

University of Vermont

**UVM ScholarWorks**

---

Rubenstein School of Environment and Natural  
Resources Faculty Publications

Rubenstein School of Environment and Natural  
Resources

---

2019

## **Cultural ecosystem services and the well-being of refugee communities**

Tatiana M. Gladkikh

*The University of Vermont*, [tgladkik@uvm.edu](mailto:tgladkik@uvm.edu)

Rachelle K. Gould

*The University of Vermont*, [rgould@uvm.edu](mailto:rgould@uvm.edu)

Kimberly J. Coleman

*SUNY-Plattsburgh*, [kcole014@plattsburgh.edu](mailto:kcole014@plattsburgh.edu)

Follow this and additional works at: <https://scholarworks.uvm.edu/rsfac>



Part of the [Environmental Studies Commons](#), and the [Urban Studies and Planning Commons](#)

---

### **Recommended Citation**

Gladkikh, T.M., Gould, R.K., Coleman, K.J., 2019. Cultural ecosystem services and the well-being of refugee communities. *Ecosystem Services* 40, 101036. <https://doi.org/10.1016/j.ecoser.2019.101036>

This Article is brought to you for free and open access by the Rubenstein School of Environment and Natural Resources at UVM ScholarWorks. It has been accepted for inclusion in Rubenstein School of Environment and Natural Resources Faculty Publications by an authorized administrator of UVM ScholarWorks. For more information, please contact [scholarworks@uvm.edu](mailto:scholarworks@uvm.edu).

**To cite:** Gladkikh, T.M., Gould, R.K., Coleman, K.J., 2019. Cultural ecosystem services and the well-being of refugee communities. *Ecosystem Services* 40, 101036.

<https://doi.org/10.1016/j.ecoser.2019.101036>

ISSN 2212-0416

This is a final draft, post-refereeing. For the full, formatted version, please visit the Ecosystem Services website: <https://www.sciencedirect.com/journal/ecosystem-services>

For the final published version, please visit:

<https://doi.org/10.1016/j.ecoser.2019.101036>

## **Cultural ecosystem services and the well-being of refugee communities**

Tatiana M. Gladkikh<sup>a,b</sup>, Rachelle K. Gould<sup>a, b, c</sup>, Kimberly J. Coleman<sup>a</sup>

<sup>a</sup> Rubenstein School of Environment and Natural Resources, University of Vermont, 81 Carrigan Drive, Burlington, VT 05405, USA [tgladkik@uvm.edu](mailto:tgladkik@uvm.edu)

<sup>b</sup> Gund Institute for Environment, University of Vermont, 617 Main Street, Burlington, VT 05405, USA [rgould@uvm.edu](mailto:rgould@uvm.edu)

<sup>c</sup> Environmental Program, University of Vermont, 153 South Prospect Street, Burlington, VT 05401, USA [kcole014@plattsburgh.edu](mailto:kcole014@plattsburgh.edu)

**Declarations of interest:** none

### **Abstract**

The growing field of research into cultural ecosystem services (CES) explores nonmaterial benefits that people receive from ecosystems. These studies have, however, largely overlooked refugee communities. To reduce this gap, we systematically review academic literature on refugee interactions with ecosystems to understand what cultural ecosystem services refugees may experience, and how these services affect their well-being. The results identify a broad range of CES that refugees experience, even though studies do not use CES terminology. Benefits include social relations, mental health, cultural heritage, education, recreation, identity, sense of place, aesthetic, spirituality, perspective, and existence value. Results also show that the majority of studies of refugee—ecosystem interactions occur in agricultural ecosystems. Findings suggest that interactions with ecosystems may ease the resettlement process and overall well-being, including mental health, in many ways. These findings enrich understanding of CES experienced by people of diverse (and in this case traumatic) backgrounds and provide practical implications for those who work in the field of refugee resettlement.

### **Keywords**

Cultural heritage; mental health; gardens; resettlement; social relations; parks

## 1. Introduction

Cultural ecosystem services (CES), a complex suite of nonmaterial benefits that people receive from ecosystems, are arguably crucial aspects of human well-being (Díaz et al., 2019; MEA, 2005). They are also likely the least-researched category of ecosystem services (ES) (Chan et al., 2012; Milcu et al., 2013). This is, at least in part, because CES are challenging to study for a variety of reasons. These include intangibility, incommensurability, difficulty of measurement, inseparability (in many contexts) of material and nonmaterial benefits, and the lack of both a universal definition of these services and accepted methods of valuation (Bryce et al., 2016; Hirons et al., 2016; Satz et al., 2013; Small et al., 2017). An overarching challenge is that CES are dependent on social factors to a larger extent than are other ES, and thus the study group plays an essential role in CES assessments (Dickinson and Hobbs, 2017). Heterogeneity in CES — i.e., that the same ecosystem may provide different CES to different people— is a vital aspect of the concept, one that may have important implications for more equitable environmental decision making (Martín-López et al., 2012).

Understanding the beneficiaries of CES is thus crucial to understanding these services. Research with diverse participants can help CES assessment account for diverse ways that nature benefits people from different backgrounds. One group that environmental research generally, and in CES studies in particular, infrequently studies is the refugee community. Considering global migration trends and threats from increased competition over resources depleted by climate change (Biermann and Boas, 2010; UN, 2018), research on this study group is particularly timely. Given the trauma refugees often endure, poor mental health tends to be a major concern among their communities (Crea et al., 2015). This has led us to ask whether CES might play a role in the refugee resettlement process.

To our knowledge, ES scholars have not specifically studied the CES that refugees receive from their new home environments, yet there are many reasons to believe that these services may be — or could be — meaningful aspects of refugee lives. In many places and cultures, connection to land, water, and other forms of life are crucial aspects of identity and well-being (Gould et al., 2014; Zent, 2013). Refugees often undergo excruciating hardships of many types; one aspect of these hardships may be a jarring displacement from familiar and beloved ecosystems in their home country (Boğaç, 2009).

This paper explores the idea that this disconnection from place may have severe consequences, and that connecting to their new places may help refugees in seldom-discussed ways. Research with non-refugee communities demonstrates that cutting ties with place may harm, for instance, peoples' sense of self or spiritual well-being (Rishbeth and Powell, 2013). Just as loss of place can harm well-being, research (again, not with refugees) increasingly demonstrates that connecting with ecosystems can lead to myriad, and at times profound, well-being benefits, especially as they relate to psychological well-being and recovery from trauma. Contact with nature alleviates symptoms of post-traumatic stress disorder and reduces pain and anxiety (Horowitz, 2012; Poulsen et al., 2015; Stigsdotter et al., 2011). It is thus likely that for refugees,

a connection with ecosystems in their new homes could ameliorate the effects of disconnection from their home country ecosystems as well as many of the forms of trauma they may suffer.

Just as studies about human-nature relationships tend to overlook the refugee community, work from the field of refugee studies has largely overlooked how ecosystems affect mental health and well-being. Numerous studies on non-refugee populations have documented the positive contribution of ecosystems to both material and nonmaterial aspects of well-being (Russell et al., 2013; Sandifer et al., 2015). However, it is rare that studies of refugee resettlement consider the natural environment as a factor that influences health and well-being (El-Bialy and Mulay, 2015).

Numerous studies have looked at displacement and the trauma of exile as they relate to refugees (Jean, 2015), yet efforts to understand the unique and deeply challenging nature of the refugee experience may currently omit meaningful aspects of well-being and potential nature-based routes to healing from trauma (Horowitz, 2012; Poulsen et al., 2015; Stigsdotter et al., 2011). In studies of refugee resettlement and health, themes such as holistic quality of life, mental well-being, and recreation receive far less attention than the legal aspects of migration and employment (Rishbeth and Finney, 2006). While there are scores of peer-reviewed papers that address interactions of immigrants with ecosystems (e.g. Egoz and De Nardi, 2017; Gentin, 2011; Ordóñez-Barona, 2017), they do not distinguish between refugee and non-refugee immigrants. For example, Ordóñez-Barona (2017) reviewed studies about refugee, immigrant, and nonwhite populations to explore how different ethnocultural groups valued urban forests. The author noted that some studies within the sample simplified ethnic and immigrant groupings and did not capture the complexity of immigration patterns and possible differences in preferences. However, the psychosocial profile of a large proportion of the refugee population differs from that of non-refugee immigrants (Segal and Mayadas, 2005). Among all immigrants, refugees tend to be the most vulnerable to developing a mental health disorder (Hollander et al., 2011; Porter and Haslam, 2005). Here we explore whether there may be an untapped opportunity to employ the potential of ecosystems to provide support during the resettlement process.

The intent of this paper is to synthesize existing literature on refugee interactions with ecosystems (as defined below) and to assess cultural ecosystem services that refugees may receive from these interactions. To accomplish this goal, we reviewed studies that examine how resettled refugees engage with different conglomerates and types of ecosystem, including forests, urban farms, gardens, parks, and rivers. We hope that this review will reveal what we know about CES as they relate to this particular study group, and that the results may offer practical suggestions for refugee services. With this in mind, we addressed these questions:

1. What nonmaterial benefits do refugees receive from ecosystems in their new home countries? Do these benefits tend to be studied jointly, in “bundles”?
2. How do interactions with ecosystems affect refugee well-being and resettlement?

## **2. Methods**

This study systematically reviews and synthesizes the literature on refugee interaction with ecosystems (Cooper, 2017). We first describe how we selected the papers in our sample, then how we coded for nonmaterial values within those papers.

### ***2.1. Selection protocol for papers***

For the purposes of exploring nonmaterial benefits from ecosystems, we define ecosystem as: “a system formed by biotic elements (living things) and abiotic elements (including water, nutrients, energy) and the interactions among them” (Russell et al., 2013). Our criteria for inclusion in this review were as follows. First, study authors identified at least part of the study group as resettled refugees. We define refugees as those who have fled their home countries due to a fear of persecution (UNHCR, 2018a). Second, the study addressed interactions of the study group with an ecosystem widely considered “natural” (e.g., park, garden, forest). Third, the study documented nonmaterial benefits resulting from these interactions. Adhering to these rules meant that we excluded: studies about immigrant populations unless they specified that participants (whether some or all) were refugees; studies on refugees in resettlement camps; studies on refugee well-being that did not consider ecosystems as a factor; and studies that did not include references to nonmaterial benefits from ecosystems.

We designed a set of search terms to capture a diversity of ways papers might reference refugee-ecosystem interactions. We combined the key word “refugee\*” with the following list of terms that might be used to represent ecosystems: agriculture, ecosystem, environment, farm, forest, garden, “green area,” “green space,” landscape, nature, park, “open space”, water, wetland (e.g. “refugee\*” AND (ecosystem\* OR park\* OR “open space\*”). To increase relevance of the search results, we decided not to use “immigrant\*” or “asylum seeker\*” in the search terms. “Immigrant” represented a broader category than the study group we defined for this review; “asylee” and “asylum seeker” differed from our operational definition of refugee (an asylum seeker is someone whose refugee request is yet to be processed (UNHCR, 2019)).

We conducted two separate searches. We conducted the first search in July 2018 using five online databases: Academic Search Premier, Geobase, Google Scholar, ProQuest and Web of Science. We included peer-reviewed studies published in English through July 2018; we did not limit the search by date or geographic scope. The selection process for the first search had four steps. In step one, we screened titles and keywords to select papers likely to meet our criteria. We read titles and keywords of the first 100 results from each search and selected papers that seemed relevant to our study. If a search returned over a hundred results, we continued screening the results until we found a block of 20 consecutive irrelevant results. After screening titles, about 75 papers moved to step two. In step two, we read the abstract to ascertain whether the study was likely to meet our research criteria. After reading abstracts, 31 papers moved to step three. In step three, we read papers in detail. Roughly half of the papers in step three (14 papers) met the three criteria detailed above. The other 17 papers we read in detail did

not: 5 papers did not involve interactions with an ecosystem; 5 papers did not contain references to nonmaterial values resulting from these interactions; 5 papers did not identify refugees as part of the study group; and 2 papers described studies in resettlement camps. In step four, we reviewed the reference lists of the 14 papers that resulted from step 3 to identify additional studies that might be relevant. Our final sample comprised 19 papers, with 14 identified through the database searches and five through the reference lists.

The second search, which we conducted in July 2019, followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) protocol (Moher et al., 2009). We used the list of search terms provided above, but this time limited the search to title, keywords, and abstract. We used all but one of the databases used in the first search (we omitted Google Scholar because it did not allow us to limit searches to abstracts) (Table 1).

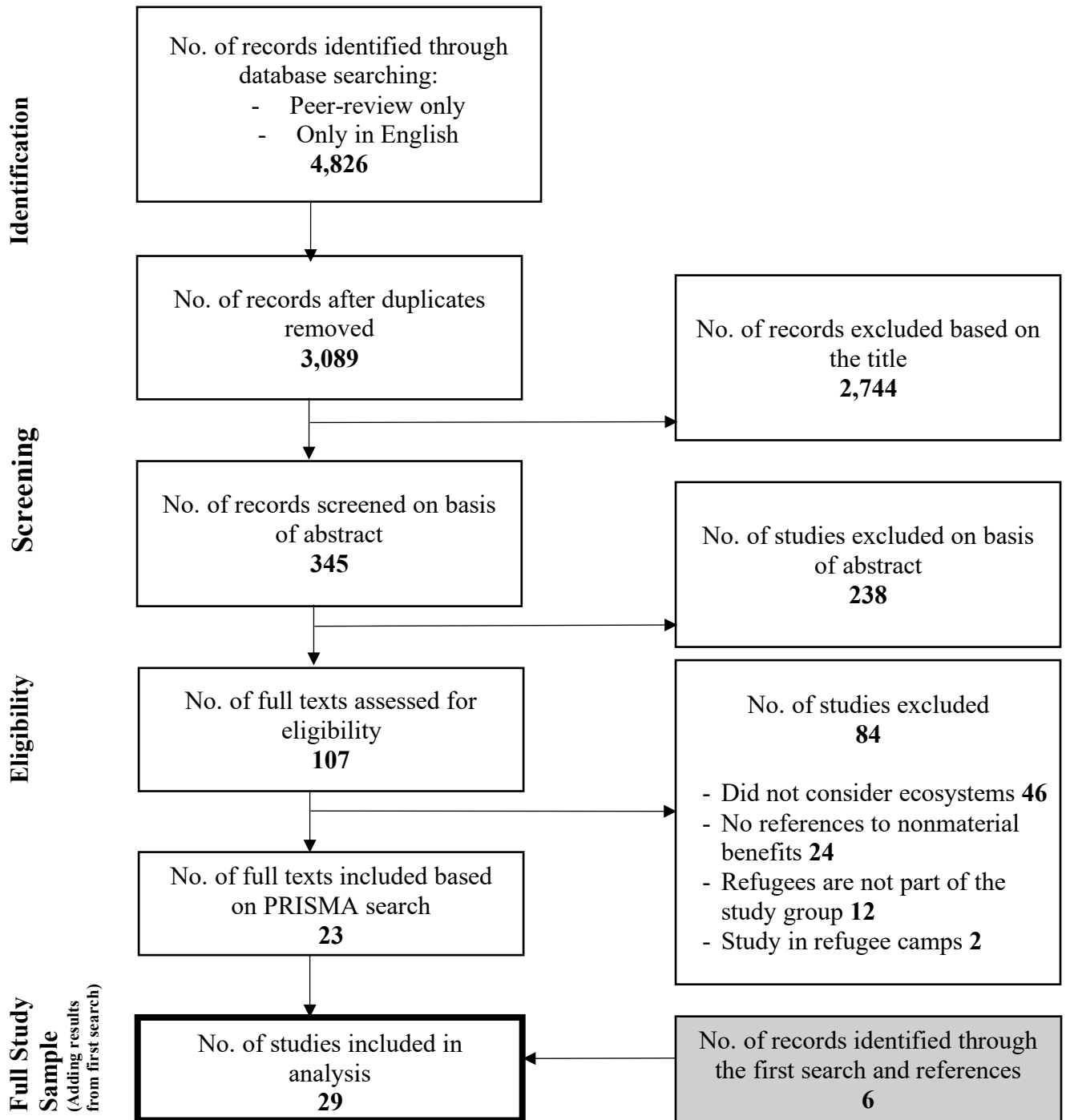
Table 1: PRISMA protocol. Search terms and restrictions applied for each database.

Database	Search terms	Total search results
Academic Search Premier	refugee* [author-supplied key words] AND (agricultur* OR ecosystem OR environment OR farm OR forest OR garden OR green area OR green space OR landscape OR natur* OR park OR open space OR water OR wetland*) [abstract]	589
Web of Science	refugee* [topic] AND (agricultur* OR ecosystem OR environment OR farm OR forest OR garden OR green area OR green space OR landscape OR natur* OR park OR open space OR water OR wetland*) [topic]	2,683
GeoBase	refugee*[title/keyword/abstract] AND (agricultur* OR ecosystem OR environment OR farm OR forest OR garden OR green area OR green space OR landscape OR natur* OR park OR open space OR water OR wetland*) [abstract]	898
ProQuest	refugee* [title] AND (agricultur* OR ecosystem OR environment OR farm OR forest OR garden OR green area OR green space OR landscape OR natur* OR park OR open space OR water OR wetland*) [abstract]	656

To select our final sample for the second search, we followed the four-step process that we used in the first search (Figure 1). One researcher combined results from all databases and removed duplicates. We then screened 3,089 titles and keywords for relevance and identified 345 papers that moved to step two. After reading abstracts, 107 papers moved to step three. In step three, we read full-text papers: 23 papers met the study criteria and 84 did not. Out of the 84 papers that did not meet the criteria, 46 did not involve interactions with an ecosystem; 24 did not contain references to nonmaterial values resulting from these interactions; 12 did not identify refugees as part of the study group; and 2 took place in resettlement camps. To increase replicability, a research assistant reviewed a randomly selected portion of papers at each step of the second search. These two researchers disagreed only on four papers based on title and abstract (one

researcher thought they should be included; the other did not), but once both read the full papers, they fully agreed that the four disputed papers should not be included. All researchers were involved in evaluating eligibility of the full papers in both searches.

Fig. 1. Flowchart focused on the second search process, which followed the PRISMA protocol (adapted from Moher et al. 2009). The bottom two boxes demonstrate how we combined results from the first search with results from the PRISMA-protocol search.



The two search processes produced a total sample of 29 papers: 4 studies only came up in the first search, 10 only came up in the second, 13 papers were present in both, and 2 papers were identified through the reference lists.

## ***2.2. Coding for non-material benefits***

Once we had our sample of papers, we coded for nonmaterial benefits from ecosystems. As a first step, we compiled a comprehensive list of 16 CES themes. We included CES present in typologies most commonly discussed in the ES literature (e.g. MEA, 2005; NEA, 2011), and three CES themes that are more novel (as described in Gould and Lincoln, 2017). Table 2 lists the themes and their operational definitions. Important to note is that none of the reviewed papers used CES language or applied a CES framework; rather, they reported nonmaterial benefits that refugees received from interacting with ecosystems and discussed how these benefits influenced refugee well-being. Within these reports, we searched for impacts related to CES; we used qualitative coding methods (Glesne, 2006) to determine whether the papers addressed these *a priori* coding categories. When we below write about CES themes addressed in reviewed papers, we refer to references to nonmaterial benefits from ecosystems that we coded according to the definitions of CES themes in Table 2.

We used the qualitative software NVivo v.12 to analyze the papers. Using the operational definition of each theme, the first author (hereafter, “the coder”) read the articles, looking for evidence of nonmaterial benefits received from ecosystems and classifying them according to the CES framework. In some instances, a study identified the theme verbatim; for example, “for the farmers in this study, a sense of place comes from having the ability to participate in place-making activities that develop a connection to landscape, soil, and the physical environment (Jean, 2015:56)” was coded as “sense of place.” In other cases, the coder interpreted the language to identify the theme; for example, “respondents expressed a desire to share their memories of Somalia with their children and used gardening as a conduit for their storytelling (Coughlan and Hermes, 2016:146)” was coded as “cultural heritage.” In cases when the specific theme was not clear, the coder and other authors discussed the classification. In addition, the coder classified references to negative impacts from ecosystems as ecosystem disservices. The other researchers spot-checked the coding to ensure consistency and reliability (Barbour, 2001; Patton, 2002). After coding was completed, the researcher enumerated the papers that addressed each of the 16 CES themes. We then calculated co-occurrences between CES themes within the same paper to explore whether “bundles” of CES exist.

In addition to identifying nonmaterial benefits and ecosystem disservices, we recorded countries where refugees resettled. We also noted the types of natural landscapes where the studies took place. We used a matrix query in NVivo to investigate whether there was a pattern related to which CES were discussed with respect to which ecosystems; the query calculated how often papers addressed each CES theme in each type of ecosystem.



Table 2: The CES typology used in this study and operational definition of each theme. Sources for definitions are in parentheses.

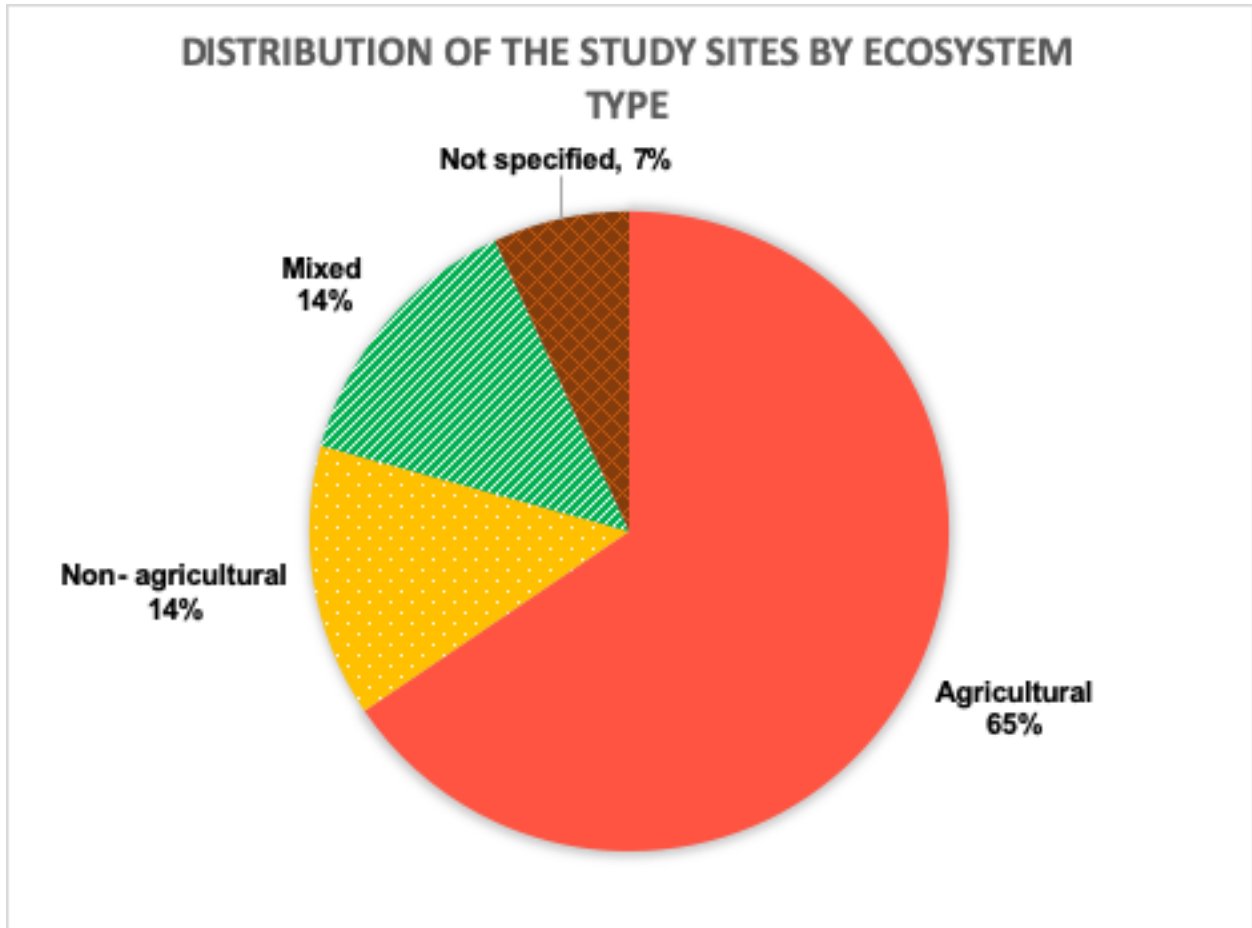
<b>Cultural Ecosystem Services (CES) themes and definitions</b>	
Aesthetic	Beauty and aesthetic value of ecosystems (MEA, 2005).
Artistic	Ecosystems as a source of inspiration for artwork (MEA, 2005).
Bequest	Satisfaction from preserving a natural environment for future generations (Raymond et al., 2009).
Cultural heritage	Contribution of ecosystems to diversity of cultures and cultural heritage (MEA, 2005).
Education	Role of ecosystems in providing formal and informal education (MEA, 2005).
Existence	Satisfaction from knowing that a site is preserved in a certain condition irrespective of use or potential use (Raymond et al., 2009).
Identity	The role of nature in producing purpose or identity (Russell et al., 2013).
Ingenuity	Ecosystems' aid in developing innovative ideas, approaches, or practices (Gould and Lincoln, 2017).
Knowledge systems	The influence of ecosystems in the types of knowledge systems developed by different cultures (MEA, 2005).
Life teaching	Opportunities for learning life lessons and personal values provided by ecosystems (Gould and Lincoln, 2017).
Mental health	Contributions of ecosystems to mental health (NEA, 2011).
Perspective	The role of ecosystems in helping people to gain perspective on their place in the world, to see where they fit, or to put things back in perspective (Gould and Lincoln, 2017).
Recreation	Leisure and recreation activities provided by ecosystems (MEA, 2005).
Sense of place	The role of ecosystems in developing meanings and attachment to a setting held by an individual or group (Masterson et al., 2017).
Social relations	Ecosystem contributions to establishment of social relationships (MEA, 2005).
Spirituality	Spiritual and religious values associated with ecosystems (MEA, 2005).

### 3. Results

The 29 papers we reviewed, published between 1994 and 2019, describe research undertaken in the United States (48% of studies), Australia (22%), Canada (17%), the United Kingdom (7%), Ireland (3%) and Cyprus (3%). Studies involved refugees from various origins, including Asia, Africa, South America, and Europe; 21% of papers did not specify origin countries. The papers examined different types of ecosystems (see Figure 2) and discussed a range of benefits that members of refugee communities derive from them (see Table 3 and Figure 3). In the sections

that follow, we provide a brief summary of the ecosystem types in which the studies took place, then summarize our results for each service.

Fig. 2. Distribution of the study sites by ecosystem type. These categories are mutually exclusive; each paper is counted only once. Agricultural ecosystem types include urban farms and gardens; non-agricultural ecosystem include river, city parks and state parks. Mixed ecosystem types include agricultural and non-agricultural ecosystems.



1 Table 3: Summary of reviewed papers and CES themes identified in each study. Papers identified through the PRISMA search are marked with \*

Publication	Data collection methods	Location	Ecosystem type	Addressed CES themes										
				Aesthetic	Cultural heritage	Educational	Existence	Identity	Mental health	Perspective	Recreation	Sense of place	Social relations	Spirituality
Abramovic et al. (2019)*	Interviews, observations, document analysis	Canberra, Australia	garden		x	x		x	x		x		x	
Airriess & Clawson (1994)*	Survey	Louisiana, USA	garden					x	x					
Andreatta (2017)*	Observations	North Carolina, USA	urban farm		x	x		x					x	
Bengston et al. (2008)*	Focus groups	Minnesota, Wisconsin, USA	public parks		x				x		x			
Boğaç (2009)*	Surveys, interviews, mental mapping	Cyprus	garden						x				x	
Brown et al. (2017)	Survey, interviews, photographs, work samples	Adelaide, Australia	garden			x							x	
Cattell et al. (2008)	Focus groups, observations, interviews	London, UK	city parks		x			x	x			x	x	
Corlett et al. (2003)*	Interviews	California, USA	urban garden		x								x	
Coughlan & Hermes (2016)*	Interviews, Photovoice	New York, USA	community garden		x				x		x	x	x	x
Cutter-Mackenzie (2009)	Interviews, observations	Dandenong, Australia	garden		x	x			x			x	x	
Eggert et al. (2015)*	Observations, interviews, survey	Virginia, USA	community garden						x	x	x		x	
El-Bialy & Mulay (2015)*	Interviews, observations	St John's, Canada	unspecified		x				x					
Gerber et al. (2017)	Survey, interviews	Texas, USA	community garden		x	x		x	x				x	x
Gichunge & Kidwaro (2014)*	Interviews	Queensland, Australia	garden		x			x	x				x	
Harper et al. (2016)*	Interviews, Photovoice	USA	garden		x	x		x					x	
Harris et al. (2014)*	Interviews	Queensland, Australia	garden		x	x		x	x			x	x	
Hartwig & Mason (2016)*	Survey and focus groups	Minnesota, USA	garden		x				x				x	
Hordyk et al. (2015)*	Drawings, story-telling	Montreal, Canada	urban greenspaces	x	x	x			x	x	x		x	x
Hurly (2019)*	Interviews	Canada	nature		x				x		x			
Hurly and Walker (2017)*	Interviews	Alberta, Canada	state park	x	x	x			x	x	x		x	
Jean (2015)*	Interviews, observations	Utah, USA	urban farm		x	x		x	x		x	x	x	
Judelson et al. (2017)*	interviews	New York, USA	garden						x		x			
Logan & Murdie (2016)*	Photovoice	Toronto, Canada	urban greenspaces			x			x		x		x	x
Murphy (2018)*	Interviews, observations	Ireland	community gardens			x			x				x	
Owens (2005)	Survey, interviews	Nebraska, USA	garden	x	x						x		x	
Rishbeth & Finney (2006)*	Interviews, photo elicitations	Sheffield, UK	urban greenspaces	x	x			x			x		x	
Sampson & Gifford (2010)*	Photo voice, journals	Melbourne, Australia	parks	x					x			x	x	
Strunk & Richardson (2019)*	Interviews, observations	Illinois, USA	urban gardens					x					x	x
van Auken et al. (2016)	Photo elicitation, interviews	Wisconsin, USA	river	x	x	x	x	x	x	x	x	x	x	

### 3.1 Study sites

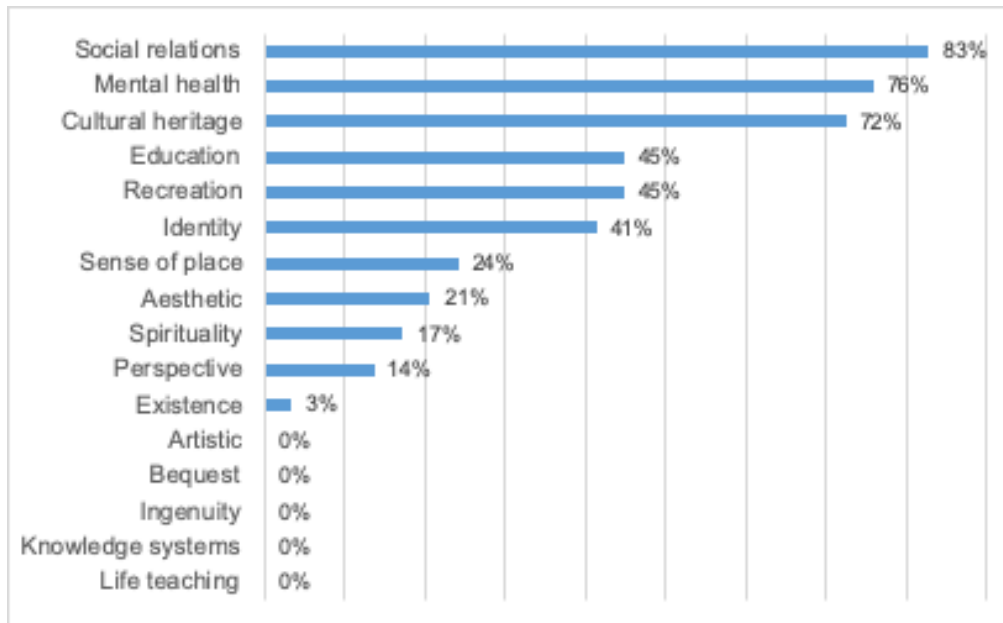
The majority of papers (65%) investigated agricultural ecosystems exclusively: two studies (7%) took place in urban farms and 17 (59%) in garden ecosystems, including community, school, and home gardens. Three papers (10%) examined state or city parks. Four studies (14%) took place in multiple ecosystem sites within the same study, which included parks, gardens, farms, urban forests, and urban woodlands. One study (4%) looked at a river watershed. Two studies (7%) did not examine a specific ecosystem, but rather took an overall view of the environmental characteristics of the resettlement city and nature-based leisure.

Our analysis of whether CES themes were associated with particular types of ecosystems revealed no patterns. Most themes (10 out of 11) were discussed across ecosystem types (both agricultural and nonagricultural), though some, of course, were mentioned in more papers than others (Table 3). The “existence” theme came up in one paper and thus was connected to only one ecosystem type (a river). Considering our small sample size, we refrain from drawing conclusions on whether certain CES themes might have stronger association with specific ecosystem types.

### 3.2 Nonmaterial benefits, or Cultural Ecosystem Services

Of the 16 CES in our list, we found references to 11 benefits that refugees received from ecosystems. We coded those benefits as social relations, cultural heritage, mental health, recreation, sense of place, identity, education, aesthetic, perspective, spirituality, and existence (Table 2 for definitions, Table 3 for distribution of CES themes across papers, and Figure 3 for percentages). We did not find evidence of benefits from nature that we interpreted as artistic, bequest, ingenuity, knowledge systems, and life teaching CES.

Fig. 3. Percent of papers in review that addressed each CES theme.



The CES addressed by the highest number of studies was social relations. Twenty-four papers (83%) discussed this benefit, which manifest as dispute resolution, social interactions, strengthening of existing relationships, and development of new relationships. Collaborative gardening, for example, helped to reconcile a conflict among members of Somali Bantu tribes, the Kizigua and the May-May (Coughlan and Hermes, 2016). These tribes have a history of rivalry in Somalia, but through collaboration of individuals from both groups in a community garden, “people who were previously against each other became friends” (Coughlan and Hermes, 2016:151). In other studies, gardening provided an opportunity to develop relations with the new community, as gardeners shared their produce with both refugee and non-refugee neighbors, and chatted about their gardening experiences (Harris et al., 2014; Hartwig and Mason, 2016). Bhutanese gardeners reported having significantly more social support, especially tangible assistance (e.g., help with chores or meals during illness), compared to non-gardeners from the same community (Gerber et al., 2017). Social relations were not limited to agricultural ecosystems; other ecosystems provided a place to socialize and connect with communities in new home countries (Hordyk et al., 2015). As one illustration, participants on an overnight camping trip noted that “the outdoor experience served as a nonjudgmental space for exploring the natural environment and making new friends” (Hurly and Walker, 2017:11). In a study of Tibetan refugees resettled in Toronto, a park provided a place to socialize and “mingle with other Tibetans” (Logan and Murdie, 2016:109).

Mental health was the second most frequently addressed service; it appeared in 22 papers (76%). Study authors and participants noted that nature helped mitigate negative emotions and cope with stress and anxieties; several mentioned that refugees turned to nature for healing purposes or “hortitherapy” (Airriess and Clawson, 1994:19). Participants from one study, for example, shared that they turn to nature to deal with depression and homesickness: “Especially if you are homesick or depressed, go to the ocean, waves are helping you, look like they giving you advice. Calming your nerves. Fishing—fishing is good when depressed” (El Bialy and Mulay, 2015:55). Several participants discussed therapeutic properties of green spaces: “Green is good—it made me happy. Once you see the view, your heart calms down” (Coughlan and Hermes, 2016:150). For youth participants, gardens provided a space “to relax and slow down” (Cutter-Mackenzie, 2009:131).

Twenty-one papers (72%) emphasized the positive contributions of ecosystems to cultural heritage. Some refugees expressed concerns about preserving their culture and traditions upon arriving in a new country, and interactions with ecosystems helped to mitigate these worries. Agricultural ecosystems provided a place for reasserting one’s culture, and this was particularly important for refugees with agrarian backgrounds (Jean, 2015). Gardens served as a place to reconnect with cultural roots, share memories, and celebrate traditions (Gichunge and Kidwaro, 2014). While gardening, participants often shared stories and memories of home countries (Gerber et al., 2017). Further, interactions with ecosystems allowed some refugees to remember and celebrate their non-Western cultural background in the Western world. During their walk through a U.K. botanical garden, for example, some refugees expressed feelings of pride that

they retained their cultural identity when they recognized plants from their countries of origin (Rishbeth and Finney, 2006).

Thirteen papers (45%) spoke of the role of ecosystems in providing learning opportunities, which we coded as “education”. Parents taught their kids about where food came from while farming together (Jean, 2015). During a visit to a state park, refugees learned new skills so they could enjoy the outdoors during the winter season, for example, through ice fishing (Hurly and Walker, 2017). Further, natural environments supported adult environmental learning and conservation awareness (Hordyk et al., 2015; Murphy et al., 2018; Van Auken et al., 2016). Two studies documented the use of school gardens to facilitate teaching students from refugee backgrounds about science, local culture and English (Brown et al., 2017; Cutter-Mackenzie, 2009). A team of researchers, a teacher, and a local artist used the school garden as a venue to teach refugee students new skills and to empower them with alternative means of expressing their knowledge (Brown et al., 2017).

The role of ecosystems in providing recreational benefits came up in 13 papers (45%). For example, some participants valued gardening beyond simply providing access to fresh produce because it served as ““their favorite entertainment”” (Eggert et al., 2015:146) and ““a good source for fun”” (Owens, 2005:38). Hurly (2019) discussed nature’s role in providing leisure opportunities to refugee women in Canada, including biking, walking, and space for their kids to play. A study on watershed use by Hmong refugees documented fishing, kayaking, and canoeing uses of the river for recreational activities with their families (Van Auken et al., 2016). Some refugees with children expressed appreciation for living close to urban parks where their children could play. They articulated that green spaces released them from the confines of inadequate housing and provided “an extension of home” where children and parents alike could play, exercise, and relax (Hordyk et al., 2015).

We found references to the role of ecosystems in developing and supporting a sense of identity in 12 studies (41%). Participants with agrarian backgrounds emphasized that farming was an inseparable part of who they were, and an ability to garden helped them maintain their identity. Resettled refugees who were participants in a community garden in Australia reported that this activity gave them a sense of self-worth; they elaborated that having a garden plot of their own made them feel that they were part of the wider Australian community (Gichunge and Kidwaro, 2014). Similarly, a study on humanitarian refugees from sub-Saharan Africa discussed the link between farming and citizenship, “highlighting the symbolism and connection with land and place that the garden provides for the migrants” (Harris et al., 2014:9208). A participant from this study shared that: ““in Africa it is the citizens who have gardens. The foreigners do not have gardens. Now I have a garden, I feel like a citizen.”” In another example, a participant discussed the role of a local river in supporting her identity as a young fisherwoman: ““I’m just focusing on myself. Every aspect of being out by the river. Me as an individual. Who I am”” (Van Auken et al., 2016:17).

Seven papers (24%) addressed sense of place. Interactions with ecosystems facilitated place-making activities and tapped into feelings of belonging and forming connections with the new society (Cutter-Mackenzie, 2009). Recently resettled youth commonly emphasized the importance of ecosystems as a means of constructing positive connections to the new place (Sampson and Gifford, 2010). For refugees with agrarian backgrounds, the ability to farm in the country of their resettlement facilitated development of a sense of place (Jean, 2015).

Six papers (21%) identified aesthetic benefits that ecosystems provide to refugees. Participants described how “pleasurable sensory experiences of nature created momentary distance from mental preoccupations” (Hordyk et al., 2015:78). Vietnamese refugees in the USA listed “beauty” as one of their reasons for having a home garden (Owens, 2005). Refugee visitors of a botanical garden in the U.K. named enjoyment of the beauty of flowers as one of the main motivations to revisit the garden (Rishbeth and Finney, 2006).

Five studies (17%) discussed contributions of ecosystems to spirituality. Somali refugees discussed the power of green spaces to put one in contact with Allah (Coughlan and Hermes, 2016). ““Seeing the trees and the plants, we believe that Allah is there. Without Allah, they wouldn’t be there”” (Coughlan and Hermes, 2016:152). For some, nature invoked connections with the spiritual self and provided a reminder “to be thankful in times of struggle” (Hordyk et al., 2015:78). Other studies described how ecosystems provided a space for meditation (Logan and Murdie, 2016) and religious services (Strunk and Richardson, 2019).

Four studies (14%) referred to changes in what we called “perspective” as a result of interacting with ecosystems. One refugee described how the four seasons gave her perspective regarding her difficulty in finding a job. In speaking of winter yielding to spring, she said: ““With the different seasons, we can see that everything has its place. There is a time to do something in life, there is a time to rest.’ The [change of] seasons served as a reminder that she would not always remain professionally inactive” (Hordyk et al., 2015:78). Another person reflected on the role of river in providing perspective to her and her family: ““It’s like you become small but when you become one with this whole thing [...] every life is actually quite similar whether you’re an animal or a person”” (Van Auken et al., 2016:18).

One study (3%) mentioned existence value, a value people place on the satisfaction of knowing that a natural site exists in a certain condition. A Hmong participant reflected on the value of the Fox River (Wisconsin, USA) and commitment to its protection (Van Auken et al., 2016). ““The Fox River is like a second home. (...) If I lived near the river, I would want it to be clean because I care about the animals that live there”” (Van Auken et al., 2016:16).

### ***3.3 CES co-occurrence***

Our results indicate that interactions with ecosystems often resulted in multiple co-occurring benefits. Table 4 illustrates two-way co-occurrence; here we note the most common two-way occurrences and a number of higher-dimensional co-occurrences.

Each of the three most frequently addressed CES themes – social relations, mental health, and cultural heritage – co-occurred with every other CES themes at least once (Table 4). Twelve papers (41% of total papers) addressed those three CES themes jointly (Table 3). In addition, all papers that addressed sense of place, perspective or existence also discussed social relations and mental health. All papers that discussed aesthetic or spirituality mentioned social relations. Cultural heritage co-occurred with 77% of the papers that addressed education, 83% that addressed identity, and 86% of the studies that mentioned sense of place. Recreation often co-occurred with aesthetic and perspective CES: 83% of studies that discussed aesthetic values and 100% of studies that discussed perspective also addressed recreation.

Table 4: Number of two-way co-occurrences between CES themes within the same papers. The percent is calculated by dividing the number of co-occurrences at each intersection by the total sample that addressed each CES theme in the corresponding row.

CES theme	Total sample	Social relations	Mental health	Cultural heritage	Education	Recreation	Identity	Sense of place	Aesthetic	Spirituality	Perspective	Existence
Social relations	24	24 (100%)	17 (71%)	17 (71%)	13 (54%)	10 (42%)	11 (46%)	7 (29%)	6 (25%)	5 (21%)	4 (17%)	1 (4%)
Mental health	22	17 (77%)	22 (100%)	15 (68%)	10 (45%)	11 (65%)	8 (36%)	7 (32%)	4 (18%)	4 (18%)	4 (18%)	1 (5%)
Cultural heritage	21	17 (81%)	15 (71%)	21 (100%)	10 (48%)	10 (48%)	10 (48%)	6 (29%)	5 (24%)	3 (14%)	3 (14%)	1 (5%)
Education	13	13 (100%)	10 (77%)	10 (77%)	13 (100%)	6 (46%)	7 (54%)	4 (31%)	3 (23%)	3 (23%)	3 (23%)	1 (8%)
Recreation	13	10 (77%)	11 (85%)	10 (77%)	6 (46%)	13 (100%)	4 (31%)	3 (23%)	5 (38%)	3 (23%)	4 (31%)	1 (8%)
Identity	12	11 (92%)	8 (67%)	10 (83%)	7 (58%)	4 (33%)	12 (100%)	4 (33%)	2 (17%)	2 (17%)	1 (8%)	1 (8%)
Sense of place	7	7 (100%)	7 (100%)	6 (86%)	4 (57%)	3 (43%)	4 (57%)	7 (100%)	2 (29%)	1 (14%)	1 (14%)	1 (14%)
Aesthetic	6	6 (100%)	4 (67%)	5 (83%)	3 (50%)	5 (83%)	2 (33%)	2 (33%)	6 (100%)	1 (17%)	3 (50%)	1 (17%)
Spirituality	5	5 (100%)	4 (80%)	3 (60%)	3 (60%)	3 (60%)	2 (40%)	1 (20%)	1 (20%)	5 (100%)	1 (20%)	0 (0%)
Perspective	4	4 (100%)	4 (100%)	3 (75%)	3 (75%)	4 (100%)	1 (25%)	1 (25%)	3 (75%)	1 (25%)	4 (100%)	1 (25%)
Existence	1	1 (100%)	1 (100%)	1 (100%)	1 (100%)	1 (100%)	1 (100%)	1 (100%)	1 (100%)	0 (0%)	1 (100%)	1 (100%)

### 3.4 Ecosystem disservices

Seven papers (24%) addressed negative effects of ecosystems; we coded these as ecosystem disservices. Refugees resettled in Canada shared their distress over the harsh Canadian climate, prolonged winter, and lack of sunlight (El-Bialy and Mulay, 2015; Hordyk et al., 2015; Hurly, 2019). “The first impression that shocked me,” said one refugee, “was the snow, and the temperature would be low, my kids they were crying, my younger ones were crying most of the time” (El-Bialy and Mulay, 2015:55). For some, ecosystem sites evoked sadness due to painful memories of violence and loss (Hurly and Walker, 2017; Rishbeth and Finney, 2006). A refugee



from Lebanon shared that the fir trees of Canada reminded him of the cedars of Lebanon, a place where he was fearful of going outdoors due to police harassment (Hurly and Walker, 2017). Refugee youth in Australia echoed associating ecosystems with danger related to crime, noting they viewed public parks as a threatening place “because of the lack of control over the dangerous behaviors of others” (Sampson and Gifford, 2010:128). Some Hmong refugees in Minnesota, USA expressed feeling anxious around water, due to both safety concerns and traditional Hmong beliefs about spirits in lakes (Bengston et al., 2008).

## **4. Discussion**

We reviewed 29 papers that explore refugee interactions with ecosystems to document the diversity of CES that refugees receive from ecosystems. These papers explore the interactions of refugees with a variety of ecosystems, with gardens and city parks as the two most common study ecosystems. They collectively report evidence that refugees benefit from 11 CES, and that the most commonly reported CES are social relations, mental health, and cultural heritage.

Below, we connect this study to CES scholarship, discuss potential contributions of ecosystems to ease resettlement processes, and offer limitations and directions for future research.

### ***4.1 Implications for CES scholarship***

Our results contribute to CES scholarship in several ways. First, they demonstrate the importance of CES to a specific population: refugee communities. We saw multiple examples of diverse ways that ecosystems benefited refugees and supported their well-being. Ecosystems helped maintain cultural heritage; supported mental health, sense of purpose and identity; facilitated building social relationships; provided perspective; and offered sites for recreation, education and aesthetic enjoyment. Seven studies reported negative impacts from ecosystems, which included distress over the winter climate, sadness due to painful memories evoked by the environment, and perception of danger at some ecosystem sites. Yet far more examples of CES emerged, and this supports our initial idea that CES might be meaningful in the lives of refugees. Our analysis showed that refugee communities received diverse CES from ecosystems. Evidence of this diversity supports the position that CES scholarship should acknowledge and consider a suite of services beyond recreation and aesthetics (Cooper et al., 2016; Gould and Lincoln, 2017). A crucial step in incorporating CES into decision-making is to attend these diverse values, and to recognize and consider the relevance of CES to different groups (Martin-Lopez et al., 2012). Previous research has found differences among services reported from the same ecosystem across distinct user groups (Ribeiro and Ribeiro, 2016), and these substantial and consequential differences are meaningful and seem to be common. Our findings suggest that non-recreational benefits may have particular importance in refugee communities because social relations, cultural heritage, education, and mental health benefits were more frequently addressed in this review than recreation.

Co-occurrences between CES themes identified in this review contribute to scholarship that identifies and discusses the interdependent, bundled nature of CES (Gould et al., 2015; Klain et al., 2014). Our review, like previous work on bundling, suggests that people often do not compartmentalize their experiences with nature (Wartmann and Purves, 2018) – and this can create challenges for measurement-focused efforts to integrate CES knowledge into decision-making. Our results demonstrate that many ecosystems provided multiple nonmaterial benefits to refugees. What’s more, in many cases these nonmaterial benefits intertwined with material benefit of food. For example, to refugees in Wisconsin, USA, fishing provided a source of food, sense of identity and recreation (Van Auken et al., 2016). As found in previous research (Riechers et al., 2017), social relations and cultural heritage were often interconnected – for example, gardens often helped refugees maintain connections with cultural roots and served as a space for meeting people and building community. That sense of place frequently co-occurred with social relations, identity, and cultural heritage, is consistent with extensive findings about the multifaceted nature of people’s relationships with place (e.g. Masterson et al., 2017).

Another interesting point related to bundling concerns mental health – specifically, how mental health may intertwine with other CES. In the papers we reviewed, mental health co-occurred at least once with every other CES (Table 4). This diverse range of co-occurrence supports the idea that diverse CES may relate to stress relief and psychological well-being (Bratman et al., 2019; Bullock et al., 2018).

Our results also contribute to CES theory since they corroborate the existence of novel CES commonly excluded from earlier typologies (i.e. MEA, 2005; NEA, 2011). Gould and Lincoln (2017) discuss the role of ecosystems in providing “perspective,” which they suggest as an addition to CES typologies. Studies in our review described benefits to refugees in many contexts that closely align with their definition of perspective, which supports the idea that this is a service in a variety of contexts. Our finding also supports their argument that this service is distinct from spirituality. Spirituality tends to include “elements of the sacred, the metaphysical, or both” (Gould and Lincoln, 2017:123); references to perspective in the studies we reviewed did not involve spiritual connections, but rather awareness of one’s place in the world and perception of the order of things. We encourage future ES studies to consider this service, particularly when assessing non-Western populations.

The results of our review add a dimension to the way “education” is discussed in CES scholarship. Education as a cultural ecosystem service commonly refers to the role of ecosystems in providing a venue for ecological learning and research (Gould et al., 2018). Two studies in our sample, however, emphasized the role of ecosystems in facilitating learning about culture and language, and in providing alternative means to express one’s knowledge. These benefits do not precisely align with the way the “education” theme is commonly discussed in CES work; nor do these examples fit within “life teaching” (Gould and Lincoln 2017) — acquiring life lessons from ecosystems. In this review, we coded these benefits as “education” and we hope the results of this study expand the scope of the way “education” is considered in future CES research.

We did not find evidence of multiple other CES -- artistic, bequest, ingenuity, knowledge systems, and life teaching. Their absence does not necessarily mean that the participants in the studies, or within a larger refugee community, do not receive these CES from ecosystems. Their absence may be because none of the papers used a CES framework to assess refugee interactions with ecosystems. Another explanation could be that some CES are more common among populations who have had a long-term relationship with a particular ecosystem. The bequest theme is often tied to continuous interactions with an ecosystem (Oleson et al., 2015), and refugees in studies we reviewed often did not have such long-term interactions. Ingenuity as a CES tends to arise from sustained observation of a particular ecosystem; perhaps refugees in our sample have not spent sufficient time with study ecosystems. Research that specifically assesses CES among refugee communities could provide more nuanced understanding of the services relevant to this group.

Finally, our results supplement knowledge about the types of ecosystems that provide CES. Our findings demonstrate the importance of home and community gardens as ecosystem activities that provide CES. This is particularly relevant in urban contexts where home and community gardens may be the main sustained contact that residents have with their ecosystems (Whitburn et al., 2018). Our results support previous research that identified unique and important role of urban gardens in providing ES, particularly CES (Calvet-Mir et al., 2012). In addition, gardening and farming may be a way of interacting with ecosystems that resonates with people from a variety of backgrounds, perhaps especially when more western “leisure”-style interaction does not resonate as strongly.

#### ***4.2 CES and easing resettlement processes***

The papers we reviewed provided evidence of how ecosystems offered a sense of welcome, which may have eased resettlement processes. These interactions with ecosystems and the CES they provided to refugees constituted readily available free mechanisms for coping with the trauma they may have experienced and the stress associated with resettlement. Refugee families indicated that upon their arrival to the new country, contact with nature mitigated the negative impact of post-arrival stress on their well-being (Hordyk et al., 2015). Nature-based leisure provided support for mental health and well-being, which manifested in expressions of “mastery, achievement, pride, determination, courage, autonomy, and connectedness” (Hurly and Walker, 2017:9). Visits to green spaces that had familiar plants, such as a botanical garden, helped mitigate feelings of nostalgia and homesickness (Rishbeth and Finney, 2006). Previous research underscores the importance of engagement in culturally relevant activities that help refugees to develop cultural connections and integration into their new home country (Beckie and Bogdan, 2010; Kim et al., 2015); access to agricultural ecosystems allowed refugees with agrarian backgrounds to engage in familiar practices and support their identities as farmers (e.g. Andreatta, 2006; Harper, 2016; Jean, 2015).

Interactions with ecosystems acted as a channel for dealing with traumas and mental health concerns, thus providing an important nonmaterial value. The development of sense of place and social connections is central to mental health: previous studies found that refugees who rated their sense of place as “positive” were more likely to report their physical and mental health as “very good” (Agyekum and Newbold, 2016), and refugees lacking social support were more likely to develop depression (Gorst-Unsworth and Goldenberg, 1998). In the papers we reviewed, ecosystems offered a venue for connecting with the new country and the larger community, building a sense of belonging and of place. By observing similarities in topography and vegetation between their home country and their new residence, participants felt a stronger connection to their new country and its human communities. Through farming and gardening, refugees with agrarian backgrounds developed a sense of place attached to their new home landscapes.

Given these findings, our results may have practical implications for those working to resettle refugees. The first relates to explicit recognition of the role that connecting to ecosystems may play in easing the stress of resettlement. We saw numerous examples of how ecosystems can improve mental health and ease resettlement processes. Ecosystems provided coping mechanisms for stress as well as restorative mental health benefits. This finding is far from novel; a burgeoning collection of empirical studies document nature’s positive impact on emotional functions and mental health (Bratman et al., 2012; Wolsko and Lindberg, 2013). Yet this result has important practical implications for resettlement programs and strategies in support of mental well-being. Because refugees are at greater risk of developing depression, anxiety and post-traumatic disorder than the general population (Davidson et al., 2008), resettlement programs could benefit from additional coping mechanisms, like nature-based activities, that refugees could immediately access upon arrival. Further, refugee communities tend to experience stigmas, financial problems and language barriers that are associated with seeking professional psychological help (Vonnahme et al., 2015); interaction with ecosystems thus becomes even more crucial since it can provide culturally acceptable remedies to alleviate or prevent mental health concerns. Examples of organizations that employ nature’s potential to help refugees overcome past traumas and stress of resettlement include Room to Heal (2019) in London, UK and STARTTS (2019) in Australia. We encourage resettlement organization to consider the extent to which they might employ interactions with ecosystems as one of their programs, given the context of their organization.

A second practical recommendation is to diversify nature-based activities and expand them beyond agricultural ecosystems. Our findings suggest that resettlement programs offer more opportunities to interact with agricultural ecosystems: less than half of the studies we reviewed took place outside of the agricultural arena. A potential explanation could involve differences in recreational preferences: not everyone enjoys hiking or camping. For many refugees, this choice of ecosystem may be ideal, the most appropriate choice. In a study of non-European refugees in the UK, as one example, refugees found the concept of seeking recreation in parks or visiting

countryside areas for pleasure strange (Rishbeth and Finney, 2006). Similarly, immigrants and nonwhite groups are less likely to visit rural nature areas for recreational purposes (Peters et al., 2010). Another explanation could be that lack of information and lack of confidence on the part of refugees impedes trying out nonagricultural nature-based activities. One study stressed the central role of resettlement agency staff in encouraging refugees to discover new landscapes and learn ways to enjoy associated activities (Hurly and Walker, 2017). Refugees from tropical countries might be less likely to engage in outdoor winter activities like skiing and snowshoeing without outside encouragement and guidance. Refugee resettlement agencies may wish to provide information and support regarding nonagricultural nature-based activities. Further, because resettlement activities that involve refugees at the design stage tend to be most successful (Maffia, 2008), agencies may choose to develop these initiatives in collaboration with refugee communities.

We acknowledge that providing access to nature requires programming efforts on the part of resettlement agencies that are often already overburdened and often resource-constrained. We hope that this review may provide evidence to support expanded funding of farming and gardening refugee programs and, in some cases, additional nature-based programs. The context of the authors of this review (Burlington, Vermont, U.S.A.) provides one example of a successful ecosystem-related initiative that works with and complements more traditional resettlement support. The Association of Africans Living in Vermont (AALV) provides resettled refugees with a range of integration services, including its New Farms for New Americans program (NFNA). NFNA is a community-based program that provides resettled refugees with access to farm plots and locally relevant agricultural training (AALV, 2017). NFNA participants build on experience and knowledge about agriculture in their home countries and learn to farm in Vermont's climate. NFNA provides important material value to refugees: access to farmland helps improve nutrition and gain access to familiar and culturally relevant food. As this review demonstrates, gardening, as well as other interactions with ecosystems, often provide myriad under-recognized nonmaterial benefits as well. Funding for such programs, however, tends to be scarce. This review suggests that expanded support for these programs could have myriad benefits.

Finally, we recognize that ecosystems may not always aid resettlement efforts. Indeed, as outlined in the results on ecosystem disservices, some research reported negative impacts. However, research noted far more positive impacts, despite the fact that the studies (at least a substantial portion of them) were open to reports of negative impacts as well. Thus, we encourage those engaged in resettlement work to consider when and how nature may be an appropriate tool to help ease resettlement.

#### ***4.3 Limitations and future research***

As the first systematic review on refugee-ecosystem interactions, this study has several limitations. We acknowledge that our search terms and selection criteria might have excluded relevant publications. We wanted to examine the role ecosystems could play in the resettlement process for immigrants who experienced a traumatic, forced exit from their homeland; thus, we considered only studies that specified that they included refugee immigrants in the study group. Although refugees might share experiences of traumatic, forced exit with asylum seekers and non-refugee immigrants, the limit we imposed on our search (i.e., to explicitly identified refugee immigrants) allowed us to focus in a systematic, reproducible way on resettled refugees with these experiences. During our search, we excluded studies on immigrant populations whose status was not specified, but whose countries of origin suggested that refugees may possibly have been involved (e.g. Jay and Schraml, 2009; Mazumdar and Mazumdar, 2012). Some potentially relevant publications might have been excluded due to interpretation bias, but because we corroborated interpretation of a subsample of papers between two researchers, this bias should be minimal.

Another possible limitation is that five studies (Andreatta, 2006;Boğaç, 2009; Cattell et al., 2008; Hartwig and Mason, 2016; Van Auken et al., 2016) included non-refugee populations, and their findings did not always distinguish between the experiences of refugee and nonrefugee populations. Also related to studies' sometimes aggregation of results from multiple participants, CES co-occurrences that we identified do not necessarily indicate whether the co-occurrences were for an individual or for the study population a whole. Future research could examine whether these “bundles” tend to vary between individuals.

Our review was also limited in its geographic representation. As an example, Germany, Turkey, and Kenya are major refugee-hosting countries (UNHCR, 2018b), yet our search did not include any publications from those countries. Indeed, because we had language constraints, we limited our search to English-language publications and thus found results primarily related to refugees in English-speaking countries: the United Kingdom, Canada, the United States, Ireland, and Australia.

Some readers may consider our use of the CES concept itself as a limitation of this study. Scholars from a variety of fields (e.g., geography, philosophy) critique the CES concept for many reasons, many of which relate to the idea that the CES framework does not capture the nuanced and multifaceted meaning of often-reciprocal relationships between people and place (Comberti et al., 2015; Kirchhoff, 2019; Leyshon, 2014). A related complexity arises from within the ecosystem services field, where CES present complex and unique challenges (Winthrop, 2014). Numerous studies in ecosystem services scholarship draw distinctions among ecosystem processes, services, benefits, and values (Chan et al., 2012; Fisher et al., 2009), including, recently, relational values (Chan et al., 2016; Muraca, 2016). All of these aspects (processes, services, benefits, and values) are important elements of complex human-ecosystem interactions, but they are especially difficult to parse when addressing CES. In this study, we focus our study to build on a core aspect of the CES concept: the nonmaterial benefits that

refugees may receive from ecosystems (with recognition that material and nonmaterial are often inseparable). In other words, we focus on the nonmaterial aspects of the ways in which nature improves the wellbeing of refugees. Future research could explore other frameworks for understanding these nonmaterial aspects of interactions with ecosystems, and also could explore the differences between services, benefits, and values.

As a final limitation, we acknowledge that some of these benefits that our reviewed studies document, and that we summarize, might not exclusively be the product of ecosystems. As one example, in some cases, meaningful social interaction may benefit the well-being and ease of resettlement of refugees, regardless of whether it takes place in an ecosystem or indoors. Many of the coded examples specified the role of ecosystems in providing benefits (e.g., described how the ecosystem enriched or facilitated social interaction), but we cannot fully assess the extent to which ecosystems contributed to some benefits. Relatedly, interactions with ecosystems sometimes resulted in co-occurring CES, but due to our small sample of studies, we cannot assess relationships between ecosystem types and particular CES co-occurrences. Future studies could examine links between ecosystem types and CES bundles.

The results of this review suggest several directions for future research. They reveal a gap in ES research with regard to refugee communities. Research on how CES, in particular, may benefit refugees has the potential to open new avenues for understanding the multiple benefits that ecosystems provide, especially to marginalized or under-studied populations. Studies that employ a CES framework to assess refugee interactions with ecosystems could provide insight into how these services operate in contexts characterized by human mobility and by the absence of long-term relationships with a place — a context that is increasingly common in a networked, global society. Such analyses could draw on studies of sense of place among mobile and cosmopolitan populations (Gustafson, 2001; Heise, 2008), but add interesting elements related to mobility that is based less on choice than on necessity.

Future research could also explore refugee interactions with a broader array of ecosystem types. Our review found that current research on refugees and ecosystems is skewed toward interactions with farms and gardens; there are few studies that explore nonagricultural ecosystems. Further research is needed on the uses of different ecosystems by refugee groups, and their preferences as related to these ecosystems, particularly nonagricultural ecosystems. Studies could also explore how relationships with ecosystems and associated CES differ within refugee groups and within refugee and non-refugee immigrants.

## **5. Conclusion**

In this review, we describe studies that demonstrate a wide range of cultural ecosystem services that refugee communities receive from ecosystems, though we note that none of the studies used

CES terminology. Some studies reported ecosystem disservices, yet positive contributions of ecosystems to the well-being of refugees and ease of resettlement were far more common. Our findings can be useful to scholars of both CES and refugee studies, as well as to those who work in the field of refugee resettlement. The diversity we found supports the effort in CES scholarship to recognize and address the broad range of cultural services people receive from nature, and to expand research beyond leisure-themed concepts such as recreation (Hirons et al., 2016). It also supports the important need for scholarship to explore CES in marginalized or inadequately researched populations.

We hope that our review encourages further inclusion and consideration of refugee communities in environmental research and ES assessments. We also hope that results of this review can be translated into refugee resettlement strategies. Certainly, we do not suggest nature as a panacea to stressors and challenges that refugees encounter upon arriving in a new country; employment and housing remain central to the success of resettlement and adjustment processes (Hordyk et al., 2015). Yet this review suggests that inclusion and availability of diverse, culturally appropriate nature-based activities in resettlement strategies can complement existing resettlement approaches to provide a more holistic approach to addressing the long-term and sustained well-being of refugees.

## **Acknowledgements**

The authors acknowledge the assistance of the University of Vermont, which made this research possible. We thank Storm Lewis, who helped to corroborate article selection in our second search. We also thank Alexandra Neidermeier, Alisha Laramée, and two anonymous reviewers for their insightful comments on drafts of the manuscript.

## **Funding**

This work was supported by the United States Department of Agriculture National Institute of Food and Agriculture, McIntire-Stennis project 1003495.



## References

*References analyzed in the review are marked with an asterisk\*.*

- AALV, 2017. New Farms for New Americans [WWW Document]. AALV. URL <https://www.aalv-vt.org/farms> (accessed 5.6.19).
- About Room to Heal [WWW Document], 2019. Room to Heal. URL <https://www.roomtoheal.org/about/> (accessed 5.18.19).
- Abramovic, J., Turner, B., Hope, C., 2019\*. Entangled recovery: refugee encounters in community gardens. *Local Environ.* 24, 696–711. <https://doi.org/10.1080/13549839.2019.1637832>
- Agyekum, B., Newbold, K.B., 2016. Sense of place and mental wellness of visible minority immigrants in Hamilton, Ontario: Revelations from key informants. *Can. Ethn. Stud.* 48, 101–122. <https://doi.org/10.1353/ces.2016.0001>
- Airriess, C.A., Clawson, D.L., 1994\*. Vietnamese Market Gardens in New Orleans. *Geogr. Rev.* 84, 16–31. <https://doi.org/10.2307/215778>
- Andreatta, S.L., 2006.\* When a good project goes awry: Community re-connecting with an urban farm. *Urban Anthropol. Stud. Cult. Syst. World Econ.* 35, 75–103.
- Barbour, R.S., 2001. Checklists for improving rigor in qualitative research: a case of the tail wagging the dog? *BMJ* 322, 1115–1117.
- Bengston, D.N., Schermann, M., Moua, M., Lee, T.T., 2008\*. Listening to Neglected Voices: Hmong and Public Lands in Minnesota and Wisconsin. *Soc. Nat. Resour.* 21, 876–890. <https://doi.org/10.1080/08941920701684197>
- Biermann, F., Boas, I., 2010. Preparing for a warmer world: towards a global governance system to protect climate refugees. *Glob. Environ. Polit.* 10, 60–88. <https://doi.org/10.1162/glep.2010.10.1.60>
- Boğaç, C., 2009\*. Place attachment in a foreign settlement. *J. Environ. Psychol.* 29, 267–278. <https://doi.org/10.1016/j.jenvp.2009.01.001>
- Bratman, G.N., Anderson, C.B., Berman, M.G., Cochran, B., Vries, S. de, Flanders, J., Folke, C., Frumkin, H., Gross, J.J., Hartig, T., Kahn, P.H., Kuo, M., Lawler, J.J., Levin, P.S., Lindahl, T., Meyer-Lindenberg, A., Mitchell, R., Ouyang, Z., Roe, J., Scarlett, L., Smith, J.R., Bosch, M. van den, Wheeler, B.W., White, M.P., Zheng, H., Daily, G.C., 2019. Nature and mental health: An ecosystem service perspective. *Sci. Adv.* 5, eaax0903. <https://doi.org/10.1126/sciadv.aax0903>
- Bratman, G.N., Hamilton, J.P., Daily, G.C., 2012. The impacts of nature experience on human cognitive function and mental health: Nature experience, cognitive function, and mental health. *Ann. N. Y. Acad. Sci.* 1249, 118–136. <https://doi.org/10.1111/j.1749-6632.2011.06400.x>
- Brown, L., O’Keeffe, L., Paige, K., 2017.\* A transdisciplinary approach to connecting students from a refugee background to the natural world. *Teach. Sci.* 63, 20–32.

- Bryce, R., Irvine, K.N., Church, A., Fish, R., Ranger, S., Kenter, J.O., 2016. Subjective well-being indicators for large-scale assessment of cultural ecosystem services. *Ecosyst. Serv.* 21, 258–269. <https://doi.org/10.1016/j.ecoser.2016.07.015>
- Bullock, C., Joyce, D., Collier, M., 2018. An exploration of the relationships between cultural ecosystem services, socio-cultural values and well-being. *Ecosyst. Serv.* 31, 142–152. <https://doi.org/10.1016/j.ecoser.2018.02.020>
- Calvet-Mir, L., Gómez-Baggethun, E., Reyes-García, V., 2012. Beyond food production: Ecosystem services provided by home gardens. A case study in Vall Fosca, Catalan Pyrenees, Northeastern Spain. *Ecol. Econ.* 74, 153–160. <https://doi.org/10.1016/j.ecolecon.2011.12.011>
- Cattell, V., Dines, N., Gesler, W., Curtis, S., 2008.\* Mingling, observing, and lingering: Everyday public spaces and their implications for well-being and social relations. *Health Place* 14, 544–561. <https://doi.org/10.1016/j.healthplace.2007.10.007>
- Chan, K.M.A., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez-Baggethun, E., Gould, R., Hannahs, N., Jax, K., Klain, S., Luck, G.W., Martín-López, B., Muraca, B., Norton, B., Ott, K., Pascual, U., Satterfield, T., Tadaki, M., Taggart, J., Turner, N., 2016. Opinion: Why protect nature? Rethinking values and the environment. *Proc. Natl. Acad. Sci.* 113, 1462–1465. <https://doi.org/10.1073/pnas.1525002113>
- Chan, K.M.A., Guerry, A.D., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., Bostrom, A., Chuenpagdee, R., Gould, R.K., Halpern, B.S., 2012. Where are cultural and social in ecosystem services? A framework for constructive engagement. *Bioscience* 62, 744–756.
- Chan, Kai M.A., Satterfield, T., Goldstein, J., 2012. Rethinking ecosystem services to better address and navigate cultural values. *Ecol. Econ.* 74, 8–18. <https://doi.org/10.1016/j.ecolecon.2011.11.011>
- Comberti, C., Thornton, T.F., Wyllie de Echeverria, V., Patterson, T., 2015. Ecosystem services or services to ecosystems? Valuing cultivation and reciprocal relationships between humans and ecosystems. *Glob. Environ. Change* 34, 247–262. <https://doi.org/10.1016/j.gloenvcha.2015.07.007>
- Cooper, H.M., 2017. *Research synthesis and meta-analysis: a step-by-step approach*, Fifth Edition. ed. SAGE, Los Angeles.
- Cooper, N., Brady, E., Steen, H., Bryce, R., 2016. Aesthetic and spiritual values of ecosystems: Recognizing the ontological and axiological plurality of cultural ecosystem ‘services.’ *Ecosyst. Serv.* 21, 218–229. <https://doi.org/10.1016/j.ecoser.2016.07.014>
- Corlett, J.L., Dean, E.A., Grivetti, L.E., 2003.\* Hmong gardens: Botanical diversity in an urban setting. *Econ. Botany* 57, 365–379.
- Coughlan, R., Hermes, S.E., 2016.\* The Palliative Role of Green Space for Somali Bantu Women Refugees in Displacement and Resettlement. *J. Immigr. Refug. Stud.* 14, 141–155. <https://doi.org/10.1080/15562948.2015.1039157>

- Crea, T.M., Calvo, R., Loughry, M., 2015. Refugee health and wellbeing: Differences between urban and camp-based environments in Sub-Saharan Africa. *J. Refug. Stud.* 28, 319–330. <https://doi.org/10.1093/jrs/fev003>
- Cutter-Mackenzie, A., 2009.\* Multicultural school gardens: Creating engaging garden spaces in learning about language, culture, and environment. *Can. J. Environ. Educ.* 14, 122–135.
- Davidson, G.R., Murray, K.E., Schweitzer, R., 2008. Review of refugee mental health and wellbeing: Australian perspectives. *Aust. Psychol.* 43, 160–174. <https://doi.org/10.1080/00050060802163041>
- Díaz, S., Settele, J., Brondízio, E., Ngo, H.T., Guèze, M., Agard, J., Arneth, A., Balvanera, P., Brauman, K., Watson, R.T., Baste, I.A., Larigauderie, A., Leadley, P., Pascual, U., Baptiste, B., Demissew, S., Dziba, L., Erpul, G., Fazel, A., Fischer, M., María, A., Karki, M., Mathur, V., Pataridze, T., Pinto, I.S., Stenseke, M., Török, K., Vilá, B., 2019. Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (No. IPBES/7/10/Add.1). Intergovernmental Science - Policy Platform on Biodiversity and Ecosystem Services.
- Dickinson, D.C., Hobbs, R.J., 2017. Cultural ecosystem services: Characteristics, challenges and lessons for urban green space research. *Ecosyst. Serv.* 25, 179–194. <https://doi.org/10.1016/j.ecoser.2017.04.014>
- Eggert, L.K., Blood-Siegfried, J., Champagne, M., Al-Jumaily, M., Biederman, D.J., 2015.\* Coalition building for health: a community garden pilot project with apartment dwelling refugees. *J. Comm. Health Nursing* 32, 141–150. <https://doi.org/10.1080/07370016.2015.1057072>
- Egoz, S., De Nardi, A., 2017. Defining landscape justice: the role of landscape in supporting wellbeing of migrants, a literature review. *Landsc. Res.* 42, S74–S89. <https://doi.org/10.1080/01426397.2017.1363880>
- El-Bialy, R., Mulay, S., 2015.\* Two sides of the same coin: Factors that support and challenge the wellbeing of refugees resettled in a small urban center. *Health Place* 35, 52–59. <https://doi.org/10.1016/j.healthplace.2015.06.009>
- Fisher, B., Turner, R.K., Morling, P., 2009. Defining and classifying ecosystem services for decision making. *Ecol. Econ.* 68, 643–653. <https://doi.org/10.1016/j.ecolecon.2008.09.014>
- Gentin, S., 2011. Outdoor recreation and ethnicity in Europe—A review. *Urban For. Urban Green.* 10, 153–161. <https://doi.org/10.1016/j.ufug.2011.05.002>
- Gerber, M.M., Callahan, J.L., Moyer, D.N., Connally, M.L., Holtz, P.M., Janis, B.M., 2017.\* Nepali Bhutanese refugees reap support through community gardening. *Int. Perspect. Psychol. Res. Pract. Consult.* 6, 17–31. <https://doi.org/10.1037/ipp0000061>
- Gichunge, C., Kidwaro, F., 2014.\* Utamu wa Africa (the sweet taste of Africa): The vegetable garden as part of resettled African refugees’ food environment. *Nutr. Diet.* 71, 270–275. <https://doi.org/10.1111/1747-0080.12143>

- Glesne, C., 2006. *Becoming qualitative researchers: an introduction*, 3rd ed. ed. Pearson/Allyn & Bacon, Boston.
- Gorst-Unsworth, C., Goldenberg, E., 1998. Psychological sequelae of torture and organized violence suffered by refugees from Iraq. *Br. J. Psychiatry* 172, 90–94. <https://doi.org/10.1192/bjp.172.1.90>
- Gould, R.K., Ardoin, N.M., Woodside, U., Satterfield, T., Hannahs, N., Daily, G.C., 2014. The forest has a story: cultural ecosystem services in Kona, Hawai'i. *Ecol. Soc.* 19. <https://doi.org/10.5751/ES-06893-190355>
- Gould, R.K., Klain, S.C., Ardoin, N.M., Satterfield, T., Woodside, U., Hannahs, N., Daily, G.C., Chan, K.M., 2015. A protocol for eliciting nonmaterial values through a cultural ecosystem services frame: Analyzing Cultural Ecosystem Services. *Conserv. Biol.* 29, 575–586. <https://doi.org/10.1111/cobi.12407>
- Gould, R.K., Lincoln, N.K., 2017. Expanding the suite of Cultural Ecosystem Services to include ingenuity, perspective, and life teaching. *Ecosyst. Serv.* 25, 117–127. <https://doi.org/10.1016/j.ecoser.2017.04.002>
- Gustafson, P., 2001. Roots and routes: Exploring the relationship between place attachment and mobility. *Environ. Behav.* 33, 667–686. <https://doi.org/10.1177/00139160121973188>
- Harper, S.G., 2016\*. Keystone characteristics that support cultural resilience in Karen refugee parents. *Cult. Stud. Sci. Educ.* 11, 1029–1060. <https://doi.org/10.1007/s11422-015-9681-9>
- Harris, N., Minniss, F., Somerset, S., 2014.\* Refugees connecting with a new country through community food gardening. *Int. J. Environ. Res. Public Health* 11, 9202–9216. <https://doi.org/10.3390/ijerph110909202>
- Hartwig, K.A., Mason, M., 2016.\* Community gardens for refugee and immigrant communities as a means of health promotion. *J. Community Health* 41, 1153–1159. <https://doi.org/10.1007/s10900-016-0195-5>
- Heise, U.K., 2008. *Sense of place and sense of planet: the environmental imagination of the global*. Oxford University Press, New York.
- Hirons, M., Comberti, C., Dunford, R., 2016. Valuing Cultural Ecosystem Services. *Annu. Rev. Environ. Resour.* 41, 545–574. <https://doi.org/10.1146/annurev-environ-110615-085831>
- Hollander, A.-C., Bruce, D., Burström, B., Ekblad, S., 2011. Gender-related mental health differences between refugees and non-refugee immigrants - a cross-sectional register-based study. *BMC Public Health* 11, 180. <https://doi.org/10.1186/1471-2458-11-180>
- Hordyk, S.R., Hanley, J., Richard, É., 2015.\* “Nature is there; its free”: Urban greenspace and the social determinants of health of immigrant families. *Health Place* 34, 74–82. <https://doi.org/10.1016/j.healthplace.2015.03.016>
- Horowitz, S., 2012. Therapeutic gardens and horticultural therapy: Growing roles in health care. *Altern. Complement. Ther.* 18, 78–83. <https://doi.org/10.1089/act.2012.18205>
- Hurly, J., 2019\*. ‘I feel something is still missing’: leisure meanings of African refugee women in Canada. *Leis. Stud.* 38, 1–14. <https://doi.org/10.1080/02614367.2018.1515241>

- Hurly, J., Walker, G.J., 2017.\* “When you see nature, nature give you something inside”: The role of nature-based leisure in fostering refugee well-being in Canada. *Leis. Sci.* 0, 1–18. <https://doi.org/10.1080/01490400.2017.1325799>
- Jay, M., Schraml, U., 2009. Understanding the role of urban forests for migrants – uses, perception and integrative potential. *Urban For. Urban Green.* 8, 283–294. <https://doi.org/10.1016/j.ufug.2009.07.003>
- Jean, M., 2015.\* The role of farming in place-making processes of resettled refugees. *Refug. Surv. Q.* 34, 46–69. <https://doi.org/10.1093/rsq/hdv007>
- Judelson, A., Orom, H., Kim, I., Na Sa, A.B., Khan, H., Devito, R., Diaz Del Carpio, R.O., Raja, S., 2017\*. Planning the city of good (and new) neighbours: Refugees’ experiences of the food environment in Buffalo, New York. *Built Environ.* 43, 402–416. <https://doi.org/10.2148/benv.43.3.402>
- Kirchhoff, T., 2019. Abandoning the concept of Cultural Ecosystem Services, or against natural–scientific imperialism. *BioScience.* <https://doi.org/10.1093/biosci/biz007>
- Klain, S.C., Satterfield, T.A., Chan, K.M.A., 2014. What matters and why? Ecosystem services and their bundled qualities. *Ecol. Econ.* 107, 310–320. <https://doi.org/10.1016/j.ecolecon.2014.09.003>
- Leyshon, C., 2014. Cultural Ecosystem Services and the challenge for cultural geography. *Geogr. Compass* 8, 710–725. <https://doi.org/10.1111/gec3.12160>
- Logan, J., Murdie, R., 2016\*. Home in Canada? The Settlement Experiences of Tibetans in Parkdale, Toronto. *J. Int. Migr. Integr.* 17, 95–113. <https://doi.org/10.1007/s12134-014-0382-0>
- Maffia, C., 2008. Well-being for refugees and asylum seekers through holistic practice. *J. Integr. Care* 16, 31–37. <https://doi.org/10.1108/14769018200800006>
- Martín-López, B., Iniesta-Arandia, I., García-Llorente, M., Palomo, I., Casado-Arzuaga, I., Amo, D.G.D., Gómez-Baggethun, E., Oteros-Rozas, E., Palacios-Agundez, I., Willaarts, B., González, J.A., Santos-Martín, F., Onaindia, M., López-Santiago, C., Montes, C., 2012. Uncovering Ecosystem Service bundles through social preferences. *PLoS ONE* 7, e38970. <https://doi.org/10.1371/journal.pone.0038970>
- Masterson, V.A., Stedman, R.C., Enqvist, J., Tengö, M., Giusti, M., Wahl, D., Svedin, U., 2017. The contribution of sense of place to social-ecological systems research: a review and research agenda. *Ecol. Soc.* 22. <https://doi.org/10.5751/ES-08872-220149>
- Mazumdar, Shampa, Mazumdar, Sanjoy, 2012. Immigrant home gardens: Places of religion, culture, ecology, and family. *Landsc. Urban Plan.* 105, 258–265. <https://doi.org/10.1016/j.landurbplan.2011.12.020>
- MEA (Ed.), 2005. Ecosystems and human well-being: scenarios: findings of the Scenarios Working Group, Millennium Ecosystem Assessment, The Millennium Ecosystem Assessment series. Island Press, Washington, DC.

- Milcu, A.I., Hanspach, J., Abson, D., Fischer, J., 2013. Cultural Ecosystem Services: A literature review and prospects for future research. *Ecol. Soc.* 18. <https://doi.org/10.5751/ES-05790-180344>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., 2009. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med.* 6, 6.
- Muraca, B., 2016. Relational values: A Whiteheadian alternative for environmental philosophy and global environmental justice. *Balk. J. Philos.* 8, 19–38. <https://doi.org/10.5840/bjp2016813>
- Murphy, F., 2018\*. Seeking solidarity through food: the growth of asylum seeker and refugee food initiatives in Ireland. *Stud. Arts Humanit. J. Dublin* 4, 79–92.
- NEA, 2011. UK National Ecosystem Assessment. WCMC, Cambridge.
- Oleson, K.L.L., Barnes, M., Brander, L.M., Oliver, T.A., van Beek, I., Zafindrasilivonona, B., van Beukering, P., 2015. Cultural bequest values for ecosystem service flows among indigenous fishers: A discrete choice experiment validated with mixed methods. *Ecol. Econ.* 114, 104–116. <https://doi.org/10.1016/j.ecolecon.2015.02.028>
- Ordóñez-Barona, C., 2017. How different ethno-cultural groups value urban forests and its implications for managing urban nature in a multicultural landscape: A systematic review of the literature. *Urban For. Urban Green.* 26, 65–77. <https://doi.org/10.1016/j.ufug.2017.06.006>
- Owens, R., 2005.\* Vietnamese refugee homegardens of Lincoln, Nebraska: A measure of cultural continuity. *High Plains Appl. Anthropol.* 25, 33–43.
- Patton, M.Q., 2002. *Qualitative research and evaluation methods*, 3 ed. ed. Sage Publications, Thousand Oaks, Calif.
- Peters, K., Elands, B., Buijs, A., 2010. Social interactions in urban parks: Stimulating social cohesion? *Urban For. Urban Green.* 9, 93–100. <https://doi.org/10.1016/j.ufug.2009.11.003>
- Porter, M., Haslam, N., 2005. Pre-displacement and Post-displacement factors associated with mental health of refugees and internally displaced persons: A meta-analysis. *JAMA* 294, 602. <https://doi.org/10.1001/jama.294.5.602>
- Poulsen, D.V., Stigsdotter, U.K., Refshage, A.D., 2015. Whatever happened to the soldiers? Nature-assisted therapies for veterans diagnosed with post-traumatic stress disorder: A literature review. *Urban For. Urban Green.* 14, 438–445. <https://doi.org/10.1016/j.ufug.2015.03.009>
- Raymond, C.M., Bryan, B.A., MacDonald, D.H., Cast, A., Strathearn, S., Grandgirard, A., Kalivas, T., 2009. Mapping community values for natural capital and ecosystem services. *Ecol. Econ.* 68, 1301–1315. <https://doi.org/10.1016/j.ecolecon.2008.12.006>
- Riechers, M., Noack, E.M., Tschardtke, T., 2017. Experts' versus laypersons' perception of urban cultural ecosystem services. *Urban Ecosyst.* 20, 715–727. <https://doi.org/10.1007/s11252-016-0616-3>

- Rishbeth, C., Finney, N., 2006.\* Novelty and nostalgia in urban greenspace: Refugee perspectives. *Tijdschr. Voor Econ. En Soc. Geogr.* 97, 281–295.  
<https://doi.org/10.1111/j.1467-9663.2006.00520.x>
- Rishbeth, C., Powell, M., 2013. Place attachment and memory: Landscapes of belonging as experienced post-migration. *Landsc. Res.* 38, 160–178.  
<https://doi.org/10.1080/01426397.2011.642344>
- Russell, R., Guerry, A.D., Balvanera, P., Gould, R.K., Basurto, X., Chan, K.M.A., Klain, S., Levine, J., Tam, J., 2013. Humans and nature: How knowing and experiencing nature affect well-being. *Annu. Rev. Environ. Resour.* 38, 473–502.  
<https://doi.org/10.1146/annurev-environ-012312-110838>
- Sampson, R., Gifford, S.M., 2010.\* Place-making, settlement and well-being: The therapeutic landscapes of recently arrived youth with refugee backgrounds. *Health Place* 16, 116–131. <https://doi.org/10.1016/j.healthplace.2009.09.004>
- Sandifer, P.A., Sutton-Grier, A.E., Ward, B.P., 2015. Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosyst. Serv.* 12, 1–15.  
<https://doi.org/10.1016/j.ecoser.2014.12.007>
- Satz, D., Gould, R.K., Chan, K.M.A., Guerry, A., Norton, B., Satterfield, T., Halpern, B.S., Levine, J., Woodside, U., Hannahs, N., Basurto, X., Klain, S., 2013. The Challenges of Incorporating Cultural Ecosystem Services into Environmental Assessment. *AMBIO* 42, 675–684. <https://doi.org/10.1007/s13280-013-0386-6>
- Segal, U.A., Mayadas, N.S., 2005. Assessment of issues facing immigrant and refugee families. *Child Welfare* 84, 563–583.
- Small, N., Munday, M., Durance, I., 2017. The challenge of valuing ecosystem services that have no material benefits. *Glob. Environ. Change* 44, 57–67.  
<https://doi.org/10.1016/j.gloenvcha.2017.03.005>
- STARTTS, 2019. Karen Community Garden Project [WWW Document]. URL <https://www.startts.org.au/services/community-services/karen-community-garden-project/> (accessed 5.18.19).
- Stigsdotter, U.K., Palsdottir, A.M., Burls, A., Chermaz, A., Ferrini, F., Grahn, P., 2011. Nature-Based Therapeutic Interventions, in: Nilsson, K., Sangster, M., Gallis, C., Hartig, T., de Vries, S., Seeland, K., Schipperijn, J. (Eds.), *Forests, Trees and Human Health*. Springer Netherlands, Dordrecht, pp. 309–342. [https://doi.org/10.1007/978-90-481-9806-1\\_11](https://doi.org/10.1007/978-90-481-9806-1_11)
- Strunk, C., Richardson, M., 2019\*. Cultivating belonging: refugees, urban gardens, and placemaking in the Midwest, USA. *Soc. Cult. Geogr.* 20, 826–848.  
<https://doi.org/10.1080/14649365.2017.1386323>
- UN, 2018. Report of the United Nations High Commissioner for Refugees. Part II Global compact on refugees. (No. A/73/12 (Part II)).

- UNHCR, 2018a. What is a Refugee? Definition and Meaning | USA for UNHCR [WWW Document]. URL <https://www.unrefugees.org/refugee-facts/what-is-a-refugee/> (accessed 5.6.19).
- UNHCR, 2018b. Figures at a Glance [WWW Document]. U. N. High Comm. Refug. URL <https://www.unhcr.org/figures-at-a-glance.html> (accessed 5.6.19).
- UNHCR, 2019. Asylum-Seekers [WWW Document]. UNHCR. URL <https://www.unhcr.org/asylum-seekers.html> (accessed 8.28.19).
- Van Auken, P., Barron, E., Xiong, C., Persson, C., 2016.\* “Like a Second Home”: Conceptualizing Experiences within the Fox River Watershed through a Framework of Emplacement. *Water* 8, 352. <https://doi.org/10.3390/w8080352>
- Vonnahme, L.A., Lankau, E.W., Ao, T., Shetty, S., Cardozo, B.L., 2015. Factors associated with symptoms of depression among Bhutanese refugees in the United States. *J. Immigr. Minor. Health* 17, 1705–1714. <https://doi.org/10.1007/s10903-014-0120-x>
- Wartmann, F.M., Purves, R.S., 2018. Investigating sense of place as a cultural ecosystem service in different landscapes through the lens of language. *Landsc. Urban Plan.* 175, 169–183. <https://doi.org/10.1016/j.landurbplan.2018.03.021>
- Winthrop, R.H., 2014. The strange case of cultural services: Limits of the ecosystem services paradigm. *Ecol. Econ.* 108, 208–214. <https://doi.org/10.1016/j.ecolecon.2014.10.005>
- Wolsko, C., Lindberg, K., 2013. Experiencing connection with nature: The matrix of psychological well-being, mindfulness, and outdoor recreation. *Ecopsychology* 5, 80–91. <https://doi.org/10.1089/eco.2013.0008>
- Zent, E.L., 2013. Jotí ecogony, Venezuelan Amazon. *Environ. Res. Lett.* 8, 015008. <https://doi.org/10.1088/1748-9326/8/1/015008>