Taking a long-term view of river renaturalization: a 50-year plan for Contra Costa County, California

Une vision à long terme de la renaturalisation d'une rivière : le plan à 50 ans du Comté de Contra Costa en Californie

G. Mathias Kondolf[1,2], Mitch Avalon[3]

1. Corresponding Author, contact email: kondolf@berkeley.edu
2. Department of Landscape Architecture and Environmental Planning, University of California, Berkeley California 94720
3. Contra Costa Flood Control & Water Conservation District, 255 Glacier Drive, Martinez, California 94553

RÉSUMÉ

Les gestionnaires de rivière ont hérité de canaux en béton et autres infrastructures « en dur » construites au cours de la seconde moitié du 20ème siècle. Grâce à une meilleure compréhension des effets négatifs de ces structures sur l'environnement, de leur coût élevé et de la préférence sociétale pour des canaux « naturels » qui présentent des avantages écologiques, esthétiques et de loisirs, il y a un mouvement en faveur de cours d'eau plus larges, avec une végétation riveraine, des sentiers le long des berges et des formes plus complexes. Convertir toutes les infrastructures en béton existantes constituerait un défi difficile, à moins d'adopter une approche à long terme. Le plan à 50 ans du District de lutte contre les inondations et de conservation des eaux du Comté de Contra Costa (Californie) constate que les éléments en béton de ses infrastructures de protection contre les inondations vont arriver la fin de leur durée de vie utile au cours des prochaines décennies, et pourront alors être remplacés par des canaux plus naturels. Le District travaille d'abord à intégrer des éléments de son plan à 50 ans dans les documents d'urbanisme des municipalités, en s'inspirant du succès du modèle de Pinole Creek.

ABSTRACT

River managers have inherited concrete channels and other such 'hard' infrastructure built during the second half of the 20thC. With better understanding of the negative environmental effects of these structures, their high costs, and societal preference for 'natural' channels with ecological, aesthetic, and recreation benefits, there is impetus to have wider stream corridors, with riparian vegetation, streamside trails, and complex in-channel forms. The thought of converting the existing concrete infrastructure seems daunting, unless one takes a long-term perspective. The 50-year plan of Contra Costa County Flood Control & Water Conservation District (California) recognizes that its concrete flood-control infrastructure components will reach the end of their useful lives in the coming decades, when they can then be replaced by more natural channels. The District first works to have elements of its 50-year plan integrated into the legal planning documents of the cities, drawing on the successful model of Pinole Creek.

KEYWORDS

Flood control, system-wide perspective, urban river restoration.

1 INTRODUCTION

Conventional 20th-century flood control approaches emphasized efficient (often concrete-lined) channels to quickly convey storm runoff, upstream reservoirs to reduce peak discharge through urban areas, or embankments to prevent flooding rivers from inundating their floodplains. In the US, such massive engineering projects were made possible by generous federal subsidies: through the early 1980s, federal agencies paid up to 90% of the cost of these projects (Samet 2007). However, such projects would unlikely be built today because environmental laws now require that environmental impacts must be analyzed and mitigated, significantly increasing project cost, because federal subsidies were severely reduced after 1986, and because many of these projects have become maintenance nightmares for local agencies who inherited them (Williams 1990). In addition, there is greater public awareness of the benefits of restored urban streams for ecological purposes, recreation and leisure (Kondolf et al in press). These trends are well illustrated by Contra Costa County, California, east of San Francisco. Typical in its 20th-century history of conventional flood control infrastructure and the problems inherited therefrom, the County is innovative in its long-term approach to making a transition to more sustainable river management in the 21st century.

The county was a major locus of urban growth during the years following the Second World War, increasing in population from 53,000 to over 250,000 from 1950 to 1966, and exceeding 1million today. This scale of urban development required extensive engineering works to convey stormwater runoff from and control flooding of new urban areas. Major floods in 1952, 1955 and 1958 created broad public support for flood control works. The Contra Costa County Flood Control and Water Conservation District (the District) was formed in 1951, and over the next three decades it partnered with two federal agencies, the US Army Corps of Engineers and the US Department of Agriculture Soil Conservation Service, to build large regional flood control facilities on the major creek systems. The federal agencies paid up to 90% of the cost of these projects, involving extensive concrete channels for flood conveyance and flood control reservoirs and detention basins. Over USD$500M (370M euros) worth of such infrastructure was built during the last half of the 20th Century. The existing flood management infrastructure has a remaining service life of 30-50 years, after which it will need replacement. Thus, the District will face a series of decisions about how to replace aging infrastructure: replace like for like, or use the opportunity to transform “channels to creeks”, ie replacing concrete channels with *natural channels,* i.e., channels with earthen banks, complex instream channel forms, and flanked by a vibrant riparian corridor.

2 THE 50-YEAR PLAN

In 2009, the District adopted a 50-year plan (the Plan) recognizing that all public infrastructure has a limited service life, after which it will need to be replaced. The plan recognizes that concrete channels tend to have very high construction and replacement costs. Natural channels require increased right-of-way width and generally higher ongoing maintenance, but low-to-zero replacement costs. Over time, natural channels will be less costly than multiple life cycles for concrete channels. The Plan calls for strategies to replace concrete channels with natural channels, such as flood bypass channels that permit the main channel to have vegetated banks, and consequently, higher hydraulic roughness and lower channel capacity. Where feasible, the stream corridors are to be widened to provide flood conveyance, recreational amenities, and habitat benefits. While acquiring land or easements is expensive up front, the long-term reduction in maintenance costs and reduced conflicts with urban infrastructure make such options more economical over a 50-year period. Moreover, the ecological benefits of creating natural creek corridors may make projects eligible for funding under ecological restoration programs, important given the lack of tax revenue for county government (the result of a California tax limitation measure in 1978) and reduced federal subsidies since 1986.

Replacing its worn-out concrete channels with new concrete channels could prove impossible given environmental laws and public opposition to such channels. To build public support for alternative solutions, the Plan calls for the District to initiate community-based catchment planning to guide replacement of this critical infrastructure. The key innovation in the District’s approach is in its explicit look ahead, and adopting as policy a more sustainable (and in the long run less expensive) approach to managing its streams. One of the first priorities has been to encourage local government jurisdictions with land use authority to include Plan elements into their land use planning documents. Communities must revise their land use plans every 20 years, and this revison process provides an opportunity to redesign a community to include a wider stream corridor to accommodate converting a concrete channel to a natural stream system. This also opens up recreational, aesthetic, and

commercial opportunities for the community, ecological benefits at the systems level, and can make the projects eligible for grants to support stream restoration. A recently completed project in the city of Pinole widened the flood control channel to provide room for a floodplain/marshplain, a recreational trail and planting riparian trees. This project included key elements of the Plan during project development and implementation. A community-based planning process produced a vision plan for the creek, which was incorporated into the city general plan as the Pinole Creek Greenway Master Plan. Using the city's new master plan, the lower reach of the creek was selected for restoration, with the project concept and preliminary design developed through community- based planning. The project's combination of environmental, recreational, and flood protection benefits attracted state funding, and the project was constructed. This overall process took over 10 years, underscoring the long-term approach needed for these types of projects.

While the problems of concrete channels are now widely recognized, to convert such infrastructure to more natural channels can seem an insurmountable challenge. Taking a 50-year perspective, however, replacing concrete with living streams becomes a viable, feasible option.

LIST OF REFERENCES

Kondolf, GM, and Podolak K. 2011. Urban rivers: Landscapes of leisure and consumption. In PM Santos and PC Seixas, eds. *Globalization and Metropolization – theory and practice from Europe's west coast.* Institute of Governmental Studies, Berkeley USA (in press)

Samet, M. 2007. Bankside Federal. In: Kibel, P. S. *Rivertown: rethinking urban rivers*. The MIT Press, Cambridge, Massachusetts USA.

Williams, P. B. 1990. *Rethinking flood-control channel design*. *Civil Engineering* 60(1), 57–59.