

# The role of cultural ecosystem services in landscape management and planning<sup>1</sup>

Tobias Plieninger<sup>a</sup>, Claudia Bieling<sup>b</sup>, Nora Fagerholm<sup>a,c</sup>, Anja Byg<sup>d</sup>, Tibor Hartel<sup>e</sup>, Patrick Hurley<sup>f</sup>, César A López-Santiago<sup>g</sup>, Nidhi Nagabhatla<sup>h</sup>, Elisa Oteros-Rozas<sup>a,g</sup>, Christopher M Raymond<sup>a,i</sup>, Dan van der Horst<sup>j</sup>, Lynn Huntsinger<sup>k</sup>

- a Department of Geosciences and Natural Resource Management, University of Copenhagen, Rolighedsvej 23, 1958 Frederiksberg C, Denmark
- b Chair of Societal Transition and Agriculture, University of Hohenheim, Schloss Museumsfluegel Ost, 70593 Stuttgart, Germany
- c Department of Geography and Geology, University of Turku, 20014 Turku, Finland
- d Social, Economic and Geographical Sciences Group, The James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH, United Kingdom
- e Department of Environmental Studies, Sapientia Hungarian University of Transylvania, Calea Turzii No. 4, 400193 Cluj-Napoca, Romania
- f Department of Environmental Studies, Ursinus College, P.O. Box 1000, Collegeville, PA 19426, USA
- g Social-Ecological Systems Laboratory, Universidad Autónoma de Madrid, Cantoblanco s/n, 28049 Madrid, Spain
- h Institute for Water, Environment and Health, United Nations University (UNU-INWEH), 175 Longwood Road, Hamilton, ON L8P 0A1, Canada
- i Barbara Hardy Institute and School of Commerce, University of South Australia, P.O. Box 190, Stirling, SA 5152, Australia
- j School of Geosciences, University of Edinburgh, Drummond Street, Edinburgh EH8 9XP, United Kingdom
- k Department of Environmental Science, Policy, and Management, University of California, 130 Mulford Hall MC 3110, Berkeley, CA 94720, USA

## Corresponding author:

Tobias Plieninger, Department of Geosciences and Natural Resource Management, University of Copenhagen, Rolighedsvej 23, 1958 Frederiksberg C, Denmark  
([tobias.plieninger@ign.ku.dk](mailto:tobias.plieninger@ign.ku.dk))

---

<sup>1</sup> Preprint. Published Version: Tobias Plieninger, Claudia Bieling, Nora Fagerholm, Anja Byg, Tibor Hartel, Patrick Hurley, César A López-Santiago, Nidhi Nagabhatla, Elisa Oteros-Rozas, Christopher M Raymond, Dan van der Horst, Lynn Huntsinger (2015): The role of cultural ecosystem services in landscape management and planning. *Current Opinion in Environmental Sustainability* 14:28-33  
<http://dx.doi.org/10.1016/j.cosust.2015.02.006>

## **Abstract**

There is increasing concern that the ecosystem services approach puts emphasis on optimizing a small number of services, which may jeopardize environmental sustainability. One potential solution is to bring cultural ecosystem services more strongly into the foreground. We synthesize recent empirical evidence and assess what consideration of cultural ecosystem services adds to landscape management and planning. In general, cultural ecosystem services incentivize the multifunctionality of landscapes. However, depending on context, cultural ecosystem services can either encourage the maintenance of valuable landscapes or act as barriers to necessary innovation and transformation. Hence, cultural ecosystems services are not uncontested, as seen through the three analytical lenses of landowner behavior, cultural practices of communities, and landscape planning.

## Introduction

The ecosystem services framework has become a boundary object for environmental sustainability, linking different scientific disciplines and opening up conservation opportunities [1]. But with increasing popularity in environmental and development policy, several shortcomings of the current ecosystem services approach have become evident, for example, an emphasis on market-based values (e.g., agri-commodities, carbon, drinking water), the promotion of the commodification of nature, and an inherently exploitative human–nature relationship [2]. One particular concern is that too much emphasis on a small number of services that are easily quantified and marketed may come at the expense of management for multiple benefits [3]. Several solutions have been offered for this dilemma. One option is to design incentive schemes for bundles of multiple ecosystem services [4]. Another is to complement biophysical and market-based valuation of ecosystem services with socio-cultural valuation techniques to enable a fuller characterization of diverse ecosystem values in research and practice [5]. A baseline activity that is fundamental for both options, and the one we explore here, is better acknowledgement of the cultural services of ecosystems (CES) [6].

Cultural ecosystem services are commonly defined as the ‘nonmaterial benefits [that] people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g., knowledge systems, social relations, and aesthetic values’ ([7], p. 894). Expanding this definition, we recognize that CES related to practices, such as gathering of wild products, also have material aspects. CES are generally enjoyed in bundles and typically captured through social-cultural valuation techniques [8]. As they are difficult to quantify, qualitative research plays a stronger role than in the assessment of other ecosystem services [9]. A central assumption of the concept is that human well-being depends on CES and that assessment and acknowledgement of these services leads to more sustainable ecosystem management [10]. CES matter, as they are more directly experienced and intuitively appreciated by people than other ecosystem services [11]. However, the current framing of CES has been criticized for its largely separationist perspective on humans and nature and its reductionist view of culture as a service provided by ecosystems [12], neglecting the social-ecological cogeneration of benefits [13].

There is evidence that CES can be significant motivators for owning, using, managing, or protecting land for particular, often amenity-related purposes [14]. For example, the growth of private and public nature reserves, tourism facilities, second homes, hobby farms, and residential homes in the countryside can all be understood as land uses stimulated by CES [15]. The CES literature has been reviewed previously regarding research approaches [16], use of indicators [9], and social and behavioral sciences contributions [11], but knowledge on how CES influence land use practice remains incomplete and fragmented. We therefore aim to synthesize empirical evidence on the opportunities and challenges in integrating CES into landscape management and planning. We believe that the practical implications of CES are best understood by using three analytical lenses, considering both individual and community levels and both management and planning aspects: the influence of CES on the behavior and decisions of landowners (individual-level management), the cultural practices that CES motivate among urban and rural communities (community-level management), and the guidance that CES offer to landscape planning for balancing multiple societal values (planning) (Figure 1). The cases reviewed here are taken from Western Europe, North

America, and Australia, and our findings should be representative for industrialized countries. We understand landscape management as ‘all action, from a perspective of sustainable development, to ensure the regular upkeep of a landscape’. Landscape planning refers to ‘forward-looking action to enhance, restore, or create landscapes’ [17].

### **Landscape management: individual landowners**

Often considered secondary to financial concerns, CES can have critical influence on landowner decisions and subsequently on efforts to manage privately owned land. Among the small, privately owned properties that make up much of the forests in Europe and North America, ownership types have diversified. Frequently, management decisions have shifted from maximizing economic returns from extractive activities (e.g., timber) towards a greater desire for cultural ecosystem services [18 and 19]. For example, 37% of private forest owners in the Southern Black Forest, Germany, are motivated by lifestyles that allow the enjoyment of experiencing nature rather than by economic considerations [20]. In England, up to 47% of woodland owners are driven by concerns for CES, often focusing on particular (and sometimes conflicting) service types, for example, public and private recreation, scenery, or wildlife watching [21]. At least 17 studies in Europe identified such forest ownership types that are influenced by CES [22]. The desire for CES supports multifunctional goals and specific management practices (e.g., application of management techniques for improved landscape aesthetics [18]), but often the adopted management strategies are relatively passive [18 and 22]. Moreover, landowners influenced by CES often lack the needed knowledge of forest management. Engaging these types of owners is a new challenge for forest extension [23].

Similar appreciation of CES has been documented for ranch lands in North America [24 and 25]. Cultural services — to live near natural beauty, to maintain a rural lifestyle, or to preserve nature — are among the most important reasons for rangeland ownership [26]. In California, owners that produce livestock (around 41% of properties larger than 8 ha) value many of the same CES as a growing number of non-production owners (59% of properties) [24]. Non-production owners are more supportive of biodiversity and ecosystem services, but they are often more passive managers [24]. As with private forests, conservation strategies that build on CES motivations to promote sustainable land management are not well-developed [27]. A characteristic of rangelands in the Western US is that many owners enjoy CES through having a residence on the land, but their desires for CES can be satisfied with small properties [28]. Together with a general lack of land use controls, this frequently drives fragmentation of larger properties into ‘ranchettes’, properties of a few hectares, ultimately leading to the degradation of CES (e.g., aesthetic values) and other ecosystem services [24].

### **Landscape management: urban and rural communities**

Cultural ecosystem services also motivate rural and urban residents to engage with public or community land. In gardens, parks, and other greenspaces [29] people make use of CES through a multitude of practices, habits, traditions, and rituals [30]. Here, we point to three of the roles for CES in communities: provisioning of opportunities for ecotourism and outdoor recreation, driving gardening and harvesting practices, and stimulating the emergence of collective landscape stewardship.

Many people relate to nature through outdoor recreation and tourism. While most ecotourism studies have focused on natural areas (e.g., [31]), tourists are also attracted by the CES of urban greenspaces [32]. As the contact of urban residents with natural or semi-natural ecosystems is often limited, opportunities for everyday outdoor recreation are particularly important [11]. Short-term recreation in nearby greenspaces provides benefits that include improved human health and psychological well-being (e.g., through increased physical activity, reduced obesity, and reduced stress), contributing to the welfare of communities [32].

In urban and rural communities, CES are frequently linked to material uses of the ecosystems. For example, community and home gardening are practiced for a wide range of CES, but also make very tangible contributions to human well-being [33 and 34]. Public greenspaces are also used for harvesting plants for edible, medicinal, craft, or other goods [35], which may or may not be motivated by CES [36]. Urban foraging offers ecological learning across generations, and opportunities to observe seasonal changes in vegetation [37]. In cities, immigrants frequently use gardening activities to create attachment to new places while seeking to maintain distinctive aspects of their cultures [38]. Among other benefits, these greenspaces may fulfil cultural, religious, and ecological purposes [39].

Community interest in CES has given rise to a multitude of landscape stewardship practices. Such self-organized management may include community gardening, reintroductions of native species, tree planting and care, and initiatives to remove invasive species. It is characterized by working in nature, referencing the local sense of place, self-organization, constant monitoring, and opportunities for learning [40]. These practices not only improve the environmental quality of local neighborhoods, but also reinforce social-ecological processes that sustain CES (e.g., recreation, sense of place) and associated benefits to human well-being [41]. In North America and Europe, cities (e.g., Seattle [35]) have recently begun reconsidering the management of some greenspaces to enhance such maintenance and use of CES.

### **Landscape planning**

Cultural ecosystem services can also inform landscape planning [42 and 43]. A cultural services approach to landscape planning reveals the multiple utilitarian and non-utilitarian values that stakeholders attach to landscapes, especially by eliciting those social values that are often ignored by biophysical and economic ecosystem services assessments [44]. For example, cultural ecosystem services have been analyzed jointly with biodiversity values using public participation GIS methods in a planning exercise for the Lower Hunter region of Australia [45]. Parks were valued highly for a range of CES, and in many areas these correlated with scientifically assessed landscape characteristics, such as the proportion of vegetation. Additionally, a high level of compatibility between social values for biodiversity, health/therapeutic values, and social interaction values was revealed. However, a cultural services focus in landscape planning may sometimes substantially diverge from biodiversity-oriented planning. For example, using the 30% of areas ranked highest in cultural ecosystem services as the basis for conservation planning in the Lower Hunter region would mean that more than 50% of the top ranking areas in biodiversity values would no longer be protected [46].

An important insight for landscape planning is that many CES, such as inspiration or sense of place, are often related to extractive activities, for example hunting, fishing, berry picking, or

mushroom gathering [5 and 6]. Similarly, many of the CES (e.g., aesthetic values, sense of place, inspiration, knowledge systems) in an agricultural landscape in Spain depend on migratory livestock husbandry [47]. Such co-generation of cultural and provisioning services challenges the hands-off conservation approaches prevailing in many protected areas. Cultural services may be valued very differently by different people and under different socio-economic conditions, thus posing challenges to landscape planning, where the goal is to reify landscape patterns and land uses. Typically, the expectations of outsiders rub against local views shaped by social and economic relations with other people, as revealed in a case of aesthetic experiences, sense of place, and wind energy development [48]. At the same time, awareness of CES in landscape planning opens up opportunities for more inclusive strategies, such as transboundary management, maintaining flexibility, capacity-building, and empowerment of stakeholders [49 and 50].

## **Conclusions**

The studies reviewed here highlight some of the ways in which CES influence landowner behavior, community engagement, and landscape planning.

We conclude, first, that a strongly increasing number of landowners in prosperous societies are motivated by a desire for CES rather than by profit. At a landscape scale, the diversity of values attached to the mosaic of forest properties held by different owners contributes to diversified land uses and management practices [20]. This offers a great potential for fostering sustainable landscape management, for example, by raising awareness about CES and their relevance for human well-being in environmental education and land management. However, targeted conservation strategies require better knowledge of the many types of landowners, including their level of ecological knowledge and the extent to which they may be persuaded to adjust their land management strategies and practices.

Second, there is a strong demand for CES among urban and rural communities, resulting in manifold types of community-level engagement with landscapes and ecosystems. CES reference intrinsic values, whether these are expressed in intangible (e.g., spiritual values) or material benefits (e.g., harvested plants). The intrinsic values that communities attach to and derive from the landscape may expand the ecosystem services framework away from an economic production perspective toward a socio-ecological systems approach that stipulates the linkages between human well-being and ecosystem services [51].

Third, CES assessment contributes to more comprehensive landscape planning, but basing landscape planning on CES alone may imply trade-offs with other landscape values (e.g., biodiversity) or between the varying views of people valuing them (as demonstrated in the Lower Hunter case). Augmenting comprehensive ecosystem services models to include CES values is more likely to support planning that, for example, supports protection or restoration of key ecosystems and identifies socially acceptable areas for conservation.

Better operationalization of CES for landscape management and planning depends on the advancement of conceptual and methodological assessment tools [52]. Social-cultural valuation is gaining ground, following the desire for mapping and modeling ecosystem services for stronger policy support [53]. CES can be approached through participatory GIS [54•], biophysical modeling [55], the integration of ethnographic methods with GIS [36], monetary valuation [56], systematic field walking [57], or photo elicitation [58]. These

techniques should be used to better integrate the well-established body of research on individual CES, such as landscape aesthetics, cultural heritage, outdoor recreation, and ecotourism [11]. If applied for assessing synergies and trade-offs among multiple CES categories and between CES, other ecosystem services, and biodiversity at multiple scales, they would become particularly valuable for landscape management and planning [59].

The studies reviewed here do not support the view that the desire for CES — or the management and planning of landscapes for these services — is always fully beneficial to environmental sustainability. There is tendency for CES to encourage the maintenance of landscapes that have developed over a long time period. If change is not desired, for example when the goal is to preserve traditional land uses, then CES may support environmental sustainability. If change is needed, for example to adapt to climate change, then CES may not necessarily support innovation as they tend to encourage the persistence of long-established practices [60 and 61]. Ironically, there is evidence that the goals and practices of CES-influenced landowners can in some cases ultimately lead to the degradation of CES, as demonstrated for the aesthetic values of California rangelands. A final point is that CES are not uncontested. CES research should be aware of existing power asymmetries [62] among stakeholders, and should acknowledge the visible and invisible conflicts around whose CES are being privileged.

### **Acknowledgements**

This research received support through Grant 603447 (Project HERCULES) from the European Commission (7th Framework Program). The paper is a contribution to the Programme on Ecosystem Change and Society (<http://www.pecs-science.org>) and the Global Land Project (<http://www.globallandproject.org>).

### **References**

- 1 D.J. Abson, H. von Wehrden, S. Baumgärtner, J. Fischer, J. Hanspach, W. Härdtle, H. Heinrichs, A.M. Klein, D.J. Lang, P. Martens, et al.  
Ecosystem services as a boundary object for sustainability  
*Ecol Econ*, 103 (2014), pp. 29–37
- 2 M. Schröter, E.H. van der Zanden, A.P.E. van Oudenhoven, R.P. Remme, H.M. Serna-Chavez, R.S. de Groot, P. Opdam  
Ecosystem services as a contested concept: a synthesis of critique and counter-arguments  
*Conserv Lett*, 7 (2014), pp. 514–523
- 3 T. Plieninger, C. Schleyer, H. Schaich, B. Ohnesorge, H. Gerdes, M. Hernández-Morcillo, C. Bieling  
Mainstreaming ecosystem services through reformed European agricultural policies  
*Conserv Lett*, 5 (2012), pp. 281–288
- 4 B. Martín-López, I. Iniesta-Arandia, M. García-Llorente, I. Palomo, I. Casado-Arzuaga, D. García Del Amo, E. Gómez-Baggethun, E. Oteros-Rozas, I. Palacios-Agundez, B. Willaarts, et al.

Uncovering ecosystem service bundles through social preferences  
PLoS ONE, 7 (2012) art. e38970

5 K.M.A. Chan, T. Satterfield, J. Goldstein  
Rethinking ecosystem services to better address and navigate cultural values  
Ecol Econ, 74 (2012), pp. 8–18

6 T. Plieninger, S. Dijks, E. Oteros-Rozas, C. Bieling  
Assessing, mapping, and quantifying cultural ecosystem services at community level  
Land Use Policy, 33 (2013), pp. 118–129

7 Millennium Ecosystem Assessment  
Ecosystems and Human Well-being: Current State and Trends Assessment  
Island Press, Washington, DC (2005)

8 C.M. Raymond, J.O. Kenter, T. Plieninger, N.J. Turner, K.A. Alexander  
Comparing instrumental and deliberative paradigms underpinning the assessment of social values for cultural ecosystem services  
Ecol Econ, 107 (2014), pp. 145–156

9 M. Hernández-Morcillo, T. Plieninger, C. Bieling  
An empirical review of cultural ecosystem service indicators  
Ecol Indic, 29 (2013), pp. 434–444

10 C.M. Raymond, G.G. Singh, K. Benessaiah, J.R. Bernhardt, J. Levine, H. Nelson, N.J. Turner, B. Norton, J. Tam, K.M.A. Chan  
Ecosystem services and beyond: using multiple metaphors to understand human–environment relationships  
Bioscience, 63 (2013), pp. 536–546

11 T.C. Daniel, A. Muhar, A. Arnberger, O. Aznar, J.W. Boyd, K.M.A. Chan, R. Costanza, T. Elmqvist, C.G. Flint, P.H. Gobster, et al.  
Contributions of cultural services to the ecosystem services agenda  
Proc Natl Acad Sci U S A, 109 (2012), pp. 8812–8819

12 G. Setten, M. Stenseke, J. Moen  
Ecosystem services and landscape management: three challenges and one plea  
Int J Biodivers Sci Ecosyst Serv Manag, 8 (2012), pp. 305–312

13 L. Huntsinger, J.L. Oviedo  
Ecosystem services are social–ecological services in a traditional pastoral system: the case of California Mediterranean rangelands  
Ecol Soc, 19 (1) (2013) art. 8

14 K.M.A. Chan, A.D. Guerry, P. Balvanera, S. Klain, T. Satterfield, X. Basurto, A. Bostrom, R. Chuenpagdee, R. Gould, B.S. Halpern, et al.



Where are cultural and social in ecosystem services? A framework for constructive engagement  
*Bioscience*, 62 (2012), pp. 744–756

15 B. Gentry, T. Sikor, G. Auld, A. Bebbington, T. Benjaminsen, C. Hunsberger, A. Izac, M. Margulis, T. Plieninger, H. Schroeder  
Changes in land governance in an urban era  
K.C. Seto, A. Reenberg (Eds.), *Rethinking Global Land Use in an Urban Era*, MIT Press (2013), pp. 239–271

16 A.I. Milcu, J. Hanspach, D. Abson, J. Fischer  
Cultural ecosystem services: a literature review and prospects for future research  
*Ecol Soc*, 18 (3) (2013) art. 44

17 ELC (European Landscape Convention)  
Council of Europe (2002) <http://conventions.coe.int/Treaty/en/Treaties/html/176.htm>

18 J.T. Hendee, C.G. Flint  
Incorporating cultural ecosystem services into forest management strategies for private landowners: an Illinois case study  
*Forest Sci*, 60 (2014), pp. 1172–1179

19 P. Howley  
Examining farm forest owners' forest management in Ireland: the role of economic, lifestyle and multifunctional ownership objectives,  
*J Environ Manag*, 123 (2013), pp. 105–112

20 C. Bieling  
Non-industrial private-forest owners: possibilities for increasing adoption of close-to-nature forest management  
*Eur J Forest Res*, 123 (2004), pp. 293–303

21 J. Urquhart, P. Courtney  
Seeing the owner behind the trees: a typology of small-scale private woodland owners in England  
*Forest Policy Econ*, 13 (2011), pp. 535–544

22 J. Urquhart, P. Courtney, B. Slee  
Private woodland owners' perspectives on multifunctionality in English woodlands  
*J Rural Stud*, 28 (2012), pp. 95–106

23 A. Van Herzele, P. Van Gossum  
Typology building for owner-specific policies and communications to advance forest conversion in small pine plantations  
*Landsc Urban Plan*, 87 (2008), pp. 201–209

- 24 T. Plieninger, S. Ferranto, L. Huntsinger, M. Kelly, C. Getz  
Appreciation, use, and management of biodiversity and ecosystem services in California's working landscapes  
*Environ Manag*, 50 (2012), pp. 427–440
- 25 M.G. Sorice, U.P. Kreuter, B.P. Wilcox, W.E. Fox III  
Changing landowners, changing ecosystem? Land-ownership motivations as drivers of land management practices,  
*J Environ Manag*, 133 (2014), pp. 144–152
- 26 S. Ferranto, L. Huntsinger, C. Getz, M. Lahiff, W. Stewart, G. Nakamura, M. Kelly  
Management without borders? A survey of landowner practices and attitudes towards cross-boundary cooperation  
*Soc Nat Resour*, 6 (2013), pp. 1082–1100
- 27 M.N. Lubell, B.B. Cutts, L.M. Roche, M. Hamilton, J.D. Derner, E. Kachergis, K.W. Tate  
Conservation program participation and adaptive rangeland decision-making  
*Rangel Ecol Manag*, 66 (2013), pp. 609–620
- 28 J. Oviedo, L. Huntsinger, P. Campos, A. Caparrós  
Income value of private amenities assessed in California oak woodlands  
*Calif Agric*, 66 (2012), pp. 91–96
- 29 J. Langemeyer, F. Baró, P. Roebeling, E. Gómez-Baggethun  
Contrasting values of cultural ecosystem services in urban areas: the case of park Montjuïc in Barcelona  
*Ecosyst Serv* (2014) <http://dx.doi.org/10.1016/j.ecoser.2014.11.016> (in press)
- 30 S. Barthel, C. Crumley, U. Svedin  
Bio-cultural refugia — safeguarding diversity of practices for food security and biodiversity  
*Glob Environ Change*, 23 (2013), pp. 1142–1152
- 31 M. Mayer, M. Müller, M. Woltering, J. Arnegger, H. Job  
The economic impact of tourism in six German national parks  
*Landsc Urban Plan*, 97 (2010), pp. 73–82
- 32 C.C. Konijnendijk, M. Annerstedt, A.B. Nielsen, S. Maruthaveeran  
Benefits of Urban Parks: A Systematic Review  
IFPRA, Copenhagen, Alnarp (2013)
- 33 L.J. Lawson  
City Bountiful: A Century of Community Gardening in America  
University of California Press, Berkeley (2005)
- 34 L. Calvet-Mir, E. Gómez-Baggethun, V. Reyes-García

Beyond food production: ecosystem services provided by home gardens. A case study in Vall Fosca, Catalan Pyrenees, Northeastern Spain  
*Ecol Econ*, 74 (2012), pp. 153–160

35 R.J. McLain, P.T. Hurley, M.R. Emery, M.R. Poe  
Gathering “wild” food in the city: rethinking the role of foraging in urban ecosystem planning and management  
*Local Environ*, 19 (2013), pp. 220–240

36 P.T. Hurley, A.C. Halfacre, N.S. Levine, M.K. Burke  
Finding a “disappearing” nontimber forest resource: using grounded visualization to explore urbanization impacts on sweetgrass basketmaking in Greater Mt. Pleasant South Carolina  
*Prof Geogr*, 60 (2008), pp. 556–578

37 M.R. Poe, J. LeCompte, R. McLain, P. Hurley  
Urban foraging and the relational ecologies of belonging  
*Soc Cult Geogr* (2014), pp. 1–19

38 M. Jay, U. Schraml  
Diversity in mind: towards a differentiated understanding of migrants’ recreational practices in urban forests  
*Urban For Urban Green*, 13 (2014), pp. 38–47

39 S. Mazumdar, S. Mazumdar  
Immigrant home gardens: places of religion, culture, ecology, and family  
*Landsc Urban Plan*, 105 (2012), pp. 258–265

40 M.E. Krasny, K.G. Tidball  
Civic ecology: a pathway for Earth Stewardship in cities  
*Front Ecol Environ*, 10 (2012), pp. 267–273

41 M.E. Krasny, A. Russ, K.G. Tidball, T. Elmqvist  
Civic ecology practices: participatory approaches to generating and measuring ecosystem services in cities  
*Ecosyst Serv*, 7 (2014), pp. 177–186

42 C. Albert, J. Aronson, C. Fürst, P. Opdam  
Integrating ecosystem services in landscape planning: requirements, approaches, and impacts  
*Landsc Ecol*, 29 (2014), pp. 1277–1285

43 I. Casado-Arzuaga, M. Onaindia, I. Madariaga, P. Verburg  
Mapping recreation and aesthetic value of ecosystems in the Bilbao Metropolitan Greenbelt (northern Spain) to support landscape planning  
*Landsc Ecol*, 29 (2014), pp. 1393–1405

44 C.J. Van Riper, G.T. Kyle

Capturing multiple values of ecosystem services shaped by environmental worldviews: a spatial analysis

*J Environ Manag*, 145 (2014), pp. 374–384

45 C.D. Ives, C. Oke, B. Cooke, A. Gordon, S. Bekessy

Planning for Green Open Space in Urbanising Landscapes Report for the Australian Government Department of the Environment

RMIT University, Melbourne (2014)

46 A.L. Whitehead, H. Kujala, C.D. Ives, A. Gordon, P.E. Lentini, B.A. Wintle, E. Nicholson, C.M. Raymond

Integrating biological and social values when prioritizing places for biodiversity conservation  
*Conserv Biol*, 28 (2014), pp. 992–1003

47 E. Otero-Rozas, R. Ontillera-Sánchez, P. Sanosa, E. Gómez-Baggethun, V. Reyes-García, J. González

Traditional ecological knowledge among transhumant pastoralists in Mediterranean Spain  
*Ecol Soc*, 18 (8) (2013) art. 33

48 D. van der Horst, S. Vermeylen

Ownership claims, valuation practices, and the unpacking of energy-landscape conflicts  
*Int Rev Sociol*, 22 (2012), pp. 429–445

49 P. Opdam, J. Nassauer, Z. Wang, C. Albert, G. Bentrup, J.-C. Castella, C. McAlpine, J. Liu, S. Sheppard, S. Swaffield

Science for action at the local landscape scale  
*Landsc Ecol*, 28 (2013), pp. 1439–1445

50 L. Huntsinger, N. Sayre, L. Macaulay

Ranchers, land tenure, and grass-roots governance: maintaining pastoralist use of rangelands in the U.S. in three different settings

P.M. Herrera, J. Davies, P. Manzano Baena (Eds.), *The Governance of Rangelands: Collective Action for Sustainable Pastoralism*, Routledge (2014)

51 B. Reyers, R. Biggs, G.S. Cumming, T. Elmqvist, A.P. Hejnowicz, S. Polasky

Getting the measure of ecosystem services: a social–ecological approach  
*Front Ecol Environ*, 11 (2013), pp. 268–273

52 R.K. Gould, S.C. Klain, N.M. Ardoin, T. Satterfield, U. Woodside, N. Hannahs, G.C. Daily, K.M. Chan

A protocol for eliciting nonmaterial values through a cultural ecosystem services frame  
*Conserv Biol* (2014) <http://dx.doi.org/10.1111/cobi.12407> (in press)

53 N.D. Crossman, B. Burkhard, S. Nedkov, L. Willemen, K. Petz, I. Palomo, E.G. Drakou, B. Martín-Lopez, T. McPhearson, K. Boyanova, et al.

A blueprint for mapping and modelling ecosystem services

Ecosyst Serv, 4 (2013), pp. 4–14

54 G. Brown, N. Fagerholm

Empirical PPGIS/PGIS mapping of ecosystem services: a review and evaluation

Ecosyst Serv (2014) <http://dx.doi.org/10.1016/j.ecoser.2014.10.007> (in press)

55 M.L. Paracchini, G. Zulian, L. Kopperoinen, J. Maes, J.P. Schägner, M. Termansen, M. Zandersen, M. Perez-Soba, P.A. Scholefield, G. Bidoglio

Mapping cultural ecosystem services: a framework to assess the potential for outdoor recreation across the EU

Ecol Indic, 45 (2014), pp. 371–385

56 D.B. Van Berkel, P.H. Verburg

Spatial quantification and valuation of cultural ecosystem services in an agricultural landscape

Ecol Indic, 37A (2014), pp. 163–174

57 C. Bieling, T. Plieninger

Recording manifestations of cultural ecosystem services in the landscape

Landsc Res, 38 (2013), pp. 649–667

58 M. Berbés-Blázquez

A participatory assessment of ecosystem services and human wellbeing in rural Costa Rica using photo-voice

Environ Manag, 49 (2012), pp. 862–875

59 M.R. Felipe-Lucia, F.A. Comín, E.M. Bennett

Interactions among ecosystem services across land uses in a floodplain agroecosystem

Ecol Soc, 19 (2014) art. 20

60 S.C. Moser, J.A. Ekstrom

A framework to diagnose barriers to climate change adaptation

Proc Natl Acad Sci U S A, 107 (2010), pp. 22026–22031

61 J.Ø. Nielsen, A. Reenberg

Cultural barriers to climate change adaptation: a case study from Northern Burkina Faso

Glob Environ Change, 20 (2010), pp. 142–152

62 T. Sikor

The Justices and Injustices of Ecosystem Services

Routledge, London (2013)

**Figure 1.**

Cultural ecosystem services and their influence on landowner decision-making, community engagement, and landscape planning.

