underfunded and the private services and facilities are struggling.

Demand exceeds supply regarding recreational service facilities in the Delta. This is consistent with the overall California and US trend of lack of funding (Solutions 2015)¹². The Great Recession (2007–2009) hit local funding for parks and recreation facilities particularly hard, as local government agencies shifted limited public funds to basic services such as police and fire (Solutions 2015; Gilroy, Kenny, and Morris 2013). The degree of this shortfall is better known for water-based recreation, as discussed in the following section, but unknown for land-based recreation. Planners and land managers involved in public lands connect this shortfall and reduction in management personnel (State Parks and USFW) to increases in unsanctioned use, due both to a lack of sufficient public areas for recreation (thus increasing activities such as trespassing) and lack of resources to monitor and patrol existing public landscapes, such as the current situation at Delta Meadows.

Funding challenges facing State Parks have led to a public-private partnership in the Delta. In 2012 the Utah-Based American Land and Leisure (ALL) won the five-year contract to operate the Delta State Recreational Areas (SRAs). According to a Parks district supervisor, "the change insofar as management is that [State Parks] no longer have staff on the ground in the Delta".¹³ The absence of Parks staff has had wide-ranging effects on human use in these SRA's, particularly in the increase of unsanctioned use due to the diminished presence of law enforcement personnel. The five-year contract with ALL will end in 2017 and its renewal is uncertain. The outcome of that decision will have significant bearing on the future conditions of State Parks lands in the Delta. Funding challenges have also delayed creation and update of SRA general plans. According to Jim Micheals, a planner for State Park's Gold Fields District, the lack of general plans impedes more robust restoration efforts including properties or facilities development.^{14 15}



Sign placed in front of informal path, Cosumnes Floodplain Mitigation Site, winter 2015

4. Current user survey data specific to restored and naturalized landscapes in the Delta is in short supply.

Empirical data on human presence in restored and naturalized landscapes is central to an understanding of "Delta as Evolving Place" and values related to existing user and desired (future) user preferences. No recent in-situ surveys (within the landscapes themselves) have been performed in the Delta beyond the initial efforts of this pilot study.¹⁶ The Boating needs Assessment and the Delta recreation provider surveys, both conducted by the DPC, provide related information. The DPC is currently finalizing an update of a 1997 recreation survey. According to the DPC report, "[a] basic problem is that there are numerous roads and highways across the Delta, but there is no single entrance where visitors can be counted and surveyed. This makes any meaningful effort to measure total recreation use time consuming and expensive" (DPC 1997).

Most attempts to estimate recreation use in the Delta have relied on a 1980 report, which estimated 11.9 million days of recreation use (Cajucum 1980). However, the alternative estimate, extrapolated from a 1993 DWR survey of the North Delta, diverges greatly. The 1993 survey estimated 800,000 recreation days in the North Delta, much lower than expected based on the 1980 estimation. The information collected in the 1993 was intended to help DWR to meet its obligation, under the Davis-Dolwig Act, to plan for recreation in conjunction with future SWP operations. Water-skiing, general boating, and sailing comprised about 30% of total use. Other major recreation activities included shore fishing and boat fishing, which comprised about 24% and 15% of all recreation use, respectively (DWR 1997). A large percentage of recreationists (39%) had traveled from the greater Bay Area; other common visitor origins were the rural North Delta area (22%) and the greater Sacramento metropolitan area (21%) (DWR 1997).¹⁷

More up to date surveys from elsewhere in the state have been used to approximate recreational values. However, the Delta is culturally and geographically unique in the State and nation. Thus questions remain as to how Delta user trends and characteristics compare to State and national trends. State trends include the rise in wildlife watching and more 'passive' forms of recreation, bicycle touring, and a decline in hunting. How does the Delta compare? Given accelerated rates of change within the Delta, previous historical snapshots may yield information that is gravely outdated.

Delta waterways have the most user information, given the presence of boating needs assessments (driven by the number of users and the high economic value of water-based recreation. Preferences will change with restoration, as these needs assessments acknowledge. Updated surveys are needed to respond to these changes. The Sacramento - San Joaquin Delta Boating Needs Assessment 2000-2020, published in 2003 by the California Division of Boating and Waterways (DBW) in cooperation with the DPC, identified numerous operations and maintenance concerns, primarily focusing on inadequate public facilities and law enforcement and on the need for aquatic vegetation control and localized dredging.¹⁸ Specific concerns include:

- The scarcity of restrooms throughout the Delta.
- The scarcity of day-use type facilities/destinations throughout the Delta, thus limiting the range of activities for Delta users.
- Beach access was identified as a high-demand resource in the Delta that is in scarce supply.
- The scarcity of public buoys in the Delta. A small number of public buoys are currently available, especially in the more naturalistic areas where boaters might wish to congregate.
- Non-motorized type boating – canoeing, kayaking, and other paddle-driven boats – is currently limited, in part by the scarcity of access sites and facilities. There is a lack of infrastructure for non-motorized boating, including parking, signage, restrooms, and stopping points.
- The insufficient number of launch facilities throughout the Delta.

The needs assessment for waterways illustrates a strong perception that the Delta lacks adequate public facilities for water-based activities. Although the other restored and naturalized landscapes of the Delta lack similar data (levees and tracts), many of the conclusions, such as the scarcity of day-use type facilities/destinations, including restrooms, also apply.

5. Delta restored and naturalized landscapes are feral and unsanctioned use is endemic and diverse within them.

Unsanctioned use occurs throughout the Delta in all types of restored and naturalized landscapes. Yet our collective understanding of unsanctioned use is quite limited; the magnitude and types are highly variable and context specific. The distribution and prevalence of unsanctioned use in these landscapes appears similar to that in more densely urbanized areas. However, these landscapes lack comprehensive monitoring and tracking required to better understand their human ecology. There are also problems related to the resources needed to track and monitor unsanctioned human use activity at the scale of the Delta. Recording and dissemination of such usage data will likely be challenging in the future, given concerns about the stigma such phenomena might bring.

Our motivation in studying unsanctioned uses is to better understand if they significantly affect the ecological functioning of these landscapes and if they pose a general public safety risk. We aim to explore ways that these uses might be creatively encountered and reconciled in the following chapter of this report.

Unsanctioned use depends on social and geographic context.

Our case studies and interviews show that unsanctioned use is not uniformly distributed across these landscapes. Rather, like in urban areas, unsanctioned use is highly patterned and embedded in local contexts. Several factors significantly influence the times and locations of unsanctioned use, including: community engagement, degree of accessibility (transportation infrastructure and adjacency to urban areas), law enforcement presence and general use levels.

Community engagement between the landscape and adjacent landowners, towns, etc. plays an important role in the presence or absence of unsanctioned use. Areas more integrated into the land use, management, and culture of adjacent lands can benefit from the presence of invested neighbors. Areas that lack integration with adjacent communities will not experience these benefits and will likely encounter more problems.

Accessibility is a key factor in unsanctioned use. Areas that are easily accessed, such as those adjacent to public roads, highways or urban areas, tend to attract more unsanctioned use. Examples include:

- White Slough Wildlife Area has high levels of unsanctioned use, attributed to its proximity to Stockton, which has a noted lack of open public spaces. Planning efforts in the South Delta are explicitly addressing underserved communities, which have been categorized as disadvantaged communities, (DACs) and prioritized for funding.^{19 20}
- The proximity of the Cosumnes Floodplain mitigation site to the city of Thornton is a contributing factor to unsanctioned activities, such as the burning of stolen cars, illegal ATV use, vandalism and theft.
- The size and geography of the Cosumnes River Preserve make for varying degrees of proximity and accessibility to adjacent urban and urbanizing areas. Our conversations indicated a clear connection between accessibility and levels of unsanctioned use.
- Stone Lakes National Wildlife Refuge (SLNWR) has been described as “the first dark spot you hit when you are heading out of the city”.²¹ Other public lands and restored and naturalized landscapes have been described similarly. We interpret this to mean that these landscapes are the most accessible areas whereby people feel they can exit from social protocols of the city and suburban fringe.



Three images above: examples of high quality (and much needed) riparian habitat; which unfortunately is also premier habitat for illegal marijuana cultivation. Each of these different locations were recent illegal marijuana grow sites.

Drawing broad conclusions regarding the relative prevalence of unsanctioned activity in landscapes that are proximate to urban areas is challenging, pointing to the need to examine activity within its more immediate and local context. Proximity is one factor of accessibility, which in turn cannot entirely explain use patterns. Several confounding variables exist related to management regimes, formal and informal patrolling, and community monitoring. The interplay of variables like these are unique to each landscape. (See appendix for case studies).

Effects of unsanctioned use are understudied.

This claim is supported by our surveys and interviews with scientists and land managers as well as our own literature review. Concerns about the effects of unsanctioned use can be grouped into three general categories: ecological effects, scientific interference (vandalism of instruments, alteration of data), and public safety.

Activities such as poaching and illegal marijuana cultivation are broadly perceived as having undesirable ecological impacts on these landscapes. Recent studies show this to be the case (Carah et al. 2015; Gabriel et al. 2013; Bauer et al. 2015; Thompson et al. 2014). Other unsanctioned activities present clear public health and safety concerns, such as armed guards at illegal marijuana cultivation sites. According to Lt. Johnson, growers employ motion detectors and trail cameras. Planting sites are often actively patrolled by armed guards. 80% of growers that have been apprehended by DBEEP were armed. Others, such as vandalism, theft, and the destruction of infrastructure, exact high costs in both money and time, often borne by landowners and management.

Early in our study, it became clear that illegal marijuana cultivation is a major issue facing the Delta and the state of California in terms of public safety and ecological effects. From our interviews two types of marijuana planting²² have been identified, user plantings, with a maximum of 12 plants and major plantings, containing up to several thousand plants. Major plantings are for profit and part of larger networks of planting operations. These are understood by law enforcement agents to be funded by Mexican cartels. Larger marijuana plantings are often in areas that offer cover and access to water, which correlate highly with riparian forests. Major plantings have also been found in tidal areas, where plants, in individual planting bags or other improvised cultivation techniques, are irrigated by tidal cycles. Both these riparian and tidal areas are seen as having high ecological value and are a priority for restoration. As restoration of these habitat types continue, their attractiveness as illegal grow sites should be acknowledged and management plans should be developed accordingly.

Poaching and illegal commercialization of fish and wildlife is largely an environmental problem, affecting mostly sturgeon and salmon.²³ White sturgeon is the primary species, sought for its roe, which is sold illegally on the black market. The endangered green sturgeon may be caught unintentionally, as its roe is less desirable. Salmon are collateral, as their eggs are often used for sturgeon bait. Lt. Kathy Ponting, former chief of the CDFW Special Operations Unit (SOU), stated that illegal commercialization has a critical impact on salmon and sturgeon populations.

Some unsanctioned activities may be ecologically benign, but remain undesirable as they are incompatible or interfere with other uses, such as scientific experimentation and monitoring.²⁴ Survey responses showed that, “theft hinders research capabilities and effective monitoring of ecosystem response to restoration actions”. In addition to minor theft and vandalism, there exists concern regarding the safety of more expensive equipment. In 2012 an ATV and \$20,000 powerboat were stolen from a locked shed on the Cosumnes River Preserve.



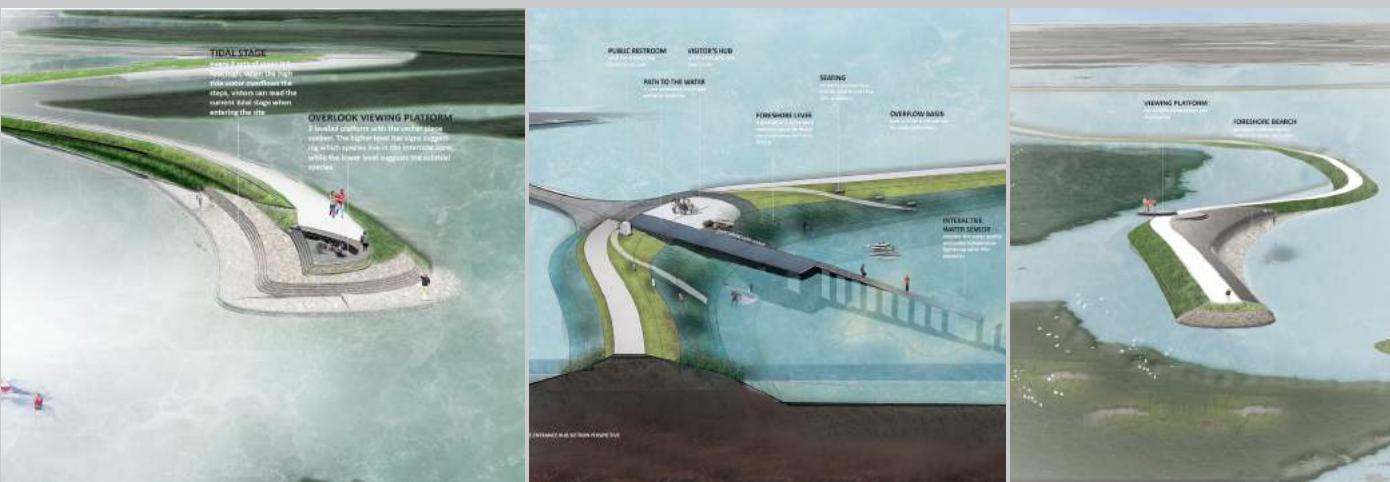
Intersection of Route 113 and Lindsey slough. In approximately 30 drives through this intersection, nearly every time we observed at least one car parked at this intersection.

A RE-COMMONING: PUBLIC ACCESS IMPLICATIONS OF PERMANENTLY FLOODED ISLANDS

It remains a matter of time before a levee breach creates another permanently flooded island in the Delta. Land subsidence continues, sea levels continue to rise, and agricultural values have changed but remain too low to justify high repair costs. With the added looming specter of a high intensity earthquake, many see the permanent flooding of an island in the central and western Delta as inevitable (Lund et al. 2010). Although, investment can reduce this risk for some areas, it is considered unrealistic by many to maintain all Delta islands (Suddeth, Mount, and Lund 2010; Mount and Twiss 2005; Suddeth 2011). The policy implications of permanently flooded islands have been discussed (Suddeth 2011; Suddeth, Mount, and Lund 2010), however, public access implications have received little attention.

Past permanently flooded islands, such as Franks Tract and Liberty Island, have created new publicly accessible spaces “held in common” and thus represent a unique “commoning” of the Delta through processes of naturalization. Regardless of the recreational quality of the flooded island, there will be, in all cases, a radical shift in legal and physical accessibility from the prior non-flooded landscape. There have been several propositions to optimize the habitat value and ecosystem functionality of flooded islands through subsidence reversal, and some have called for the experimental flooding of islands to gain a better understanding of how different species may respond to a given set of conditions (P. B. Moyle and Bennett 2008). However, no studies have focused specifically on optimizing conditions for recreation or public access, although Lund and Bates (2013) posit that recreational uses may benefit from depth-dependent, subsidence reversal activities (Bates and Lund 2013).

The *Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh*, a collaboration between the Delta Stewardship Council (DSC) and the California Department of Parks and Recreation (DPR), offers recreation as a contingency plan for flooded islands that are too expensive to reclaim (DPR 2011). However, this proposal does not offer any further policy or management suggestions to this effect.



“Giving Land to Water” (2016)

Design project by Boya Ye, UC Davis Landscape Architecture student. The project explored design proposals to facilitate and conjoin the primary uses of flooded Delta polders: scientific study and recreation.

Interviews and surveys also spoke to a concern that unsanctioned use within a restored or naturalized area, particularly marijuana growing and theft, could spill out into adjacent properties. Illegal vehicle parking can also block adjacent property gates and results in trash dumping and vandalism. Such spillover effects can jeopardize relationships with adjacent landowners, relationships that can be important to achieving management goals. Spillover effects go both ways. Trespass into access-prohibited restoration areas occurs through adjacent properties. Litter and garbage is often dumped at property boundaries which affects all parties. Furthermore, agricultural management, such as pesticide and fertilizer application can have undesirable effects on adjacent restoration lands. Interestingly, in the Stone Lakes NWR, we heard that adjacent landowners, some in organic production, were concerned about the herbicide applications within the Wildlife Area. This concern prompted better communication and coordination with adjacent landowners about the timing of herbicide treatments.²⁵

Our conversations indicated that unsanctioned users seem to be a minority of all users. Repeat infractions by the same users can indicate a ‘bad apple’ phenomenon in which a few unsanctioned users have a disproportionate effect on a landscape. Such observations often came in reference to the maintenance of bathrooms and other facilities in which the actions of few can create more problems than repeated, but respectful use by a large majority.



Signage on high ground adjacent to an engineered levee breach, Cosumnes Floodplain Mitigation Bank, Winter 2015.

What is sanctioned and unsanctioned activity is not always clear, and can change.

At the intersection of Route 113 and Lindsey Slough is a popular fishing area. Fishing in this area is, or was technically unsanctioned. However, CDFW managers and enforcement came to an informal understanding that fisherfolk should not be prosecuted in this location. CDFW tried to enforce the letter of the law at this location but was largely unsuccessful. So rather than continuing, the shifted tactics. They constructed entrances within the fencing and provided trash bins. Ryan Carruthers describes this situation as one of “live and let live”. The location is monitored for serious transgressions, but its daily use for fishing is permitted.

In the course of our interviews we encountered a sense of territoriality and proprietary unique to those that have a long term and lived relationship to these landscapes, whether they live, work, or own property in the adjacent area or have had some other type of relationship to the area prior to designation or other shifts in management or ownership. Mike Eaton, a former Senior Project Director with TNC, who currently farms adjacent to the Cosumnes River Preserve spoke of a, “sense of ownership - for people who have lived here they feel entitled to be in these landscapes”.

This sense of entitlement may be challenged by shifts in ownership or management that in some way alter existing or historical access and sanctioned uses. These situations may also emerge from situations where management changes and no longer turns a blind eye to trespassing and activities that had been illegal but were informally permitted.

This was often noted in relation to those restored landscapes which have no public access. Here trespassing by some users is an unsanctioned use, regardless of the activity. However, entitlement and associated exceptionalism may influence users who think that they are in a separate user group, distinct from the general public and other ‘outside’ visitors, and thus not subject to rules prohibiting public access. Perception of “customary rights” persists despite the lack of legal basis for a differentiating between users from the adjacent areas or those with long term relationship, and those who come from further afield. Community engagement can influence this dynamic. Regular management or enforcement presence also can forge interpersonal relationships that allow for effective communication of strategies and goals.

Levees throughout the Delta present a particular public access conundrum, as there exist various and sometimes contradictory interpretations of laws and policies related to access.²⁶ Some argue for the existence of a ‘prescriptive easement’, an established right of access derived from the original mandate of the state to preserve public access to all waterways then considered navigable, and part of its entry into the union on September 9th, 1850.²⁷ It should be noted that “waterways then considered navigable” do not align perfectly with waterways currently under tidal influence. Additionally, in the Delta, the “ordinary high water mark” (OHWM)²⁸, which, along with navigability and tidal-influence, establishes the geographic extent of both state²⁹ and federal regulatory programs, is contentious. If the OHWM is judged to reach the county road right of way, it would provide broad public access to the water.

However, landowners have posted no-trespassing signs on Delta levees to prevent dumping, illegal campfires and habitations, and levee modifications.^{30 31} Signage is crucial as the California penal code states that it, “... is unlawful to enter or remain upon any posted property without the written permission of the owner, tenant, or occupant in legal possession or control thereof” (California Penal Code 555). In the absence of proper signage, trespassing claims lack strong legal backing.³²



Recreational ATV use on a seasonally dry river bed, 2014



Former unsanctioned encampment awaiting cleanup. Winter 2016

Matt Gause a manager at Westervelt's Cosumnes Floodplain Mitigation Bank describes their approach to signage:

The way the property is posted with no trespassing signs is very strategic for one thing it meets all the various fish and game codes and civil codes but [signs] are also placed around the property at a certain elevation so if this is flooded and someone comes in here duck hunting I can call the warden and it's still legally posted from that standpoint

This illustrates the clear distinction between access and activity, and the complexities of intermittent flooding. Although, access to navigable waters is a constitutional right, the ability to hunt upon the waters of the state is constrained by the physical realities of duck hunting, where downed birds may end up on private property:

"If it is navigable it is still the waters of the state. Say if this were in flood stage you could boat in here - boat around and do whatever you want but if you shot a duck out here I could call a warden and say I have someone illegally hunting on my property"

Gause mentioned the discussion regarding the rights of hunters on navigable waters and the constraints upon the rights associated with civil codes related to signage and private property rights:

"Lots of discussion on the duck forums³³ about retrieving downed birds on private property and the wanton waste law..."

Management personnel often must adapt their interpretation of laws and legal definitions to circumstances they face, acknowledging shortcomings and imperfections of the letter of the law, and legal definitions. Scarcity requires that management pick their battles and in some cases turn a blind eye to transgressions subjectively deemed as relatively benign, acceptable, or infeasible to address given current resources.

RE-INHABITING INFRASTRUCTURE: THE GREAT DELTA TRAIL

The Great California Delta Trail System was established in 2006 by the California legislature in response to the growing demand for public access to the Delta's natural resources, recognition of the importance of natural and rural places, and to acknowledge the value of outdoor recreation to healthy lives and communities

The Delta Protection Commission has unanimously approved designation of the Great California Delta Trail (Delta Trail) on existing trail segments under the jurisdiction of the City of West Sacramento (Sycamore, Riverwalk, and Clarksburg Branch Line) and East Bay Regional Park District (Big Break Regional Shoreline in Oakley). The Eastern Blueprint is under development. Planning has prioritized implementation on existing public lands, and otherwise working with willing private landowners for access. Water trails segments are intended to ensure trail continuity in places where land trails are not feasible. Planning is being conducted such that sensitive habitat areas and private uses will not be adversely affected. The Delta Trail would include routes for bicycling and hiking, with interconnections to other trails, park and recreational facilities, and public transportation.

Private landowners have expressed concerns regarding increased usage and access, which they believe may result in increased trespassing, theft, and vandalism. The Commission's Great California Delta Trail Blueprint Report notes that, "[w]hile all of the above concerns are valid, it's important to note that studies show that neither public nor private landowners have experienced significant liability losses from trail development." Furthermore, "Agricultural landowners in California who own land through which a trail passes are protected by the State's Recreational Use Statute (RUS). The RUS makes landowners immune from liability for injuries sustained by individuals using their land for recreational purposes without fee payment. Over the thirty-year period the RUS has been in place, the judgments made by the California Courts have predominantly upheld the purpose of this RUS" (Commission and Others 2010) (for additional discussion of the RUS see Delta Law Review Chapter 4).

This is illustrated in the informal enrolling of citizens to assist in management and surveillance of an under-patrolled landscape. In an effort to retain eyes on the landscape, and prompted by a lack of resources, cooperative citizens may be granted exemptions from certain regulations, such as limitations on the amount of time a boat can be moored in one place, in return for providing resource enforcement personnel information related to human use.

6. Effects of Bystanders

In our interviews, participants repeatedly brought up the positive bystander effect, whereby having eyes on the landscape can reduce unwanted and unsanctioned activity.³⁴ This claim has not been empirically verified in the Delta, has been observed in other landscapes (Christensen and Clark 1983). Jeff Stoddard, USFW observed that people are most likely to behave better when they think they are being watched. He then gave an anecdote about dog walkers feigning to deal with their dog poop. After dutifully picking up after their animal, he observed owners then looking around to see if they are being observed, and if not, throwing the bag into the bushes.

As Campbell Ingram, executive officer of the Delta Conservancy, suggests there exists a, "quantifiable positive bystander effect of recreation, whereby the more people in the landscape the less unsanctioned and undesirable activity". However, Ingram recognizes the challenge of,

[d]etermining thresholds of occupancy whereby there is an optimization of habitat value and human use value... Firstly, trade-offs do exist between the two. Landscapes with extensive human use and presence can disrupt ecological functioning. Likewise landscapes without paths of access and related infrastructure do not invite human use. Secondly, human use projections rely on an imperfect science. Therefore it can be challenging to design a multi-benefit landscape based potential use

Despite the challenges, integrating human use into the design of multi-benefit landscapes is desirable for many. In our interview with Cheryl Essex, an environmental planner at DPR, she expressed the following,

I am not saying human use does not have impacts, because it does. But is really about finding that balance. That reconciliation. And you still see in that discussion about multibenefit projects and recreation that it's something people care about

Cheryl Essex singles out the Reclamation Districts, although they are not unique:

Reclamation Districts close levee's to use because they don't want trash. But if they provided trash cans a picnic tables it would help focus the use and is more likely to be used by folks who care about the landscape. Less abuse, because they are willing to be seen at the place

GRANDFATHER CLAUSES - LOWER SHERMAN ISLAND CABINS AND LIBERTY ISLAND DUCK BLINDS

The ongoing use of the cabins of Lower Sherman Island emerge from a pivotal decision by CDFW to grandfather these leases into the creation of the Wildlife Area. This decision was prompted by strong voices of opposition, which sought to resist attempts to end existing lease agreements when CDFW assumed management of the landscape. This has put the CDFW in the situation of acting as “landlords” as well as wildlife area managers.² CDFW is proficient at the latter, but lacks protocols for the former.³

The case of Liberty Island (Liberty) provides a sharp contrast. When Liberty was flooded in 1997, hunters spontaneously took it over, setting up floating blinds on the flooded tract. Hunters were starting to fight with one another over claimed territory and other emergent public uses were crowded out. There was a need for CDFW to determine whether this informal historical practice should be replaced with a formal system that provides equal opportunity access for all members of the public. Subsection 550(v)(1), Title 14, CA Code of Regulations requires visitors to remove personal belongings (including blinds) from CDFW lands on a daily basis. In this instance, the public asked CDFW to enforce this regulation and reclaim the landscape for public uses. Currently, Liberty is open to waterfowl hunting seven days per week during the regular waterfowl season. Hunters may use temporary floating blinds, but blinds must be removed daily in accordance with regulation.

Unlike those at Liberty, the duck hunting blinds maintained by the hunting community on Lower Sherman Island are a product of considerable intergenerational investment, which precedes establishment of the Wildlife Area. This high degree of investment is seen as positive, as users are engaged in the stewardship of the hunting areas. The 20 duck blinds are maintained voluntarily by the hunting community, saving CDFW resources and justifying their ongoing existence. Were the maintenance of these blinds to become a resource sink for the CDFW, this program would likely be discontinued.



Cabins on the southern shore grandfathered into the Lower Sherman Wildlife Area, summer 2015.

7. Carrying capacity and ecological impacts of human use.

Although our data clearly demonstrates the degree of human use and occupation of restored and naturalized landscapes in the Delta, we found little research or empirical knowledge about the ecological and social effects of these uses – whether they are beneficial, detrimental, benign, or variable across different Delta contexts (as our initial research suggests). This stands in stark contrast to the extensive fish, bird and other non-human scientific study and monitoring in the Delta. Our preliminary study indicates that the following directions of inquiry are important to the desirable management of the Delta and deserve further research.

- Habitat value vs. human use (tradeoffs/optimization) - The work of Cloe Garnache and Robyn Suddeth represents an attempt to look at tradeoffs and optimization between human uses and habitat values (Suddeth 2014; Garnache 2015).
- Anticipated/projected use (an imperfect science) - Anticipations or predictions are muddled by the complexity of human use. Change occurs at various spatial and temporal scales, with certain looming changes, such as the BDCP Waterfix exerting influence even without physical intervention.
- Optimal/regenerative use levels. The question of what is desirable requires conversation between multiple ways of seeing value in the landscape, which can differ within the same scientific discipline, stakeholder group, government agency, etc.

Determining the human carrying capacities or optimal usage for a restored and naturalized landscape in the Delta will be a complex and nuanced exercise, yet would be required for adaptive management approach which seeks to acknowledge and integrate human use. For State Parks General Plans, human carrying capacity is currently determined through the use of WALROS (Water and Land Recreation Opportunity Spectrum), a tool developed by the US Bureau of Reclamation (BOR 2011). The implementation of WALROS in State Parks general plans has resulted in modest investments in facilities and recreation

infrastructure. This tool is used to determine many components of the park design, from permitting systems, to the number of parking spaces. Essex, emphasized that they rarely overbuild recreational facilities as demand always exceeds supply. Due to EIS/EIR and attendant environmental regulations the facilities themselves often have a low environmental impact, which is mitigated for. However, according to Essex, environmental impacts are not caused by facilities but lack thereof. She gave the example of a river access point that lacked a trail. People made one, and due to its lack of formal design, erosion ensued.

The informal trails or infrastructure (boat docks, bathrooms, etc.) that emerge from a lack of facilities are not accounted for in EIS/EIR processes, which focuses on the environmental impacts from construction of facilities but does not adequately look at the environmental impacts from their absence. Furthermore, the WALROS tool does not account for a lower bound of human use related to the positive bystander effect and eyes to acre ratio. This lower bound can be thought of as the threshold past which unsanctioned activities are dissuaded by more eyes on the landscape.

8. The conditions under which restored and naturalized landscapes emerge strongly affect subsequent human use and the evolution of the landscape.

Comparing those landscapes that have been a product of planned, formal and institutionalized restoration with those that have been products of accidental or unplanned naturalization show clear differences. From our research we observed that the initial use protocols help form the types and quality of human use that develop in the landscape. Planning and implementation establishes the nature of community-management relationships which will have a lasting effect. Accidental or unplanned restored and naturalized landscapes have different processes for establishing community-management relationships. The “grandfathering-in” of existing use and management practices may be more likely in these cases. (See box below)

Working partnerships, public-private coalitions and proactive approaches are important in creating these landscapes.

The creation of the Cosumnes Preserve illustrates the success of working partnerships between public agencies and private stakeholders. The original preserve is product of a convergence of flood control and conservation interests, particular the Stone Lakes National Wildlife Refuge Association (now known as Friends of Stone Lakes NWR), against a 50,000 person development plan. The State of California and County of Sacramento purchased about 2,600 acres in the early 1970s, turning the land over to their respective park departments. The list of USFWS partners involved in the Stone Lakes National Wildlife refuge, which

includes a local school district, several non-profits, tribal groups, as well as local, county and state agencies, illustrates the importance of public-private as well as public-public coalitions (further information on Stone Lakes is in the appendix) Several groups help get the public directly involved in the restoration and monitoring of the landscape.

Partnerships are especially valuable and visible in cases where there are claims made by American Indian groups. Bart McDermott, the Stone Lakes NWR manager, discussed how tribal groups were initially brought in during wetlands restoration when cultural sites were uncovered. This relationship blossomed as tribes became interested not just in cultural site protection, but also, restoration, and gathering of traditionally used plants.

9. Engaging the public in planning, design and management of these landscapes has demonstrated benefits and positive effects.

Given the challenges faced by law enforcement (under-funded, spread thin, focused on more populated areas), combined with trends of urban expansion at the edges of the Delta, and the planned expansion of restored and naturalized landscapes within, it seems safe to conclude that unsanctioned use will be part of the human uses in these landscapes. Coming to terms with the realities of human use and the resources currently allocated to addressing them should encourage an honest and open conversation on what is acceptable and what is undesirable.

Such a conversation is already underway in the Yolo Bypass, and has begun to bear fruit in the form of effective programs to encourage community engagement with the added benefit of discouraging unsanctioned use. Some programs are explicitly aimed at patrolling and human use monitoring. These include the Natural Resource Volunteer Program (NRVP) administered by the CDFW LED as well as a volunteer Sunday patrol when no CDFW staff are available. Other programs encourage broader community engagement around science and restoration projects and have as a byproduct discouragement of unsanctioned activity. These programs take many forms including citizen science programs, work-trade related to restoration, etc.

These approaches show that increasing the eyes to acres ratio on a landscape need not entail hiring additional staff. However, costs in money and time for managing volunteers and non-staff personnel should not be discounted. Jeff Stoddard emphasized that while the Sunday volunteer patrol, has been a great benefit to the Wildlife Area, it has also been a huge undertaking. Such programs require resources to operate and their proliferation should not be seen as an opportunity to further diminish funding for conventional management.

Citizen Science is remarkably absent in the Delta.

Citizen science and monitoring is a celebrated, expanding, and often sanctioned human use in restored and naturalized landscapes throughout the world. Recent research has demonstrated the effectiveness of citizen science and how it can aid scientific monitoring while also offering productive and desirable work-play experiences for the public (Theobald et al. 2015; McKinley et al. 2015).

However, citizen science and monitoring is hardly employed in the Delta (3% of survey respondents reported this use). Meanwhile the adjacent San Francisco Bay Area is a bastion for citizen science programs.³⁵ When we asked scientists and land managers about the potential of citizen science in the Delta, we heard that it is possible but that it likely requires some training and organization to implement. Citizen science seems an overlooked asset in Delta restoration.

Stewarding Novel Ecosystems

The California Delta is an exemplary landscape of the Anthropocene: radically altered and remade by human agency, and one that will continue to change and co-evolve. Planning for human presence may entail accepting the degradation or privileging of certain ecological processes. Decisions may be justified on a variety of different grounds related to the promotion, preservation and celebration of certain landscape values, be they cultural or more related to ecosystem functions. Decisions can also create the conditions for synergy, with co-benefits between the enhancement of human opportunities and increased ecosystem health or increased habitat value for a certain species.

To effectively steward restored and naturalized Delta landscapes it is important to pursue the following research, policy and management agenda:

- Compare the ecological impact of unsanctioned use in the restored and naturalized landscapes of the Delta to those impacts associated with sanctioned uses, occupations and activities, such as: In-Delta water exports, upstream diversions, agriculture (especially wine grapes, nuts, and other crops with low habitat value), the application of herbicides as part of restoration, motorized recreational boating, legal hunting and fishing, urban sprawl on the Delta edge, dredging, levee maintenance, shipping, etc.
- In the context of the impacts of these sanctioned activities, reevaluate the resources being directed towards addressing unsanctioned use.

CONCLUSIONS

In this chapter we have presented our findings of current human uses of restored and naturalized Delta landscapes. These were based on a year of mixed methods research consisting of interviews, surveys, case studies and extensive field work. Human use of these landscapes is diverse and pervasive. All areas are subject to multiple human uses that span sanctioned and unsanctioned activities. How these uses combine and interact varies with the physical qualities of the specific landscape and its immediate and wider geographic context is poorly understood.

We can draw some generalizations about human use of restored and naturalized landscapes in the Delta, with the caveat that each landscape should be approached individually to understand the distinctive ways it came to be through a social, political and physical processes. Each rewilded landscape is subject to a unique set of circumstances, such as its proximity to urbanized areas, adjacent land uses and management. How these landscapes emerge, by accident or deliberate intervention, affects how they develop and are used. Generally we observed that restoration projects that have anticipated human uses and incorporated local communities and organizations in their planning appear to fare better in the long term than those that do not.

We encountered a significant lack of data regarding metrics of current human use of rewilded landscapes in the Delta, such as quantification of the ecological impacts of human uses or “carrying capacity”, as well as verification of “positive bystander” effects discussed by land managers and scientists. We also observed a surprising lack of citizen science initiatives and public understanding of the Delta’s ecology, a surprising finding given how pervasive citizen science and civic ecology is in the adjacent San Francisco Bay as well as the general allusion to ecological crisis that pervades discussions and efforts in the Delta generally.

Notes

1 “The public does weird things, they are unpredictable” From interview with Matt Coyle and Matt Gause, Westervelt, discussing human use of the Cosumnes River Floodplain Mitigation Bank as well as other Westervelt properties. These descriptions of unusual, surprising and unpredictable behavior was common to many of interviews with land managers.

2 The DISB Adaptive Management Review discussed thresholds of acceptability as being determined by, “the cost and feasibility of making a change, the suitability of alternatives, the priorities of stakeholders and interest groups, and a multitude of other factors” (DISB 2016).

3 Related to the Broken Windows hypothesis is the concept of defensible space. As defined in Oscar Newman’s book Design Guidelines for Creating Defensible Space, defensible space is “a residential environment whose physical characteristics—building layout and site plan—function to allow inhabitants themselves to become key agents in ensuring their security.” He goes on to explain that a housing development is only defensible if residents intend to adopt this role, which is defined by good design: “Defensible space therefore is a sociophysical phenomenon”. Therefore, both society and physical elements are parts of a successful defensible space (Newman 1972).

4 As a poignant example, a court case, Property Reserve Inc. v. Superior Court, C067758 (JCCP No. 4594), settled in 2013, addressed the issue of DWR’s entry onto hundreds of Delta properties for the purpose of conducting environmental studies and geological activities in support of the BDCP. The court ruled that these entries constituted a taking under the State and federal Constitutions.

5 The Natural Resource Volunteer Program (NRVP) assists the California Department of Fish and Wildlife (CDFW) by providing enhanced public service to the community while offering opportunities for citizens to make a definitive contribution toward protecting California’s wildlife resources.

6 <http://californiadelta.org/fishing/delta-fishing-holes/>

7 See Appendix for a full list of Delta Fishing Tournaments in 2016 (source: <https://nrm.dfg.ca.gov/FishingContests/default.aspx>)

8 <http://californiadelta.org/event/56th-annual-barron-hilton-fireworks-extravaganza/>

9 <http://www.seasteading.org/>

10 The Cosumnes River is an interesting example of an intermittent stream which creates distinct use regimes which depend on highly seasonal flow. The riverbed serves as a migration corridor for humans and nonhumans alike. Use of the corridor, for both humans and nonhumans changes profoundly depending on whether the riverbed is dry or wet.

11 Bill Wells has an intimate understanding of how the success of service provision businesses depends on the presence of fish and desirable conditions, which are influenced by these aforementioned cycles. He mentioned that the decline in Delta fisheries and the overall indeterminacy of future environmental conditions in the Delta is threatening the survival of marinas, some of which have been family owned and operated for generations.

12 Deferred Maintenance on National Park Properties Reaches \$11.49 Billion (March 25, 2015)

http://www.nps.gov/subjects/plandesignconstruct/upload/FY14-DM-by-State-and-Park_2015-03-13.pdf

13 Conversation with Jim Micheals, CA State Parks. Although staff members have been reassigned out of the Delta, they do conduct bimonthly visits to Delta Meadows and staff is involved in the placement of hunting blinds at Franks Tract.

14 Conversation with Jim Micheals, CA State Parks.

15 Franks Tract and Brannan Island are both need of a general plan update. Their last general plans are from 1988 and 1987 respectively.. Delta Meadows, which has been Park’s property since 1985, still lacks a general plan.

16 A finding verified in interviews with CA State Parks personnel

17 For additional information on recreational surveys see 1997 Sacramento-San Joaquin Delta Recreation Survey — Chapter 2. Previous Recreation Surveys (http://www.delta.ca.gov/survey_ch2.htm).

18 <http://www.dbw.ca.gov/PDF/DeltaAssessment-PDF/Chapter8/Chapter%208.pdf>

19 <http://www.sjafca.com/pdf/lsjrdsrfmp/draft91514/AppendixA.pdf>

20 <http://www.environment.ucla.edu/prop84>

21 From Interview with Bart McDermott, Stone Lakes NWR Manager

22 In addition to plantings, we have heard these referred to as grows and marijuana gardens.

23 Illegal commercialization, refers to the unlawful commercial exploitation of species, often by organized criminal enterprises.

24 For example, ATV use in the dry riverbed of the Cosumnes River may have not have a clear undesirable impact on ecosystem processes such as seed dispersal or sediment movement. However, this use does interfere with models which are seeking to understand geomorphological processes that occur in the absence of ATV use and affect tree growth on the restored floodplain.

25 Interview with Bart McDermott, Stone Lakes NWR Manager

26 http://www.Deltanationalpark.org/blog/view/what_does_public_and_private_mean_in_the_Delta/

27 <http://www.mcclatchydc.com/news/nation-world/national/article24726670.html>

28 Federal regulations (33 CFR 328.3(e)) define the “ordinary high water mark” (OHWM) as “that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. The OHWM is used by the USACE, the US EPA, and other federal agencies to determine the geographical extent of their regulatory programs.

29 The commission may establish the ordinary high-water mark or the ordinary low-water mark of any of the swamp, overflowed, marsh, tide, or submerged lands of this State, by agreement, arbitration, or action to quiet title, whenever it is deemed expedient or necessary. The amendment hereby made is declaratory of the existing law and any such agreements heretofore made establishing the ordinary high-water mark or the ordinary low-water mark of any of the swamp, overflowed, marsh, tide, or submerged lands of this State hereby are ratified and confirmed. (Ca. Public Resources Code. Section 6357-6360)

30 http://www.Deltanationalpark.org/blog/view/what_does_public_and_private_mean_in_the_Delta/

31 <http://www.mcclatchydc.com/news/nation-world/national/article24726670.html>

32 The California Penal Code Section 552-555.5 provides the legal framework for signage as well as the specifics on how to insure that a property is legally posted (554.1). However, the efficacy of signage does not correspond to its adherence to these specifications per se. What matters is that potential users see the sign, get the message, and understand the consequences of trespass or transgression. The actual practices of signage reveal some of the grey area, particularly in regards to the water-land interfaces.

33 We have looked at these forums and the following summarizes the conundrum that some waterfowl hunters feel they face: It is a damned if you do, damned if you don’t situation. If you leave the bird they can cite you for wanton waste. If you go and get it you are trespassing. Here is what the wardens told me: You must make an attempt to retrieve the bird even if on private land or you will be cited for wanton waste - you must leave your gun in your boat. If the landowner explicitly {sic} states to you that you are not to be on the property -dead bird or not- then you are to leave their property and the bird but you will not be cited for wanton waste. All of the wardens I spoke to said that they would be very accomadative {sic} if you at least make an attempt to retrieve the bird and that it would have to be an extreme, unlikely scenario for them to write you a trespass ticket. They all said that in court an understanding judge would most likely not penalize you for trespass if you were attempting to retrieve downed game WITHOUT your gun. (<http://www.duckhuntingchat.com/forum/viewtopic.php?f=21&t=18692>)

34 The positive bystander relates to the notion of the eyes to acres ratio introduced by Wes Jackson (Leonard 2012). By “eyes” Jackson means a competent watchfulness, aware of the nature and the history of the place, constantly present, always alert for signs of harm and signs of health. These eyes could come in the form of a trained, expert land manager, but could also belong to a farmer. The exact eyes to acres ratio is not scientifically predictable or computable, but we can suppose that the ratio is approximately correct when a place is thriving in human use and care.

35 <http://www.calacademy.org/citizen-science/>

8: Planning and Designing for Delta Wilds



Native plant restoration

Native plant hedgerow being maintained Stone Lakes National Wildlife Refuge by the Sacramento Tree Foundation, Winter, 2015.
In addition to providing habitat, the hedgerow is intended to be a buffer and natural fence that will discourage trespassing onto adjacent, privately held farmland.

CHAPTER 8. PLANNING AND DESIGNING FOR DELTA WILDS

Our one year study offers a variety of initial findings from surveys, interviews, background planning research, field work and specific case studies, examined in previous chapters. This chapter provides some overarching recommendations for future planning and management efforts. We also present a variety of opportunities for further research regarding the nature of human use of restored and naturalized landscapes in the Delta.

In general our research supports a reconciliation approach which seeks synergies between ecosystem needs and those who live, work and play in the Delta, both now and in the future. We see much potential in deploying more holistic, creative and adaptive management techniques, which can provide resources for both “doing” (i.e. recreational enhancements, law enforcement, design interventions, access experiments, etc.) and “learning” (monitoring, in-situ user surveys, and data analysis, etc.). Ideally, the two processes are integrated into adaptive management practices with robust feedback between the socio-ecological conditions “on the ground” and management strategies and policies.

PLANNING AND DESIGN RECOMMENDATIONS

1. Strive for multi-purpose/multi-benefit landscapes rather than single purpose projects.

The creation of multi-benefit landscapes is guided by the Delta Plan and other Delta planning initiatives. Human use and presence within restored and naturalized landscape should be more integral to this effort.¹ From examining a variety of restored and naturalized landscapes in the Delta, we found that those that were able to encompass multi-purpose interests and design goals tend to be more robust and successful than single purpose projects. Planning and designing for a range of future benefits – for both humans and non-humans – might require more initial effort and planning, but over the long term, these landscapes provide a solid return on these investments through better performance. Landscape projects that don’t plan for a range of compatible uses tend to encounter costly issues related to design shortcomings and management challenges, such as unsanctioned use.

2. Plan Inclusively: Community involvement and participation in restoration planning and design is critical for long term success.

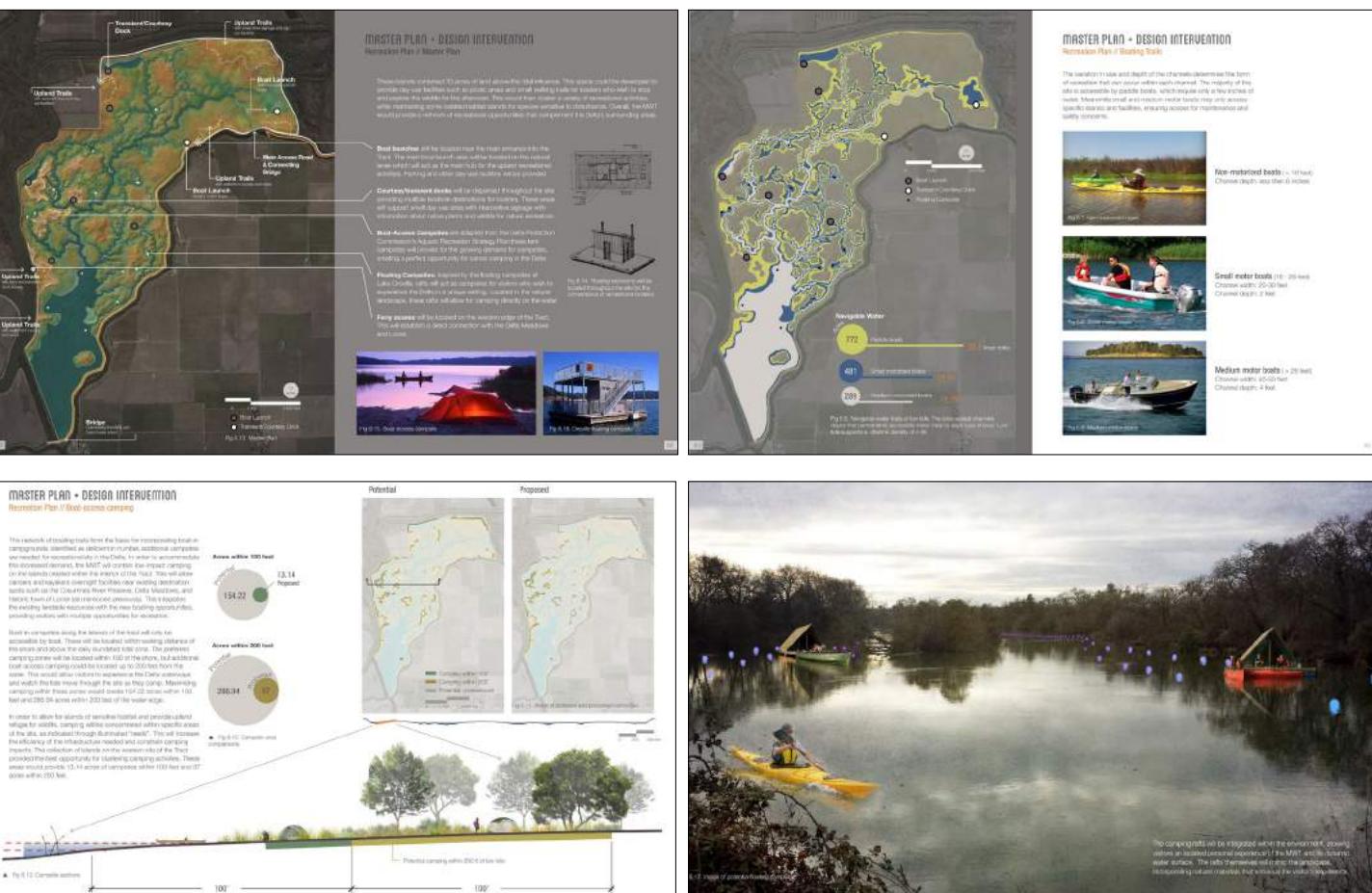
Given the territorial, over-allocated and conflict-prone nature of the Delta, buy-in and support of local stakeholders is necessary for the success of restoration projects. Community-based restoration, in which community members are engaged in the planning, implementation (as pictured above) and monitoring is recommended. The Delta Dialogues, convened by the Delta Conservancy, represents such an attempt, as did their current Delta Restoration Network (DRN).² We are hopeful that in the Delta Conservation Framework, meaningful community participation can continue through coordination with existing local Habitat Conservation Plans (HCP’s) and Natural Community Conservation Plans (NCCP’s). As we learned from the HCP/NCCP process, ongoing monitoring is crucial to the success of an approach that balances those immediate requirements of management with the need to learn about the system being managed (Spencer et al. 2006). Stable, long-term funding is required to support these participatory planning, design and monitoring elements as they are often outcompeted by the more immediate requirements of management and implementation (Barbour and Kueppers 2011).

3. Recreational and other human uses should be integrated into restoration planning from the beginning, rather than as an afterthought.

Including recreation in ecosystem projects is a recommendation in the Delta Plan (DP R9). The metric for achieving this goal is the percent of new ecosystem restoration projects that include recreational facilities. The Delta Plan Performance Measures have a 100% target.³ Efforts will have to be strengthened to make this a reality, as recreation has tended to consistently be pushed aside as peripheral and unimportant. As an example, recreation was a major component of the historical Peripheral Canal plans, but has been deemphasized in the latest BDCP/Waterfix iteration (for additional information see planning review).

A variety of benefits come from integrating recreation and other human uses into restoration planning. Recreational and human use planning builds constituency and economic value into restoration projects. Pragmatically, it can also help save money through more integrated planning. According to Cheryl Essex, an environmental planner at the Department of Parks and Recreation (DPR), *If recreation happens at the same time as this planning for these other benefits than it is much easier to fund and we also don't have to do a CEQA [California Environmental Quality Act] analysis on impacts because if it proceeds at the same time as restoration work then it is all good. It is all good, all a public benefit. It is a lot tougher to do it now than later.*⁴ Early integration also would allow for forecasting of anticipated future uses, which could eliminate surprises from shifting cultural preferences, and allow for more effective, long-term planning. Furthermore, if taxpayer dollars are being used for restoration-oriented projects there is an obligation that taxpayers see some benefit, which can take the form of enhanced public access.

Much of the work of integrating human uses into Delta restoration projects needs to occur at the state and regional level of governance and policy making, as this is where most restoration programs and mandates are housed. We recommend that state government and Delta agencies allocate more funds for human aspects of restoration, which will pay for itself in long term benefits. In particular, more resources need to be set aside and dedicated for planning and implementation of human use within ecological restoration projects. At the highest levels of state planning for the Delta, such as the Delta Stewardship Council (DSC), there is no representative, expert, or ‘champion’ for reconciling human uses within restoration efforts. Thus when these issues arise, they are not addressed internally,



"Navigating the Delta: The McCormack-Williamson Tract" (2014)

Excerpts from the Design Project by UC Davis landscape architecture student Katie Herman examined the existing plan for the North Delta Flood Control Project, building a vision of incorporated aquatic recreation with the natural ecological and hydrological processes into the future inundated landscape. Based on the growing recreational demand in the Delta, this plan proposes implementing a network of boating trails, campsites, and interactive wayfinding media for the new waterways. The project was coordinated with and advised by representatives from the DWR, The Delta Conservancy and the Nature Conservancy.

but often passed off to other agencies, who are not integrated into top level planning discussions. When proponents of human uses are fragmented between recreation, scientific monitoring, adaptive management, agriculture, etc. the ability to manage for multiple objectives is compromised. There is a strong need for internal and high level expertise able to facilitate and oversee planning for multiple human uses of Delta wilds. Policy for integrating human uses in restoration efforts lack efficacy and implementation in the Delta because they currently exist as recommendations, rather than mandates. The San Francisco Bay and Suisun Marsh provide examples where such policy has more teeth and thus more tangible results and benefits. This same type of integration is needed in adaptive management efforts in the Delta, where entities such as the Interagency Adaptive Management Implementation Team (IAMIT) can strive to include human uses as part of adaptive management efforts.

4. Funding for human use and recreation planning should be budgeted for and consistently factored into restoration projects.

Currently, funding and support for enhanced human use and recreational planning in restored and naturalized landscapes are low and inadequate, following a larger US trend (Ogden 2008). The Delta Conservancy supports opportunities to increase public access, recreation and tourism opportunities in the Delta as a primary mandate. However, currently this is a largely unfunded mandate.⁵ Their funded tourism marketing and development strategy is focused on agritourism, boating, wine, historic tourism, eco-tourism, etc. The Delta Conservancy and Delta Protection Commission are partners in an additional effort to assist Delta residents in developing a “Delta Brand” for agricultural products and tourism.⁶ Although these initiatives may affect human use, they are not directly related to enhancing public access in restored and naturalized landscapes.

The lack of updated general plans (Franks Tract, Brannan Island) or any general plan (Delta Meadows) is a major impediment to developing and implementing integrated recreation and restoration in the State Parks Delta properties. Recreational facilities in these properties lag far behind demand and as we observed and were informed, serious impacts from the lack of adequate facilities and funding are apparent.⁷ The effects of inadequate facilities and underserved users has not been quantified but it seems the situation is likely going to worsen with current trends of increasing urbanization of the Delta periphery.

5. Design and management choices made early in a restoration project or the emergence of a naturalized landscape strongly influence future relationships and conditions. We should plan accordingly.

From the information we gathered, the processes through which landscapes emerge leaves a strong imprint on how they subsequently develop. The relationships and legacies engendered by these initial conditions set the stage for future activity. Examples we have discussed include:

- Hunter blinds fully occupying and contesting territory over Liberty Island after the tract's final unrepaired levee breach
- Cabins grandfathered in to Lower Sherman Island Wildlife Area continue to persist and present management challenges
- The White Slough ponds have become attractive sites for varied public use.

Robust participatory planning and design at the initial stages when these landscapes emerge (or prior to) can help establish desirable trajectories of development, which in turn can foster more effective management in the long term.

6. Plan for regional connectivity (landscape networks) - the scale and spatial distribution of restored landscapes matters.

From a landscape ecology perspective, the geographic form of this network matters not just in terms of ecological function and recovery goals, but also for human uses. This holds true for a variety of factors related to ecosystem function, such as: connectivity, tidal/floodplain process, nutrient cycling, refugia, etc. as well as human use performance measures, such as: accessibility, desirability, stewardship, unsanctioned use, etc.

As an example, the BDCP set out ambitious acreage targets for restoration, which have since been significantly reduced as Waterfix and EcoRestore. Agencies charged with Delta restoration foresaw difficulties in accommodating the original BCDP mandates due to the size and contiguity of the restored areas that were envisioned. They experienced pushback from local stakeholders concerned with seizure by eminent domain and the potential impact of such landscapes changes on their livelihoods and communities. Smaller, more disparate units might be easier to achieve and reach broad agreement on. But there are tradeoffs. A dispersed patchwork is typically harder to manage than larger contiguous parcels, and smaller, disconnected landscape units might have less ecological benefit and resiliency. These benefits and tradeoffs should be considered concurrently.

7. Adaptively manage for human uses, sanctioned and unsanctioned.

Active adaptive management strategies already developed for non-human species can be expanded to include human uses, which is an integral and fundamental component of the ecology of these landscapes. "Active adaptive management balances the requirements of management with the need to learn about the system being managed, which leads to better decisions" (McCarthy and Possingham 2007). Specific to human uses,

- Plan for a variety of uses with the understanding that use patterns will change with socio-ecological changes, i.e. shifting cultural preferences and sociopolitics as well as biogeophysical transformations.
- Plan for unsanctioned use in ways similar to newer approaches towards novel and reconciled ecologies. These approaches acknowledge that some (to many) species are a part of the novel ecology of the Delta, including ourselves. Some are viewed as less desirable than others (water hyacinth), while some (black and striped bass) have mixed desirability. Although, full eradication of unsanctioned uses is unlikely, management strategies can be developed to mitigate or creatively prevent undesirable activity. A critical component of managing unsanctioned uses is making conscious and well-considered decisions about whether an activity



UC Davis Researchers measuring, recording and sampling hunted waterfowl at the Yolo Bypass Wildlife Area, Fall 2015. Recreational hunters voluntarily participate in the effort and researchers gain valuable wildlife data.

should be considered unsanctioned, based upon empirical and local data. And for activities that are unsanctioned, which are environmentally degrading and compromise public safety, thus warranting management resources.

- The Delta ISB Adaptive Management review posits that a, "more holistic and integrated approach to science based adaptive management in the Delta is needed to face both current and future challenges" (DISB 2016).

Some human uses clearly conflict with restoration objectives. The magnitude or intensity of human uses and their effects are also of critical. But equally important are ways that human uses and presence might be enrolled to benefit restoration goals, an aspect of creative management and monitoring that we find to be under considered in the Delta. We speak to each of these human use factors below.

8. Revisit user protocols and avoid over reliance on law enforcement.

As noted in our law enforcement chapter, enforcement personnel are already spread thin due to budgetary constraints, and given the subsequent need for triage, enforcement tends to localize in areas of higher population density, often deprioritizing restored landscapes. This is neither the only way nor best way to hold people accountable to their actions and promote good resource stewardship in the Delta. We support a broader range of protocols and interventions that deal with human use holistically and better address systemic and structural causes of unsanctioned use.

We propose that some laws and restrictions should potentially be reassessed in light of this research. For example, mitigation banks currently do not allow for any unsupervised public access.⁸ As mitigation banks expand in size, human use pressures could be ameliorated through special access dispensations, with the understanding that certain types of access could be symbiotic (see example below).



Beehives being used as a theft deterrent at a mitigation bank. Here the hives are strategically placed on the high ground of a levee, surrounding electrical infrastructure. Although mitigation banks have strict rules related to human access, experiments such as this illustrate the potential benefits of human use and occupation.

9. Explore more creative and inclusive ways to monitor and manage restored and naturalized landscapes.

Landscape monitoring and management is largely conducted within specialized professional practices, and often prosaically, as laborious and sometimes expensive tasks. Particularly for the Delta there is considerable opportunity to experiment with more creative and inclusive methods to perform these tasks. Civic ecology, community-based environmental monitoring, and community-based watershed stewardship programs have shown promise in increasing citizen trust in government, improving the biophysical environment, and fostering participants' ecological understanding (Shandas and Messer 2008). Citizen science is completely understudied, and seemingly undervalued in the Delta as a tool for monitoring and restoring ecological habitat and functions. We see embracing the novel ecologies of the Delta as an opportunity for engaging citizen sciences as well as the general public (see recommendation 11.) In our conversations with the Interagency Ecological Program (IEP) there was an expressed interest in the use of citizen science as a monitoring tool. Thus far the logistical challenges of coordinating a citizen science program have dissuaded the program. However, the creation of dedicated Delta Research Station⁹ may create an opportunity for a citizen science program and additional public engagement with the IEP, which conducts extensive monitoring throughout the Delta.

10. Design interactive, real time and creative digital media for users and visitors to the Delta.

The Delta's complex tracts, levees, and waterways can be a challenge to interpret, or even see, given the Delta's flat landscape. There is a major opportunity for digital media, mapping and smartphone apps to augment the Delta experience by allowing users to explore

previous cultural relationships and forge new connections to place. Smart phone apps include Instagram, Litterati¹⁰ and the IVAN (Identifying Violations Affecting Neighborhoods) platform. The Delta Conservancy has been using Litterati for their Delta clean-up days to track trash collection and create infographics and reports. IVAN is a crowdsourced environmental monitoring system that connects community participants with organizations and agencies that can help solve local environmental problems.¹¹ The IVAN reporting network currently includes several counties in the Southern San Joaquin valley as well as urban areas such as Bayview Hunters Point in the San Francisco Bay Area. A Sacramento network is in development, which will cover much of the Delta.

11. The Delta's novel ecosystem and efforts to improve it should be embraced in Delta literature, marketing and advertising.

We must embrace and celebrate the novel ecology of the Delta. The Delta contains ideal places in which to engage with the concepts and challenges of a new era - the anthropocene/econocene.¹² Sea level rise, non-native species, drought, flood, migration (human as well as non-human), agriculture, economic (de)growth, strategic/managed retreat, State's rights, a shrinking federal role, are all entangled in the Delta landscape.

The Delta's novel ecology is absent in tourism information, as if we do not want people to know the extent of its alteration. Historical baselines for the Delta have political implications. Yet the novel ecology of the Delta is something that visitors might want to engage in – conceptually (through interpretive resources) and physically (paddling through invasive aquatic weeds and catching non-native but naturalized fish; citizen science). Calling attention to the Delta's dynamic and novel ecologies offers another dimension of Delta experiences, one that might improve scientific efforts, as well as build constituency for improving the health and desirability of the larger estuary.

OPPORTUNITIES FOR FURTHER RESEARCH

1. Additional studies are needed for better understanding how people are working, playing and dwelling in restored and naturalized landscapes of the Delta

Human use and occupation of these Delta landscapes is integral and inseparable to current and future conditions. Contrary to how these landscapes are often approached in Delta planning literature, they already have their own repertoire of established and emergent place values for Delta residents and a multitude of others. For ecological restoration to be successful it should be situated within a broader cultural context which nurtures an evolving connection to, and sense of, place.

Having recognized the degree of human presence in these landscapes, critical design and management questions then turn towards how these human uses – science, management, recreation, unsanctioned activity – might be guided towards mutually desired landscape performance outcomes. As we set about designing and adaptively planning for these landscapes – through charting current conditions and setting goals – our own cultural habits, desires and ways of interacting with landscapes must also be factored in.

2. Assess thresholds of occupancy and socio-ecological effects of human use.

In contrast to the extensive fish, bird and other non-human scientific study and monitoring that occurs in the Delta, we know very little about the human ecology of these landscapes, even though we exert a significant influence on the form and function of these landscapes. Although our data demonstrates the degree and diversity of human use and occupation of restored and naturalized landscapes in the Delta, we found very little research or empirical studies regarding the ecological and social effects of these uses – whether they are beneficial, detrimental, benign, or variable across different Delta contexts.

Determining thresholds of occupancy requires a qualitative and quantitative understanding of the socio-ecological effects of human use. Thresholds of occupancy may differ between different landscapes, reflecting distinct management priorities, which may include, but are not limited to mitigation, flood control, invasive species control, groundwater recharge, subsidence reversal, general ecological recovery, climate change adaptation, navigation, and recreational provisions. Generally we, and many Delta land managers and scientists, see a strong need for more depth and rigor in assessing the effects of different human presences in restored and naturalized Delta landscapes.¹³ The following general questions might be used to guide future studies and research questions:

- Given that we know that human activity and presence will be a part of these landscapes (both for work and pleasure), to what degree can restored and naturalized landscape withstand and/or benefit from specific human uses?
- How can we best augment or foster potential benefits (current and future, known and unknown) of human presence?
- What are the complements and conflicts of different combinations of uses?

3. Conduct Delta specific survey research on public user opinion, attitudes, and desires.

As of this writing, no prior in-situ (in landscape) user surveys have been performed in the Delta. Given the distinctive physical geography of the Delta, it will be useful to determine how the region's recreational and other uses compare to State and National trends (i.e. rise in wildlife watching, bicycle touring, and birdwatching). This data will better inform planning efforts. Given the accelerated rates of change within the Delta, such surveys could shed light on what people are doing in these landscapes and how use is changing. For example, fishing activity shifts based on drought, water flows, salinity levels and other shifting ecological conditions,

both annually and over longer durations. Conducting regular updates of human use surveys can help track changes associated with such shifts, while also potentially providing other ecological data.

In terms of public uses, we probably know the most about the Delta's waterways, due to the boating needs assessments (DBW 2003). However, this assessment will also require continual updates as opportunities and preferences will change with restoration, creating more non-motorized boating opportunities (kayaking, canoeing) connected to those waterways. A survey of service providers, being conducted by DPC and DPR, is in process and may offer some insights into changing user preferences. The DPC is also updating a 1997 inventory of recreational facilities.

4. Better assess bystander and eyes-on-acres benefits.

Our study has identified the need to quantify and qualify the benefits, or "positive bystander effects", of recreation and other human activity within restored and naturalized landscapes. In the previous chapter we documented instances of human use activity that demonstrated beneficial bystander effects, including volunteer trash clearing on the public shoreline of Lower Sherman Island, which subsequently thwarted future littering; ecological benefits of hunting (reduced spread of disease); citizen science and volunteer citizen patrols, such as for the US Coast Guard, and the YBWA Natural Resource Volunteer Program (NRVP). These programs successfully involve the general public in stewardship of these lands, but additional research is needed to broaden the range of examples and to more clearly demonstrate the potential benefits of such activity.

5. Experiment with innovative and integrative methods of managing and monitoring landscapes, particularly citizen science.

Our study identified untapped opportunities to develop more integrative and multi-benefit forms of landscape monitoring and management. By and large, most landscape monitoring is done within narrow, specialized silos. Within scientific communities there is a push for more integrative and holistic monitoring. We contend that this should be extended to human uses. Citizen science has the potential to engage local communities and is widely and effectively performed in the neighboring San Francisco Bay. Delta land managers and scientists participating in this project, generally agreed that such efforts could be mutually beneficial, however funding is a major hurdle. As we have documented, the Delta already has some of these experiments in place, be they inadvertent and "naturalized". Delta Meadows State Park property is a paramount example of an experimental landscape initiated by severe budget cuts. The park property operates in a quasi-closed, quasi-open state with no regular or formalized management presence. Access and activity protocols are thoroughly ambiguous. And yet the landscape is still cared for through informal coalitions between State Park wardens the local community of Locke and Walnut Grove, and an itinerant mariner that keeps voluntary patrol of the sloughs and banks in exchange for safe harbor.

CONCLUSIONS

Human uses of restored and naturalized Delta landscapes are endemic, pervasive and diverse. Planning, policy and design should include human uses in Delta restoration efforts to make them more realistic and effective. This will require changes in how Delta restoration work is performed. It will require more effort, research and resources for planning for human uses of restored landscapes upfront as an investment in the long term. It also will require more outreach, community engagement and inter-agency cooperation in restoration planning consistent with efforts of the Delta Conservancy.

Restoration decisions will continue to be made under conditions of uncertainty that define the current Delta – be they infrastructural, scientific, economic and socio-political. Adaptive management efforts, combined with adequate resources to perform them, will continue to be important for restored and naturalized Delta landscapes. Most critically, these adaptive and experimental management practices should be revamped to include human activity and how it affects these landscapes. Human uses of restored landscapes are typically cast as detrimental to scientific and ecological goals and thus are not prioritized. But given the working landscape of the Delta and the extensive urbanized areas and cities that surround it, reconciling human use into its rewilded landscapes is necessary, and if done with foresight and creativity, has potential to benefit and support restoration goals.

The potential benefits of humans in these landscapes, such as monitoring and ecological advocacy through citizen science, is largely unknown, since it has yet to be adequately tested in the Delta. Thus we advocate for more research and funding in these areas. Specifically, citizen science, civic ecology and environmental education and volunteer programs should be more actively tested and prototyped in the Delta. Adaptive management and monitoring programs that integrate and utilize existing human uses should also be trialed and refined. Lastly, our findings provide a general understanding of how people are currently using and valuing restored and naturalized Delta landscapes. Delta policy and planning would benefit from additional socio-ecological research on these human-environment relationships that would build on our initial findings and explore specific questions emerging from this study.

Notes

- 1 DWR's Delta Levee Special Projects program has an explicit mandate to support multi-benefit projects which, "safeguard public benefits, including roads, utilities, urbanized areas, water quality, recreation, navigation and fish and wildlife from flood hazards", in addition the program, "mitigates the habitat impacts of each project and ensures a net long-term habitat improvement in the Delta" (http://www.water.ca.gov/floodsafe/fessro/Deltalevees/special_projects/index.cfm)
- 2 As the DRN provided a valuable opportunity for all restoration interests to gather and coordinate, its work was morphed into developing these planning processes and is now somewhat redundant to the EcoRestore meetings run by the California Natural Resources Agency (CNRA).
- 3 <http://DeltaCouncil.ca.gov/docs/Delta-plan-performance-measures/Delta-plan-performance-measures-draft-staff-recommendations-0>
- 4 Interview with Cheryl Essex, DPR
- 5 Email correspondence with Campbell Ingram.
- 6 <http://Deltaconservancy.ca.gov/Delta-branding-and-marketing/>
- 7 Interview with Cheryl Essex and Jim Micheals, DPR
- 8 Incorporating management into the bank agreement is key to the bank's success. With few exceptions, listed species and their habitat cannot be conserved without management of the conservation property. An active management program may consist of halting and removing illegal trash dumping, preventing trespassing that might include off-road vehicle use, and/or imitating the natural disturbance regimes that might include prescribed burns. The ultimate goal for any management plan will consist of maintaining the habitat for the continued use by the listed species conserved on site" (Bayon, Carroll, and Fox 2012).
- 9 <http://www.Deltaresearchstation.com/>
- 10 <http://www.litterati.org/#home>
- 11 <http://ivanonline.org/index.php>
- 12 The use of this term remains highly contested. See Donna Haraway's recent Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin (Haraway 2015). Delta Independent Science Board member Richard Norgaard has advances the term "Econocene" in his 2013 SFEI piece, The Econocene and the Delta (Norgaard 2013).
- 13 We attended quarterly stakeholder meetings of the Interagency Ecological Program (IEP). In these meetings and through communication with IEP members we sought to assess interest in the human ecology of the Delta and more direct monitoring of human use. We also identified the IEP as a prime mechanism for disseminating our survey to field scientists who conduct regular fieldwork in the Delta, particularly the waterways, tidal wetland and marshes. Survey responses are forthcoming and conversations with IEP members are ongoing.

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