

A Fifty-Year Plan to Integrate Multi-Functional Green Infrastructure in Walnut Creek Watershed

Jennifer Natali*, University of California, Berkeley, jennifer.natali@berkeley.edu

Anneliese Sytsma, University of California, Berkeley, anneliese_sytsma@berkeley.edu

Ari Frink, University of California, Berkeley, ari.frink@gmail.com

G. Mathias Kondolf, University of California, Berkeley, kondolf@berkeley.edu

Mitch Avalon, Contra Costa County Flood Control and Water Conservation District, mitch.avalon@pw.cccounty.us

Mike Carlson, Contra Costa County Flood Control and Water Conservation District, mike.carlson@pw.cccounty.us

Our research partnership between UC Berkeley and Contra Costa County Flood Control and Water Conservation District defines a framework for identifying opportunities to integrate multi-functional green infrastructure into existing urban development. As cities, counties and flood control districts seek to replace aging, single-purpose “gray” infrastructure with multi-functional green infrastructure, existing development limits options to restore natural, self-sustaining creeks. Strategies for integrating cost-effective green infrastructure into existing development must consider underlying biophysical conditions that support natural processes. Our presented case study from Walnut Creek Watershed explores the ecological and social potential of creek restoration within a watershed context and develop strategies to overcome constraints and reconfigure land use to support multiple community needs.

We used suitability analyses to target areas that can serve specific watershed functions: creek conveyance, seasonal storage, and infiltration for groundwater recharge. We mapped reach-based benefits and parcel-based opportunities for creek restoration and floodplain expansion, then considered their intersection to develop recommendations for short-term versus long-term planning strategies. Our delineation of reach-based benefits was informed by a literature review that sought evidence and quantification of “services” that stem from watershed functions of creek corridors, expanded floodplains and infiltration zones. Our parcel-based analysis maps allowed us to identify and classify restoration strategies based on parcel, stakeholder and spatial relationships.

Resulting maps informed development of six planning strategies to support project goals: define and prioritize a roadmap of restoration steps, build a stakeholder network, pursue integrative policy approaches across a hierarchy of jurisdictions, communicate and negotiate objectives and timelines, and inform decision-making with economic and hydrologic models that consider multiple across a range of implementation scenarios. Our proposed framework and strategies can help align community stakeholder interests, policy agendas and planning efforts toward effective implementation of multi-functional green infrastructure and investment in creeks, floodplains and watersheds as community resources.

Keywords: green infrastructure, watershed, restoration, water quality, community benefits

Poster Cluster Title: A Fifty-Year Plan to Restore Aquatic Ecosystems with Green Infrastructure in Walnut Creek Watershed

Infiltration Suitability Mapping for Cost-Effective, Watershed-Scale, Community-Based Green Infrastructure

Anneliese Sytsma*, University of California, Berkeley, anneliese_sytsma@berkeley.edu

Jennifer Natali, University of California, Berkeley, jennifer.natali@berkeley.edu

G. Mathias Kondolf, University of California, Berkeley, kondolf@berkeley.edu

Current approaches to urban creek restoration often employ opportunistic, site-based management resulting in isolated stream reach restoration that do not consider the context of the former floodplain, upstream contributing watersheds and community needs. Planning for and realizing a healthy watershed requires watershed-scale suitability mapping to recognize and address the impacts of urbanization on water as it cycles through a watershed. To address this gap in watershed management and urban creek naturalization, our UC Berkeley research team developed a geospatial framework for identifying priority areas for green infrastructure. Using Grayson Creek Watershed, a subwatershed of Walnut Creek, in Contra Costa County as a case-study, we combined feasible locations for stormwater infiltration throughout the watershed to support ecological restoration of creek channels.

Our results indicate that limited opportunities exist for shallow surface infiltration due to low permeability soils, liquefaction, and steep slopes; however, permeable quaternary deposits present opportunities for deep stormwater infiltration throughout the watershed where shallow infiltration may be infeasible. These shallow infiltration and deep infiltration areas can support infiltrating green infrastructure to treat stormwater runoff, increase groundwater recharge, and reduce peak flows in the watershed, and can be paired strategically with high priority channel reaches to further improve ecological benefit for restored salmonid populations through improved water quality, increased base flows and cooler water temperatures. These infiltration priority areas can be incorporated into green infrastructure planning and creek restoration initiatives by identifying parcels and engaging land owners with capacity to support implementation and participate in demonstration projects. Our strategic approach to green infrastructure planning can be transferred to other watersheds and serves as a new tool for landscape architects, environmental planners, and flood control districts seeking to restore self-sustaining creek corridors through a watershed-scale approach.

Student Award Competition: Yes

Keywords: Infiltration, creek naturalization, suitability mapping, urbanization, flood management, community need

Poster Cluster Title: A Fifty-Year Plan to Restore Aquatic Ecosystems with Green Infrastructure in Walnut Creek Watershed

Land-Use Planning, Policy and Precedents for Integrating Green Infrastructure in Suburban Watersheds of SF Bay

Jennifer Natali*, University of California, Berkeley, jennifer.natali@berkeley.edu

Ari Frink, University of California, Berkeley, ari.frink@gmail.com

G. Mathias Kondolf, University of California, Berkeley, kondolf@berkeley.edu

Mitch Avalon, Contra Costa County Flood Control and Water Conservation District, mitch.avalon@pw.cccounty.us

Mike Carlson, Contra Costa County Flood Control and Water Conservation District, mike.carlson@pw.cccounty.us

Private parcels dominate Bay Area watersheds. Existing development along creek centerlines, within floodplain corridors and over the most suitable locations for infiltration presents a challenge to planning and implementation of creek restoration and green infrastructure. In 1999, the Contra Costa County Flood Control and Water Conservation District (District) defined and adopted a “Fifty-Year Plan” to prioritize concrete channel removal, creek restoration, and floodplain expansion in the District’s capital replacement plans. Our poster will explore land use mechanisms to support implementation of this long-term vision within a watershed-scale, green infrastructure framework based on an analysis of opportunities and constraints within the Walnut Creek Watershed of Contra Costa County.

Walnut Creek Watershed creekside and floodplain parcels range from small and numerous suburban residential lots to large commercial holdings that generate sales tax revenue for municipalities. Local flood control channels protect these encroaching properties, reinforce expectations of permanent flood protection, and lie enmeshed in the constraints and opportunities of Bay Area land-use issues. To address these constraints, we inventory and explore potential land-use ordinances, land acquisition programs, funding strategies, and integrated planning efforts based on anticipated needs and a wide-ranging survey of precedent studies. Our poster will present a curated set of relevant land use planning and policy mechanisms, explain how they work, where they have been implemented, and pros and cons of their potential integration into policies and programs to support green infrastructure planning and implementation in the Bay Area.

Student Award Competition: Yes

Keywords: Land use, policy, ordinances, special districts, green infrastructure, flood management

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