

# ENVIRONMENTAL NOTES & ABSTRACTS

Urban Coast contains summaries of submitted research and policy as well as abstracts from current literature. This section brings together innovative policy developments, environmental research, technical studies, and monitoring and project implementation to keep our readers abreast of the latest thinking about environmental issues and solutions. This collection of notes and abstracts reflects the latest developments in urban coastal research and policy and shares knowledge of how the vast array of techniques and tools available are being applied in urban coastal regions. We encourage our readers to learn more about any or all of the work highlighted in this section.

We welcome suggestions for abstracts to include in this section as well as submittals. Please direct correspondence to [gwang@waterboards.ca.gov](mailto:gwang@waterboards.ca.gov).

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PHOTO: JOHN HOLLERBECK

## POLICY

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*Towards a Social–Ecological Resilience Framework for Coastal Planning.* Lloyd, M. G., Peel, D., and Duck, R.W. 2013. *Land Use Policy* 30(1): 925–33.

### Abstract

It is increasingly recognized that designing and implementing adaptive land management and development policies for the coastal zone requires an interdisciplinary and integrated approach. Yet integrative thinking and action often remain problematic due to the competing interests and ambitions involved in coastal zone planning and management and the legacy of established development on the coast. This paper presents a developmental timeline to critically consider institutional responses to coastal development and seeks to locate contemporary challenges, such as climate change, in the context of a new environmental determinism. The argument is put forward that securing a shared understanding of development conditions and risks needs to be predicated on creating more robust conditions for interaction and fostering a sounder appreciation of the inter-dependencies of natural processes and governance. The concept of resilience is critically explored in order to consider a normative analytical framework for facilitating social learning and developing a reciprocal understanding of social–ecological dynamics that offers a spectrum of resilience options. This is illustrated in the context of coastal geomorphological processes and Process-Defined Management Units.

*Coastal and Ocean Science-Based Decision-Making in the Gulf of California: Lessons and Opportunities for Improvement.* Lowell, S. M., T. C. Hoffmann, M. McGrath, G. Brazil, and S. L. Thomas. 2012. *Coastal Management* 40(6): 557–76.

### Abstract

The Gulf of California hosts astounding biodiversity that supports numerous economic activities in the region. These activities, and emerging threats, are placing pressure on the region's ecosystems. Government and civil society are working to address threats through several conservation and management mechanisms. Nevertheless, the use and incorporation of scientific information—a key component for creating effective and durable management—are still deficient. This article presents science integration and discusses the findings of a study that assesses the regional landscape, existing institutional arrangements, and capacity for using science to inform policy and management decisions. The article also explores the current use of science within fisheries policy and management and the capacity of the National Network of Information and Research of Fisheries and Aquaculture (RENIIPA) and the State Fisheries and Aquaculture Councils, two mechanisms in the region. Finally, the article shares lessons learned and offers recommendations on how the region can strengthen science-based decision-making. Results indicate

that although some actors in the Gulf of California are producing relevant science, the capacity of intermediary groups connecting producers with users of science, or mechanisms in place to ensure that science is being used in decision-making processes, varies. Moreover, despite having a well-developed landscape of producers, intermediaries, and mechanisms in place for fisheries management in the region, effective science integration is not occurring.

*Buy Coal! A Case for Supply-Side Environmental Policy.* Bard Harstad. 2012. *Journal of Political Economy* 120(1): 77–115.

### Abstract

Free-riding is at the core of environmental problems. If a climate coalition reduces its emissions, world prices change, and nonparticipants typically emit more; they may also extract the dirtiest type of fossil fuel and invest too little in green technology. The coalition's second-best policy distorts trade and is not time consistent. However, suppose that the countries can trade the rights to exploit fossil-fuel deposits: As soon as the market clears, these problems vanish, and the first-best is implemented. In short, the coalition's best policy is to simply buy foreign deposits and conserve them.

*Near-Term Priorities for the Science, Policy and Practice of Coastal and Marine Spatial Planning (CMSP).* Halpern, B. S., J. Diamond, S. Gaines, S. Gelcich, M. Gleason, S. Jennings, S. Lester, A. Mace, L. McCook, K. McLeod, N. Napoli, K. Rawson, J. Rice, A. Rosenberg, M. Ruckelshaus, B. Saier, P. Sandifer, A. Scholz, and A. Zivian. 2012. *Marine Policy* 36(1): 198–205.

### Abstract

There is currently a rare opportunity to inform emerging efforts to implement coastal and marine spatial planning (CMSP) in the United States, Europe, and elsewhere around the world. In particular, the newly formed U.S. National Ocean Council is developing a strategic action plan for CMSP over the next eighteen to twenty-four months. To identify priority needs for significantly advancing CMSP, a group of experts in the science, policy, and practice of CMSP developed recommendations for (1) process development, (2) communication and engagement efforts, (3) tradeoff and valuation analyses, and (4) decision support. Some of these priorities are supported by existing activities in the United States and elsewhere. Others have yet to be addressed and merit immediate attention.

*Facilitating Ecological Enhancement of Coastal Infrastructure: The Role of Policy, People and Planning.* Naylor, L.A., M. A. Coombes, O. Venn, S. D. Roast, and R. C. Thompson. 2012. *Environmental Science & Policy* 22(1): 36–46.

### Abstract

Urbanization is recognized as a major pressure on coastal biodiversity. Increasing risks of flooding and erosion associated with future climate change indicate that new hard infrastructure will have to continue to be built—and existing structures upgraded—in areas of high social and economic value. Ecological enhancement involves undertaking management interventions at the design stage to improve the ecological potential of these structures, or to improve the ecological value of existing structures. Although scientific research into ecological enhancement methods and designs is growing, discussion of the non-science drivers and mechanisms by which ecological enhancements can be successfully implemented in coastal infrastructure projects has been limited.

We explore the science–policy–practice interfaces of the ecological enhancement of hard coastal structures from three perspectives. First, we outline the growing number of European and United Kingdom policies and legislative instruments that are increasing the need to consider ecological enhancement in coastal developments. These serve as a facilitative tool for making enhancement projects happen, constituting a significant ‘policy push’ for research and application in this area. Second, we examine the role of people in influencing the uptake of ecological enhancements. The critical role of “knowledge brokers” and the need for effective and sustained collaboration between a range of groups and individuals to get research approved operational trials off the ground is discussed. Third, we examine where in the typical planning, design, and build process current enhancement projects have been embedded, serving to illustrate how the science can be used in practice.

*Long-term Corporate Climate Change Targets: What Could They Deliver?* Gouldson, A., and R. Sullivan. 2013. *Environmental Science & Policy* 27(1): 1–10.

### Abstract

Driven by the rising cost of energy, stakeholder pressure, and the expectation that governments will continue to implement policy measures directed at reducing greenhouse gas emissions, an increasing number of companies have set targets to reduce their greenhouse gas emissions. These commitments raise two important questions. The first is whether they can be considered—individually or collectively—an appropriate response to the threat presented by climate change. The second is whether they are dependable; that is, can policy makers and other stakeholders can rely on companies to deliver on the commitments that they have made?

This article examines these two questions using the case of the United Kingdom (UK) supermarket sector to illustrate and explain the issues at stake and, more generally, to examine the contribution that these types of voluntary commitments can make to wider public policy goals on climate change. The reasons for focusing on the UK supermarket sector are that the companies in this sector are some of the largest retailers in the world, they are significant emitters (their direct emissions account for 0.9% of UK carbon emissions, and some indications suggest that their indirect emissions account for ten times as much), and they are less heavily regulated than other sectors with comparable carbon footprints.

The article concludes that the targets being set voluntarily by companies in this sector align with, or may even exceed, the climate change policy goals being set by national governments. Moreover, the article concludes that the companies' targets are plausible and have a reasonably high likelihood of being delivered if energy prices remain high and if the companies can sustain recent rates of improvement. However, the article also cautions against relying on these types of voluntary commitments, noting that their scope is limited (i.e., most targets relate to companies' direct rather than indirect emissions), and that the inconsistencies and opacities in company reporting on performance and outcomes make it extremely difficult for stakeholders to have confidence that the targets set have actually been delivered.

## POLLUTION

*Linking Chemical Contamination to Biological Effects in Coastal Pollution Monitoring.* Beiras, R., I. Durán, S. Parra, M. B. Urrutia, V. Besada, J. Bellas, L. Viñas, P. Sánchez-Marín, A. González-Quijano, M. A. Franco, Ó. Nieto, and J. J. González. 2011. *Ecotoxicology* 21(1): 9–17.

### Abstract

To establish the connection between pollutant levels and their harmful effects on living resources, coastal monitoring programs have incorporated biological tools, such as the scope for growth (SFG) in marine mussels and benthic macrofauna community indices. Although the relation between oxygen-depleting anthropogenic inputs and the alteration of benthic communities is well described, the effects of chemical pollutants are unknown because they are not expected to favor any particular taxa. In this study, the combined efforts of five research teams involved in the investigative monitoring of marine pollution allowed the generation of a multiyear data set for Ría de Vigo (northwest Iberian Peninsula). Multivariate analysis of these data allowed the identification of the chemical-matrix combinations responsible for most of the variability among sites and the construction of a chemical pollution index (CPI) that significantly ( $P < 0.01$ ) correlated with biological effects at the

individual and community levels. We report a consistent reduction in the physiological fitness of local populations of mussels as chemical pollution increases. The energy balance was more sensitive to pollution than individual physiological rates, but the reduction in the SFG was primarily due to significantly decreased clearance rates. We also found a decrease in benthic macrofauna diversity as chemical pollution increased. This diversity reduction resulted from altered evenness, as the classic paradigm might suggest, but from a loss of species richness.

*Concentrations and Annual Fluxes of Sediment-Associated Chemical Constituents from Conterminous US Coastal Rivers Using Bed Sediment Data.* Horowitz, A. J., V. C. Stephens, K. A. Elrick, and J. J. Smith. 2012. *Hydrological Processes* 26(7): 1090–14.

### Abstract

Coastal rivers represent a significant pathway for delivering natural and anthropogenic sediment-associated chemical constituents to the Atlantic, Pacific, and Gulf of Mexico coasts of the conterminous United States. This study entails an accounting segment using published average annual suspended sediment fluxes with published sediment-associated chemical constituent concentrations for (1) baseline, (2) land-use distributions, (3) population density, and (4) worldwide means to estimate concentrations and annual fluxes for trace and major elements and total phosphorus, total organic and inorganic carbon, total nitrogen, and sulfur, for one hundred thirty-one coastal river basins. In addition, this study entails a sampling and subsequent chemical analysis segment that provides a level of “ground truth” for the calculated values, as well as generating baselines for sediment-associated concentrations and fluxes against which future changes can be evaluated.

Currently, between 260 and 270 Mt of suspended sediment are discharged annually from the conterminous United States; about 69% is discharged from Gulf rivers ( $n = 36$ ), about 24% from Pacific rivers ( $n = 42$ ), and about 7% from Atlantic rivers ( $n = 54$ ). Elevated sediment-associated chemical concentrations relative to baseline levels occur in the reverse order of sediment discharges: Atlantic rivers (49%) > Pacific rivers (40%) > Gulf rivers (23%). Elevated trace element concentrations (e.g., copper [Cu], mercury [Hg], lead [Pb], zinc [Zn]) frequently occur in association with present/former industrial areas and/or urban centers, particularly along the northeast Atlantic coast. Elevated carbon and nutrient concentrations occur along the Atlantic and Gulf coasts but are dominated by rivers in the urban Northeast and by Southeastern and Gulf coast (Florida) blackwater streams. Elevated calcium (Ca), mercury (Mg), potassium (K), and sodium (Na) distributions tend to reflect local petrology, whereas elevated titanium (Ti), sulfur (S), iron (Fe), and aluminum (Al) concentrations are ubiquitous, possibly because they have substantial natural as well as anthropogenic sources. Almost all the elevated sediment-associated chemical concentrations found in conterminous U.S. coastal rivers are lower than worldwide averages.

*The Challenge of Choosing Environmental Indicators of Anthropogenic Impacts in Estuaries.* Daffor, K. A., S. L. Simpson, B. P. Kelaher, G. F. Clark, V. Komyakova, C. K. C. Wong, and E. L. Johnston. 2012. *Environmental Pollution* 163:207–17.

### Abstract

Ecological assessments over large spatial scales require that anthropogenic impacts be distinguishable above natural variation, and that monitoring tools are implemented to maximize impact detection and minimize cost. For three heavily modified and four relatively pristine estuaries (disturbance category), chemical indicators (metals and polycyclic aromatic hydrocarbons [PAHs]) of anthropogenic stress were measured in benthic sediments, suspended sediments, and deployed oysters, together with other environmental variables. These were compared with infaunal and hard-substrate invertebrate communities. Univariate analyses were useful for comparing contaminant loads between different monitoring tools and identified the strongest relationships between benthic and suspended sediments. However, multivariate analyses were necessary to distinguish ecological response to anthropogenic stressors from environmental “noise” over a large spatial scale and to identify sites that were being impacted by contaminants. These analyses provide evidence that suspended sediments are a useful alternative monitoring tool for detecting potential anthropogenic impacts on benthic (infaunal and hard-substrate) communities.

*The Use of Benthic Macroinvertebrates to Establish a Benchmark for Evaluating the Environmental Quality of Microtidal, Temperate Southern Hemisphere Estuaries.* Tweedley, J. R., R. M. Warwick, F. J. Valesini, M. E. Platell, and I. C. Potter. 2012. *Marine Pollution Bulletin* 64(6): 1210–21.

### Abstract

Establishment of a benchmark against which deleterious changes to an estuary can be evaluated requires validating that it has not been subjected to detrimental anthropogenic perturbations and then identifying the biological features that indicate a pristine condition and can thus be used as indicators for detecting and monitoring departures from the natural state. The characteristics of the benthic macroinvertebrate fauna of an essentially pristine, seasonally open estuary in Western Australia (Broke Inlet) have been determined and compared with those previously recorded for a nearby eutrophic, seasonally open estuary (Wilson Inlet). Density was far lower in Broke than Wilson. Compositions differed radically at all taxonomic levels, with polychaetes contributing less, and crustaceans more, to the abundance in Broke. Average taxonomic distinctness was greater for Broke than Wilson and sixteen other temperate southern hemisphere estuaries, whereas the reverse was true for variation in taxonomic distinctness, emphasizing that Broke Inlet is pristine.

*Source Characterization and Spatio-temporal Evolution of the Metal Pollution in the Sediments of the Basque Estuaries (Bay of Biscay).* Legorburu, I., J. G. Rodriguez, A. Borja, I. Menchaca, O. Solaun, V. Valencia, I. Galparsoro, and J. Larreta. 2013. *Marine Pollution Bulletin* 66(1–2): 25–38.

### Abstract

According to Water Framework Directive requirements, Member States must identify and analyze effects derived from human pressures in aquatic systems. As different kind of pressures can impact water bodies at different scales, analyses of spatio-temporal evolution of water bodies becomes essential to understand ecosystem responses. In this investigation, an analysis of spatio-temporal evolution of sedimentary metal pollution (cadmium [Cd], chromium [Cr], copper [Cu], mercury [Hg], nickel [Ni], lead [Pb], zinc [Zn]) in twelve Basque estuaries (Bay of Biscay) is presented. Data collected in extensive sampling surveys are the basis for the geographic information system (GIS)-based statistical approach used. The implementation of pollution abatement measures is reflected in a long-term decontamination process, mostly evident in estuaries with the highest historical sediment pollution levels. Spatial evolution is determined by either naturally occurring or human-driven processes. Such spatial processes are more obviously being reflected in estuaries with lower historical sediment pollution levels.

## MONITORING

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*Sediment Fluxes from California Coastal Rivers: The Influences of Climate, Geology, and Topography.* Andrews, E. D., and R. C. Antweiler. 2012. *Journal of Geology* 120(4): 349–66.

### Abstract

The influences of geologic and climatic factors on erosion and sedimentation processes in rivers draining the western flank of the California Coast Range are assessed. Annual suspended, bedload, and total sediment fluxes were determined for sixteen river basins that have hydrologic records covering all or most of the period from 1950 to 2006 and have been relatively unaffected by flow storage, regulation, and depletion, which alter the downstream movement of water and sediment. The occurrence of relatively large annual sediment fluxes are strongly influenced by the El Niño – Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO). The frequency of relatively large annual sediment fluxes decreases from north to south during La Niña phases and increases from north to south during El Niño phases. The influence of ENSO is modulated over a period of decades by the PDO, such that relatively large annual sediment fluxes are more frequent during a La Niña phase in conjunction with a cool PDO and during an El Niño phase

in conjunction with a warm PDO. Values of mean annual sediment flux, Sf, were regressed against basin and climatic characteristics. Basin area, bedrock erodibility, basin relief, and precipitation explain 87 percent of the variation in Sf from the sixteen river basins. Bedrock erodibility is the most significant characteristic influencing Sf. Basin relief is a superior predictor of Sf compared with basin slope. Sf is nearly proportional to basin area and increases with increasing precipitation. For a given percentage change, basin relief has a 2.3-fold greater effect on Sf than a similar change in precipitation. The estimated natural Sf from all California coastal river Sf for the period 1950–2006 would have been approximately 85 million tons without flow storage, regulation, and depletion; the actual Sf has been approximately 50 million tons, because of the effects of flow storage, regulation, and depletion.

*Long-term Monitoring of Heavy Metals in Chilean Coastal Sediments in the Eastern South Pacific Ocean.* Chandía, C., and M. Salamanca. 2012. *Marine Pollution Bulletin* 64(10): 2254–60.

### Abstract

Concentrations of seven metals (aluminum [Al], cadmium [Cd], copper [Cu], iron [Fe], lead [Pb], nickel [Ni], zinc [Zn]) were determined in 256 surface sediment samples, collected between May 2006 and November 2009, from fifteen stations at the mouth of the Itata River and its adjacent marine zone (central-southern Chile) as part of an environmental monitoring program. The objectives of the work were to (i) establish baseline metal concentrations in the sediments of the area and (ii) identify tendencies in the spatial and temporal distribution of the metals in these marine sediments. Concentrations were highest in the north zone of the Itata River mouth (stations E2C, E13C) for all the metals and at the stations farthest offshore from the mouth (E4, E6) for copper (Cu), iron (Fe), lead (Pb), and nickel (Ni). The ranges in those concentrations were lower than those reported in other studies performed along the Chilean coast and lower than those observed in most other coastal systems around the world. Based on results of the indices used (geoaccumulation index, enrichment factor), the coastal sediments were not measurably elevated above natural levels.

*Will Coastal Wetlands Continue to Sequester Carbon in Response to an Increase in Global Sea level?: a Case Study of the Rapidly Subsiding Mississippi River Deltaic Plain.* R. D. DeLaune, and J. R. White. 2012. *Climatic Change* 110(1–2): 297–314.

### Abstract

The highly visible coastal phenomenon of wetland loss in coastal Louisiana (LA) was examined through the prism of carbon accumulation and loss. Carbon storage or sequestration in rapidly subsiding LA coastal marsh soils was based on vertical marsh accretion and aerial change data. Marshes sequester a significant

amount of carbon through vertical accretion; however, large amounts of carbon previously sequestered in the soil profile is lost through annual deterioration of these coastal marshes. Hurricanes, such as Katrina and Rita, have triggered instantaneous large carbon losses of sequestered soil carbon through the destruction of large areas of marsh. This analysis shows proposed coastal restoration efforts will not be sufficient to restore carbon losses by storms and marsh deterioration. Further, we have estimated the economic benefit of carbon sequestration for coastal wetland restoration efforts. Results show that LA coastal marshes may not serve as a net sink of carbon. These results may serve as a predictor of the impact of future predictions of increasing global sea level rise on carbon sequestration for other coastal regions.

*An Integrative Management Protocol for Connecting Human Priorities with Ecosystem Health in the Neponset River Estuary.* Frashure, K. M., R. E. Bowen, and R. F. Chen. 2012. *Ocean and Coastal Management* 69(1): 255–64.

### Abstract

Environmental scientists currently lack a common and unifying approach to equitably connect human activities with ecosystem health assessments. To enhance ecosystem health, our historical way of thinking about ecosystem monitoring needs to include a vital connection between the benefits of ecosystems and users' well-being. To date, much emphasis has been placed on environmental indicators (e.g. pH, salinity, dissolved oxygen), and not as much on socio-economic indicators (e.g. environmental clean-up costs, dollars lost from beach closures, number of public access points), ones that the public can understand more easily, and therefore value, and this bias toward environmental indicators may influence their decisions. Given that each ecosystem has unique physical characteristics and that monitoring objectives may vary, a common set of indicators is not necessarily suitable to all systems. Rather, a common protocol for indicator selection is more appropriate as it can be applied across political jurisdictions and a diverse set of ecosystems. To investigate the value of environmental and socio-economic indicators in coastal urban ecosystems, we have applied a methodology to identify management goals and to select indicators specific to an urban estuarine ecosystem, the Neponset River Estuary. In our study, we identified the stakeholder community who had significant management interests in order to specify and rank management goals. A panel of experts was convened to select and rank essential environmental and socio-economic indicators according to how well they measured success in achieving the largest number of more important management goals. A post-survey evaluation was administered among the stakeholder community and panel of experts in order to evaluate the protocol's applicability, effectiveness, and potential for implementation. This protocol resulted in a ranked set of environmental and socio-economic indicators that were equally assessed against a common set of management goals identified by the stakeholder community from the Neponset River Estuary.

*Taxonomic Sufficiency of Polychaete Taxocenes for Estuary Monitoring.* Soares-Gomes, A., C. L. T. Mendes, M. Tavares, and L. Santi. 2012. *Ecological Indicators* 15(1): 149–56.

### Abstract

The polychaetes assemblage structure was used to investigate taxonomic sufficiency in a heavily polluted tropical bay. Species abundance was aggregated into progressively higher taxa matrices (genus, family, order) and was analyzed using univariate and multivariate techniques. Polychaetes distribution in Guanabara Bay (GB) was in accordance with a pollution gradient, probably ruled by the organic enrichment, consequent effects of hypoxia and altered redox conditions coupled with prevailing patterns of circulation. Within the sectors of GB, an increasing gradient in species richness and occurrence was observed, ranging from the azoic and impoverished stations in the inner sector to a well-structured community in terms of species composition and abundance inhabiting the outer sector. Multivariate statistical analysis showed similar results when species were aggregated into genera and families, while greater difference occurred at coarser taxonomic identification (order). The literature about taxonomic sufficiency has demonstrated that faunal patterns at different taxonomic levels tend to become similar with increased pollution. In GB, an analysis carried out solely at family level is perfectly adequate to describe the environmental gradient, considered a useful tool for a quick environmental assessment.

## RESTORATION

*A Comparative Review of Recovery Processes in Rivers, Lakes, Estuarine and Coastal Waters.* Verdonshot, P. F. M., B. M. Spears, C. K. Feld, S. Brucet, H. Keizer-Vlek, A. Borja, M. Elliott, M. Kernan, and R. K. Johnson. 2012. *Hydrobiologia*. doi:0.1007/s10750-012-1294-7.

### Abstract

The European Water Framework Directive aims to improve ecological status within river basins. This requires knowledge of responses of aquatic assemblages to recovery processes that occur after measures have been taken to reduce major stressors. A systematic literature review comparatively assesses recovery measures across the four major water categories. The main drivers of degradation stem primarily from human population growth and increases in land use and water use changes. These drivers and pressures are the same in all four water categories: rivers, lakes, and transitional and coastal waters. Few studies provide evidence of how ecological knowledge might enhance restoration success. Other major bottlenecks are the lack of data, effects mostly occur only in short-term and at local scale, the organism group(s) selected

to assess recovery does not always provide the most appropriate response, the time lags of recovery are highly variable, and most restoration projects incorporate restoration of abiotic conditions and do not include abiotic extremes and biological processes. Restoration ecology is just emerging as a field in aquatic ecology and is a site, time, and organism group-specific activity. It is therefore difficult to generalize. Despite the many studies, only few provide evidence of how ecological knowledge might enhance restoration success.

*Assessment of the Subtidal Macrobenthic Community Functioning of a Temperate Estuary following Environmental Restoration.* Verissimo H, J. Bremner, J. Patricio, P. van der Linden, and J. C. Marques. 2012. *Ecological Indicators* 23(1): 312–22.

### Abstract

Biological Traits Analysis (BTA) is a recently proposed method for addressing ecological functioning based on traits exhibited by members of biological assemblages. This multi-trait approach was applied to the soft-bottom subtidal macrobenthic communities of the Mondego estuary (Portugal), aiming to assess its functioning following a management measure implemented in this system. In particular, the response of benthic assemblages to restoration efforts was investigated over a five-year period, testing for temporal differences before and after management, in order to assess the effectiveness of this recovery action.

BTA revealed to be a useful approach providing valuable information on the functioning of the subtidal benthic communities. Overall, results suggested that there have been some changes in the ecosystem over the study period, although the success of the management measure at the benthic functional level revealed unclear. The climatic variability experienced in the estuary over the monitoring period seemed to have played a significant role in masking the potential effects of restoration. Furthermore, evidence suggested a possible persistence in the benthic functioning despite the occurrence of shifts in taxonomic composition, assured by the potential ability of different species with a similar set of traits to perform similar roles in the ecosystem.

To best of our knowledge, this study constituted one of the first attempts to investigate the effects of a management measure in an estuary by means of Biological Traits Analysis. Thus, it can thus be useful as a guideline for further management actions in the Mondego estuary extendable to other poikilohaline estuaries as well, and to provide insights on the BTA application to this type of ecosystems.

*Biotic and Abiotic Controls on Sediment Aggregation and Consolidation: Implications for Geochemical Fluxes and Coastal Restoration.* Land, L. E., A. S. Kolker, and R. P. Gambrell. 2012. *Marine Environmental Research* 79(1): 100–10.

### Abstract

This study examined the influence of particle size and organic matter on aggregation and compaction of three hydraulically dredged sediments from coastal Louisiana (clay, silt loam, sandy loam) saturated under a range of salinity regimes (1 and 5 PSU, 5 and 10 PSU, and 15 and 25 PSU) for four time periods (1, 8, 16, and 26 weeks). Particle sizes were determined using a laser diffraction particle size analyzer, which allowed us to develop high-resolution results indicating changes in aggregate size across a spectrum of experimental conditions. The sediments with greater organic matter content exhibited approximately 60% aggregation, as indicated by fewer aggregates in the clay size fraction, and subsequently more aggregates in the sand size fraction, when organic matter remained in the sediment. Additionally, the sandy sediment compacted more than the organic sediments in the first sixteen weeks. These findings suggest that sediments with greater clay and organic matter content behave as larger particles and may undergo particle rearrangement and compaction over longer time scales than sandy sediments with low organic matter. For coastal wetland restoration, models should include the effect of organic matter on particle aggregation to understand sediment dynamics over geologic time.

*A Methodology for the Classification of Estuary Restoration Areas: A Management Tool.* Jimenez, M., S. Castanedo, R. Medina, and P. Camus. 2012. *Ocean & Coastal Management* 69(1): 231–42.

### Abstract

Planning the recovery of estuarine areas represents a major challenge for environmental managers, who must find a balance between the desired environmental restoration, understood as the return to natural conditions, and the different socioeconomic uses currently borne by the estuaries. This work presents a methodology for optimizing decision-making in accordance with the objectives that might arise in projects for the hydrodynamic restoration of estuaries. Socioeconomic issues are not considered in this study. The new approach is based on a classification of the zones to be restored according to characteristics representing their hydrodynamic performance and the possible morphodynamic effects of the restoration on the rest of the estuary. To achieve this, the four following parameters were chosen: (1) changes in tidal prism induced by restoration of that zone ( $\Delta\Omega$ ), (2) the distance between the concession and the estuary inlet ( $L$ ), (3) the tidal wave phase lag ( $\square$ ), and (4) the flood potential of the restoration area ( $I$ ). The classification combines self-organizing maps (SOM) and the K-means algorithm. The methodology was applied in a total of 139 areas (concessions) on ten estuaries along the entire coast

of Cantabria (northern Spain) where a Spanish Ministry of the Environment Recuperation Plan is under way. The results classify the 139 areas of restoration into five clusters. Empirical relationships were used to estimate the effects the restoration of each cluster may have on the estuary's various morphodynamic elements (cross-sectional area of the estuary mouth, area of tidal flats, volume of tidal channels, and volume of the ebb tidal delta), giving managers an overall view of the potential effects of the restoration in each zone and providing a basis on which to plan these actions.

## URBAN RIVERS

*Some Simple tools for Communicating the Biophysical Condition of Urban Rivers to Support Decision Making in Relation to River Restoration.* Shuker, L., A. M. Gurnell, and M. Raco. 2012. *Urban Ecosystems* 15:389–408.

### Abstract

This paper illustrates a set of simple tools that may be used to assess and communicate the biophysical condition of river and riparian habitat in urban catchments. The tools are based upon information collected using the Urban River Survey (URS), a habitat survey designed for application to 500 m stretches of urban river corridor, and comprise (i) a series of aggregate indices, (ii) three classifications relating to the materials, habitat, and vegetation characteristics of urban river stretches, which contribute to an overall score, the Stretch Habitat Quality Index (SHQI), and (iii) two environmental gradients that define a URS matrix of engineering:habitat associations. This toolkit may be used to gather and exchange knowledge about urban river habitat quality to a wide range of specialist or nontechnical stakeholders and local community members. It may be used to provide information at the catchment and reach scales to support stakeholder discussions and decision making relating to initial site selection for restoration works, to post project appraisal, and to track changes in river character across space and through time. Example applications of the tools are provided using URS surveys undertaken on tributaries of the River Thames within London in comparison with an archive of previous surveys from three other urban river systems. These tools are being validated in London as part of a larger interdisciplinary research project that is testing the suitability of this type of approach in the context of the London Rivers Action Plan, Water Framework Directive, and urban green space regeneration.



*Rediscovering the Value of Urban Rivers (Review)*. Everard, M., and H. L. Moggridge. 2012. *Urban Ecosystems* 15:293–314.

### **Abstract**

Rivers commonly serve as defining, founding features of human settlements, yet urbanization has degraded them, often to the extent that they no longer provide the services to society from which the settlements developed. Urban river restoration has expanded in recent years, and part of this can be attributed to the increased recognition of the interconnected benefits that restored ecosystems can provide to society. This paper reviews the impact of urbanization on rivers and the ecosystem services that they provide, and explores the ecosystem approach to restoration. Techniques and tools for the practical application of the ecosystem services approach in conservation are considered, with reference to case studies. There is a need to internalize ecosystem service insights into pragmatic, transparent, and readily used and understood planning tools, based on the capacities of a range of ecosystem services in river corridors. This is necessary if we are to avoid the continued erosion of critical resources such as rivers, rediscovering their multiple values to society, and to accelerate the translation of these sustainability concepts into applied tools.

*Riparian Habitat Assessment Tool for Lebanese rivers (RiHAT): Case Study Ibrahim River*. Abboud, M., J. Makhzoumi, C. Clubbe, R. Zurayk, S. Jury, and S. N. Talhouk. 2012. *BioRisk* 7:99–116.

### **Abstract**

Biodiversity conservation in Lebanon ought to be guided by practical assessment tools in order to promote conservation efforts amid destructive and profit-driven urban and industrial expansion. The challenge for national conservation scientists, however, is to develop such tools while reconciling between scientific “rigor” and pressing national realities. Those include rapid habitat loss, limited human and financial resources, and the fact that biodiversity is a low national priority compared to other social, political, and economic issues. It is in this context that we propose a rapid management strategy guide based on a habitat assessment tool for riparian ecosystems (which are typically threatened in Lebanon). The proposed riparian habitat assessment tool (RiHAT) consists of a habitat condition index based on twelve indicators grouped under two attributes, floristic and landscape.