BOOK REVIEW

**Butterfield, H. Scott, Kelsey, T. Rodd, and Hart, Abigail K. (Editors). Rewilding Agricultural Landscapes: A California Study in Rebalancing the Needs of People and Nature, Island Press, Washington, DC; 2021, Paperback, 264 pages, Price: $39.00 ISBN: 978-1-64283-126-9.**

The story of California's San Joaquin Valley is one of transformation. From the perennial grasslands, shrublands, and desert of the pre-colonial era, the valley has become one of the most heavily modified landscapes in the world, with massive infrastructure projects facilitating its growth into the nation's agricultural powerhouse. At the same time, it remains a hotspot for biodiversity and critical habitat, sheltering many rare and endemic species and unique ecosystems found nowhere else.

This juxtaposition is a challenge for land managers, planners, and policy makers at the best of times. Now, of course, California is in the midst of compounding crises. Population growth and urban expansion threaten conversion of prime farmland and valuable habitat alike. Climate change is increasing the frequency of extreme, long-term droughts like the one last seen in 2012-2016, along with the severe water shortages being faced this year. Communities in the San Joaquin Valley are seeing their drinking water wells dry up, and farmers are fallowing their fields as their irrigation ditches remain empty. Land is sinking from overconsumption of groundwater resources, and air quality ranks among the worst in the nation. If that wasn't enough, the highest concentration of threatened and endangered species in the continental U.S. can be found here in the valley.

The premise of the new book "Rewilding Agricultural Landscapes: A California Study in Rebalancing the Needs of People and Nature" is that these crises of climate, biodiversity, and resource use are symptoms of a broader disease; they are the result of resource extraction beyond nature's capacity to replenish. The central argument of the book is that things cannot go on as before, even if we wanted them to. Many agricultural lands will become unprofitable to farm and may simply be fallowed in a haphazard way. Such an outcome would be a lost opportunity at best, and at worst, a public liability, whether by becoming the source of additional dust emissions that worsen already poor air quality, harboring agricultural weeds and pests that harm neighboring cropland, or slashing employment avenues for the valley's agricultural workforce. Instead, the book's authors offer this vision: lands that can no longer be farmed but have strategic value to conservation efforts can be restored to their native plant and animal communities, a re-transformation would be enabled by a careful, creative, and inclusive planning process. The culmination of this vision, they argue, would be a rare triple-win: 1) productive and sustainable agricultural systems, 2) healthy and thriving natural systems that provide ecosystem services, and 3) healthy and thriving human communities.

"Rewilding Agricultural Landscapes" is a collaborative effort to translate the sciences of restoration ecology and conservation biology into a practical toolbox for policy makers, natural resource managers and planners, and conservation leaders. The authors represent a variety of public, non-governmental, and academic institutions and are spearheaded by the trio of editors from The Nature Conservancy. As a group, they tackle the complex and intersecting issues of agricultural sustainability, water management, and conservation – issues that come to a head in the transitioning landscape of the San Joaquin Valley – and present them in a way that is easy for a general audience to understand. The aim is to inspire readers to seek unconventional avenues for creating multibenefit landscapes, that is, landscapes that benefit people and nature in equal measures. The authors use a series of case studies, side-by-side with explanations of the latest scientific understanding and research, to tell a story that is at once very particular to California but hints at themes germane to many such transformations as our global climate and managed ecosystems evolve. (Disclaimer: Some of the book's authors are now my colleagues at the Public Policy Institute of California; however, I joined the team well after the book was in the last stages of publication.)

Chapter 1 sets the stage by detailing how water scarcity is driving the valley towards a tipping point. The authors argue this tipping point could be seen as either a threat or an opportunity. Operating under the assumption that more than 300,000 acres of irrigated agricultural land will likely need to come out of irrigated production, whether temporarily or permanently, they pose the key questions that serve as the roadmap for the rest of the book: "which lands should come out of production, what are the best alternative future uses of these lands, and how do we make that transition in a way that creates the best outcome given the challenges the valley and state face? How do we as a society do this in ways that are equitable for farmers and communities who will pay the heaviest price?"

The following pages set out to address those questions in three sections. The first is a primer on San Joaquin Valley plant and animal communities, introducing readers to the native ecosystems and leading characters – charismatic organisms such as the San Joaquin kit fox (*Vulpes macrotis mutica*), giant kangaroo rat (*Dipodomys ingens*), and Bakersfield cactus (*Opunita basilaris* var. *treleasei*) – that provide both the local flair and fodder

for discussion in the rest of the book. It is also an overview of past large-scale restoration efforts in the valley, including the lessons learned from these efforts and the recurring themes drawn from restoration ecology as they pertain to the unique San Joaquin Valley landscape. With this orientation under their belts, readers can then approach the next two sections with a sense of familiarity of the ecosystems under discussion.

The second section dives into the nitty gritty of *how* ecosystem restoration or rewilding happens in practice, at the level of an individual project site. How do we decide what lands are best for siting a restoration project? How do we ensure the adaptability and genetic robustness of reintroduced populations of plants and animals? And how do we prioritize lands for rewilding when multiple potential land use alternatives exist? Species distribution modeling, wildlife genomics, and species reintroductions feature as particularly important tools in the rewilding toolbox. Equally important will be management of adjacent agricultural lands. Kremen, Kelsey, and Gennet discuss in chapter 10 that where inhospitable agricultural sacrifice zones surround disjointed islands of good habitat, rewilding is unlikely to succeed over the long term. Whereas, leveraging ecological intensification approaches to "soften" the agricultural matrix into a permeable, semi-habitat zone can benefit both conservation areas and farmers' bottom lines. When it comes to prioritization, however, the book moves beyond site-specific questions to the large-scale spatial considerations of interest to policy makers and land use planners. In chapter 9, Kelsey et al. highlight the importance of connectivity among metapopulations of species to ensure the long-term success of habitat rehabilitation. "This means selecting areas with the greatest current and future potential *habitat suitability*, consolidating land retirement into *large blocks*, and ideally building on *existing natural and protected lands*" (my emphasis).

Clearly, flexibility and coordination among groups of stakeholders is a prerequisite for rewilding, but this may be more difficult to achieve in a fragmented agricultural landscape than the authors let on at this point. They argue that "fundamentally, all that is needed is an ability to represent how benefits associated with different land uses vary in space." This is the linchpin of the entire conversation and is more difficult than it sounds. Also, even the most accurate and well-validated model comes with uncertainty. Model-driven spatial land use planning and benefit quantification should go hand in hand with expanded monitoring, verification, and ground-truthing of model predictions, along with community-led valorization and prioritization efforts, a point which could have received more attention in the text.

Section III is where the rubber hits to road in terms of how rewilding efforts might play out in the socio-political dimension. Who is going to benefit from these transitions, and who is going to pay for them? Chapter 11 meets these questions head-on, stating that rewilding will require "much greater coordination than ever before among the many individuals and agencies that own, manage, and regulate water and land." So how might this happen? The authors highlight several key considerations that must be met: 1) basin-scale planning to enable coordinated land fallowing, 2) flexible regulations to reduce the time, cost, and risk to landowners from rewilding efforts, and 3) financial incentives from a broad range of programs to grease the wheels and minimize the private costs borne by landowners. These considerations, they argue, must go hand-in-hand with accessible technical support from third-party, "honest brokers" that can bridge the gap between land managers' local knowledge and the scientific and engineering expertise needed to implement rewilding projects.

Chapter 12, by Abigail Hart, comes the closest to examining the question of rewilding from the perspective of farmers and landowners by incorporating their insights into the learnings from several case studies. Hart makes her case plainly: the goals of conservationists and agriculturalists can be mutual, and complementary, rather than antagonistic. Indeed, this will be imperative if the vision of the book's authors is to be realized. Two themes are salient: 1) the need to create value for *all* parties involved in a restoration/conservation effort, including and especially landowners/managers, and 2) the need to have skin in the game (i.e., a willingness on the part of conservation organizations to "share in the risk private landowners face" as a critical waypoint to building trust and mutual understanding among stakeholders). While the need for farmer and rancher engagement is adeptly handled in this chapter, one of my main critiques of the book is the notable absence of contributors from the agricultural sector. Despite repeated emphasis here and elsewhere in the book on agricultural sector buy-in as a key to rewilding success, all but one of the book's authors come from the research and conservation sectors, whether affiliated with non-governmental organizations such as the Public Policy Institute of California and The Nature Conservancy, universities, or federal and state agencies.

An interesting issue brought up by Andrew Ayres, the author of chapter 13, is that of fragmentation and the size of landholdings involved in rewilding efforts, both in terms of individual projects and of higher-level economic considerations. Ayres notes that residents of the valley are willing to pay to avoid exposure to the negative effects of haphazard fallowing, such as dust pollution, pests, and weeds. However, in the San Joaquin Valley, farms are typically small relative to the national average of 757 acres. "As individual landholdings become smaller and the landscape of landholding more fragmented, the portion of the costs resulting from

dust emissions (or pests or weeds) that accrue to the landowner from any given square foot of land decreases. Accordingly, incentives to manage and reduce such emissions decrease." This insight echoes themes on habitat consolidation and connectivity described in earlier chapters, reiterating that *where* fallowing happens, *how* it happens, and *how much* of it happens is important both from an agricultural management standpoint and from a restoration ecology standpoint.

However, the implications of this assumption are at odds with Kremen, Kelsey, and Gennet's emphasis in chapter 10 on diversifying farmland management. The management practices they highlight – hedgerow planting, riparian buffer zones, inter- and cover cropping, among others – are labor intensive, meaning they would naturally work best on smaller scales. So how to reconcile this problem with the need to consolidate land management so that the economics of alternative land management strategies such as rewilding pencil out? Regardless of the disparity in the most optimal land configurations for ecological intensification of agricultural versus rewilding for multiple benefit creation, Ayre's point that articulating costs, beneficiaries, and uncertainties seems a crucial first step in any rewilding effort. It also reemphasizes assertions from earlier chapters that rewilding projects won't get off the ground without first demonstrating mutual benefit and bringing value to everyone with a stake in the land.

The book's authors go to great lengths to demonstrate that transformation at the scale envisioned for the San Joaquin Valley is not only possible but may prove to be a triple-win driven by both economics *and* values. They also do not sugarcoat the fact that we have a lot of work to do to make the vision a reality, whether in terms of research and development, stakeholder engagement, or policy reform. Rewilding the San Joaquin Valley will require a suite of financial incentives, relaxation of many regulatory hurdles, greater access to native seed and technical support, research on the feasibility and spatial distribution of priority land use alternatives, and levels of broad-scale planning and coordination never seen before in the valley. But, as Butterfield, Kelsey, and Hart put it in the book's final chapter, growing water scarcity on top of ongoing state legislation regulating groundwater pumping in overdrafted basins will "drive land use change whether rewilding is embraced or not," principally in the form of haphazard fallowing of formerly irrigated agricultural lands. "Strategically consolidating and repurposing only a fraction of these fallowed lands into larger, less fragmented habitat blocks could meet the needs of dozens of threatened and endangered species while minimizing human impacts and even producing other benefits."

The potential upsides of rewilding for all parties – human, plant, and animal communities – are there, but they must be well articulated and accessible to those with skin in the game. Doubtless, success will hinge on proactively addressing the complex social, environmental, economic, and political challenges currently driving land use and land use change in the San Joaquin Valley.

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