Gorgan University of Agricultural Sciences and Natural Resources

Environmemtal Resources Research (ERR)

Print ISSN: 2783-4832
Online ISSN: 2783-4670

Educational services of different landscapes using actor group opinions in Jiroft County

Azam Khosravi Mashizi[1*], Mohsen Sharafatmandrad[1], Batoul Alizadeh[2]

[1] Associate Professor, Department of Ecological Engineering, Faculty of Natural Resources, University of Jiroft, Jiroft, Iran
[2] Undergraduate Student, Department of Ecological Engineering, Faculty of Natural Resources, University of Jiroft, Jiroft, Iran

Article Info

Article type:
Research Article

Article history:
Received: April 2024
Accepted: June 2024

Corresponding author:
Azam.khosravi@ujiroft.ac.ir

Keywords:
Science value
Rangeland
Woodlands
cultural services

Abstract

Despite the significance of nature-based learning for ecosystem conservation, limited information exists regarding ecosystems' potential to provide educational services. This study aimed to assess the educational services of various landscapes, including woodlands, rangelands, and water bodies, using the opinions of actor groups in Jiroft County. An expert method was employed to evaluate the educational values of these landscapes and identify the main drivers of education service provision. Results indicated that rangeland landscapes offered the highest educational value compared to woodlands and water bodies. Rangelands dominated by semi-shrubs exhibited the greatest scientific value, significantly differing from meadows and shrublands in their ability to supply educational services ($p < 0.05$). In woodlands, *Juniperus excelsa* and *Pistacia atlantica* demonstrated the highest scientific value ($p < 0.05$). According to expert opinions, plant and animal diversity, along with degradation, were identified as the main drivers of educational services, suggesting their potential for assessing the educational services of ecosystems.

Cite this article: Khosravi Mashizi, Azam; Sharafatmandrad, Mohsen; Alizadeh, Batoul. 2024. Educational services of different landscapes using actor group opinions in Jiroft County. *Environmental Resources Research*, 12(1), 59-70.

DOI: 10.22069/IJERR.2024.22315.1433
Publisher: Gorgan University of Agricultural Sciences and Natural Resources

Introduction

Over the last 20 years, ecosystem services have become a useful tool for decision-making on various ecological and social systems (Shi et al., 2023). Ecosystem services are defined as the benefits that people obtain from ecosystems (MEA, 2005, Wang et al., 2024). Cultural ecosystem services are defined as the nonmaterial benefits people obtain from the ecosystem (MEA, 2005) which indirectly influence the life quality of people (Willis, 2015). Cultural services reflect what people obtain from the natural ecosystems, and therefore they can increase people's awareness and motivation for ecosystem conservation (Opdam et al., 2015). Cultural services evaluation may help ecosystem management and policy-making (Shin et al., 2016). Demand for cultural services is expected to grow as industrialization grows (Ingold and Zimmermann 2011). However, cultural ecosystem services are greatly valued by diverse stakeholders in social systems Cultural services have been neglected by decision-makers (Willis, 2015). The evaluation of cultural services of ecosystems is relatively neglected and poorly understood because cultural services are "intangible", "immaterial" and "invisible" compared to other services (Tilliger et al., 2015). The lack of data, especially qualitative data, is an important limitation for evaluating all ecosystem services (Brown et al., 2016). Data collection and quantification of ecosystem services are needed for decision making (Paracchini et al., 2014). In traditional societies, cultural services are essential for cultural identity and even survival (Brown and Hausner, 2017).

Today, experiences related to nature and the educational values of ecosystems are included in many studies of cultural ecosystem services (MEA, 2005; Haines-Young and Potschin, 2013). The educational values of living and non-living characteristics of ecosystems represent the educational service of ecosystems. In general, knowledge about nature; and recreation for learning are called educational services (Mocior and Kruse 2016). Need for education about nature, both formal education (e.g. in school courses) and informal education (e.g. on private trips) is necessary for several reasons. Knowledge of ecosystems can help to better understand environmental risks (Hiwasaki et al., 2014) and increases public awareness and acceptance of nature conservation (Coratza and Waele, 2012). Nature recognition has also helped to expand public participation in ecological decision-making (Le Lay et al., 2013) and can lead to an improved understanding of interactions between social systems and ecosystems (Ploaie and Turnock, 2001).

Different kinds of nature education can be carried out indoor including school classrooms, museums, and educational centers or outdoor in the form of fields, workshops, and scientific visits. Educational services provide learning opportunities at different levels of education (Shi et al., 2023). However, direct learning from the ecosystem in field is more difficult. Field study is more useful for the learner (Spalie et al., 2011). Studying of ecosystems in the open air improves the learning process and because of the use of all senses, it increases observation and thinking abilities, inspires learning, and helps to expand interests (Plieninger et al., 2013).

Ecosystems that expand knowledge about plant and animal species are believed to have educational values based on Pleininger et al., (2013). MEA (2005) defined education services as "ecosystem characters that influence the education systems of different countries". Boehneke-Henrichs et al. (2013) introduced education service as an ecosystem's contribution to teaching, research, etc. Loomis and Patterson (2014) define "teaching" as formal and informal ecosystem learning opportunities known to be created by access to specific ecosystems.

The use of surveys or interviews is useful in evaluating cultural services. In the evaluation of ecosystem services, the groups using the services should be taken into consideration (e.g. Plieninger et al., 2013; Ament et al., 2016). Academic researchers are one of the groups that are related to the educational service based on former studies such asMocior and Kruse (2016) examined the educational value of natural ecosystems using the opinions of undergraduate, graduate, and Ph.D. students. Böhnke-Henrichs et al. (2013) investigated the educational value of ecosystems by using the time that researchers spend studying natural ecosystems. The most important ecological and managerial characteristics in relation to educational services also help us to identify alternative indicators for quantifying educational services. Plieninger et al. (2013) showed that species diversity and diversity of flowering plants are the most important ecological indicators in relation to the educational value of ecosystems. There is little information about the cultural services of natural ecosystems in Iran. Most studies have focused on recreation services, and cultural services such as educational services have remained unknown. The purpose of this study is to compare the educational value of natural ecosystems of woodlands, rangelands, and water bodies in Jiroft city based on local researcher's experience and then main drivers of education services were revealed.

Materials and Methods

Study area

Jiroft county has been selected for this study, which is located in the southeast of Iran (56º51 to 58º15´ E and 28º20´ to 29º 28´ N). The region area is 746516.6 hectares. In the southern parts, there are plains with 900 meters mean elevation and 136 mm mean annual rainfall. The northern parts are mostly mountainous with an average altitude of 3030 meters above sea level and an average annual precipitation of 468 mm. Woodlands cover 22 percent of the region. Woodlands are dry forests that do not have continuous cover (Menaut et al. 1995). *Tecomella undulate* in the plains and *Pistacia atlantica* and *Juniperus excelsa* in highlands were selected to assess education service in woodland. The most part of the region consists of rangelands, which are included mostly semi-shrub, shrubs and meadows. Dams, waterfalls, and wetlands are the main water bodies in Jiroft county. Jiroft dam is used for drinking, agriculture, recreation and tourism, hydroelectric energy, and environmental needs of the Jiroft plain and Jazmurian wetland, as well as flood control with a storage of about 224 million m^3 . (Afzali et al., 2018). Jiroft has many waterfalls, such as Dalfard and Sarenkoh waterfall. Parts of the wetland are located in Kerman province and Jiroft city, and parts of the wetland are located in Sistan and Baluchistan province. (Qaderi Nasab and Rahnama, 2019).

Data Collection

The number of people interviewed was determined based on Cochran formula (Cochran 1977). Hence, 45 local natural resources experts from Jiroft universities and natural resources and watershed management organizations in Jiroft were requested to fill in a questionnaire. They were selected based on their educational background in the natural resources. Since in previous study, color photographs have been found to represent landscapes in a satisfactory manner when compared to preference rankings made in the field (Dramstad et al. 2006) It must also be noted that the photos were selected subjectively by the authors in consultation with colleagues working in this area. As such a certain perspective and limitation must be placed on the representativeness of the images included as it is possible.

The first part of the survey was comprised of nine photographs (presented by a PowerPoint presentation) showing landscapes, which were selected by the authors for survey purposes (Figure1). The respondents were requested to evaluate the educational value of woodlands, rangelands, and water bodies depicted in each picture, using the relative scale from 0 ('no educational value') to 5 ('very high educational value'). In the second part of the survey, the respondents were requested to answer how many times they spent in each of the woodlands, water bodies, and rangelands for studying in a year. In the third part of the survey, the respondents were asked to choose which criteria were the most relevant for the evaluation of the educational value.

Data analysis

Kolmogorov– Smirnov normality test was used to check data for normal distribution. Due to the normality of the studied variables, one-way analysis of variance (ANOVA) followed by the least significant difference (LSD) test was used to compare different landscapes in terms of education service. The multiple regression tests was used to explore main drivers for supplying education services using IBM SPSS Statistics V22.0.

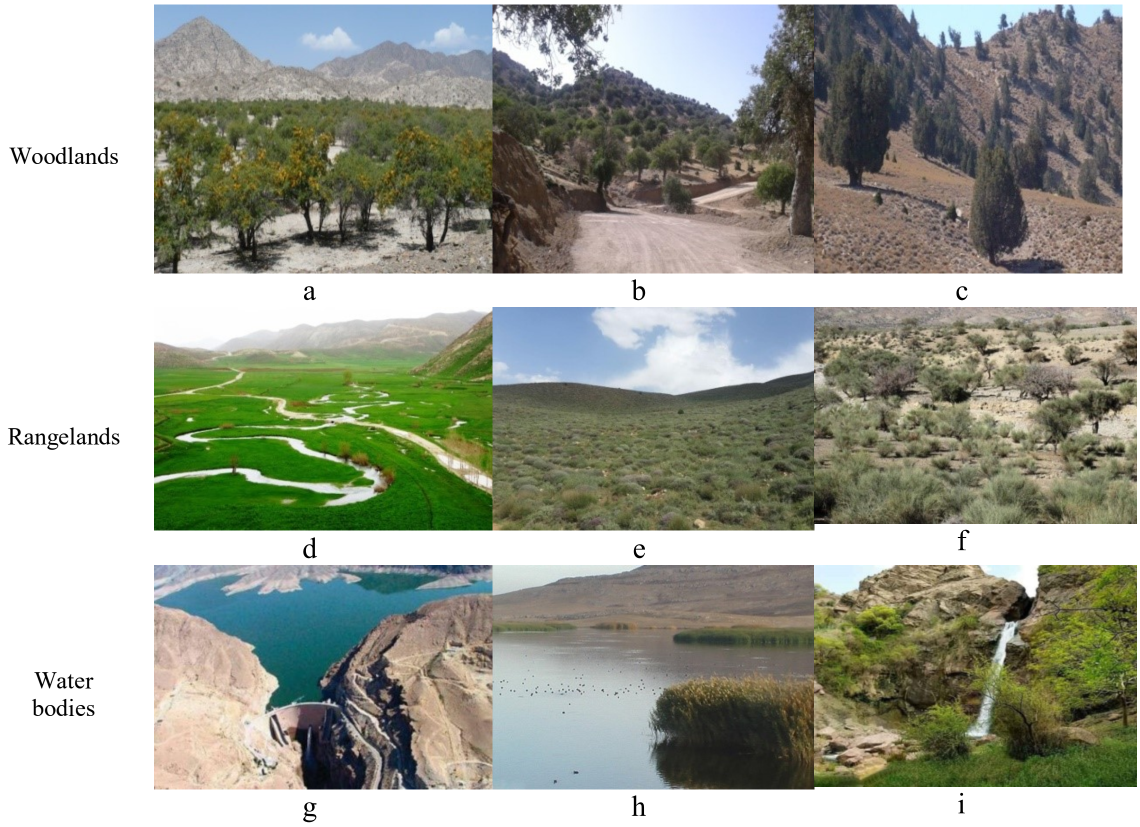

Figure 2. Photograph samples of woodlands (a: *Tecomella undulata* , b: *Pistacia atlantica*, c: *Juniperus excelsa*), rangelands (d: meadow e: semi-shrubland, f: shrubland), and water bodies (g: dam, h: wetland, i: waterfall)

Results

Participants were chosen with three educational background in natural resources including environmental science (n = 19), ecological engineering (n=28), and fisheries (n=12). Most of the participants were under 30 years old (70%), nine of them had Ph.D. degrees and 50% of them had a master's degree. There was almost the same proportion of males and females (Table 1). ANOVA results showed that the Woodlands had a significant difference in terms of educational service ($p<0.05$, Table 2). The results also showed that rangelands had significant differences with each other in terms of educational service ($p<0.01$). Water bodies also had significant differences in terms of educational service ($p<0.05$). The results of the average comparison showed that *Juniperus excelsa* and *Pistacia atlantica* had the highest educational value with averages of 4.78±1.68 and4.47 ±1.52, respectively, and they had significant differences with *Tecomella undulata* ($p<0.05$, Table 2). Semi-shrubs had the highest educational value with an average of 4.89 ± 1.25 among different rangelands, which had a significant difference with meadows and shrubs ($p<0.05$). Among the water bodies, the wetland had the highest educational value with an average of 4.73 ± 1.32, which was a significant difference from waterfall and dam landscapes in terms of educational value ($p<0.05$). The results indicated that landscapes had significant difference in terms of educational service and the rangelands had the highest educational value (Figure 2).

Table 1. Personal information of individuals who participated in the study.

		Observations	Frequency (Percent)
Age	20-25	32	54
	25-30	15	26
	30<	12	20
Field of Study	Environmental science	19	32
	Ecological engineering	28	48
	Fisheries	12	20
Education	4year college degree	20	34
	M.S.	30	50
	Ph.D	9	16
Gender	Female	28	48
	Male	31	52

Table 2. ANOVA results of education services in woodlands, rangelands and water bodies. Significant differences are shown by: $^*p = 0.05$; $^{**}p = 0.01$.

	df	MS	F
Woodland	2	0.86	3.21*
Rangeland	2	0.53	8.49**
Water body	2	1.21	5.38*

Table 3. Mean comparison of education services between different woodlands, different rangelands and different water bodies. Significant differences obtained by the LSD test are showed by the superscripts a and b ($p < 0.05$). the same letter indicates no significant difference

		Max	Min	Mean
Woodland	*Tecomella undulata*	5	2	4.47±1.52b
	Pistacia atlantica	5	1	4.05±0.97a
	Juniperus excelsa	5	2	4.78±1.68b
Rangeland	Meadow	5	1	3.66±0.82a
	Semi-shrubland	5	2	4.89±1.25b
	Shrubland	5	1	3.98±0.85a
Water body	Dam	5	1	3.77±0.69a
	Wetland	5	2	4.73±1.32b
	Water fall	5	1	3.37±0.42a

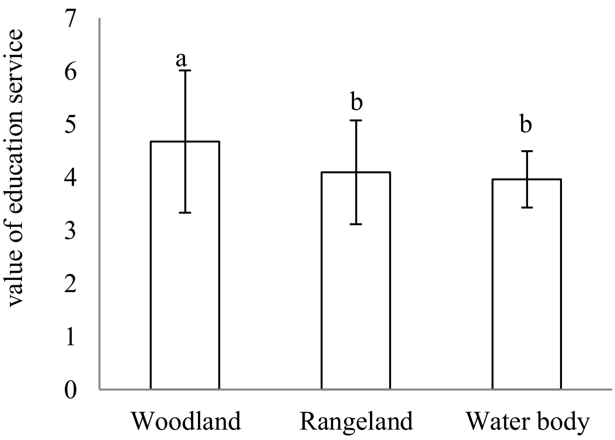

Figure 2. Mean comparison of education services of woodlands, Rangelands and water bodies. Significant differences obtained by the LSD test are showed by the superscripts a and b ($p< 0.05$). the same letter indicates no significant difference.

Table 4. ANOVA results of visiting number of woodlands, rangelands and water bodies for studying in a year. Significant differences are shown by: *p = 0.05; **p = 0.01.

	df	MS	F
Woodland	2	1.23	5.21*
Rangeland	2	1.56	11.23**
Water body	2	1.34	4.56*

Table 5. Mean comparison of visiting number between different woodlands, different rangelands and different water bodies. Significant differences obtained by the LSD test are showed by the superscripts a, b and c (p < 0.05). the same letter indicates no significant difference.

		Max	Min	Mean
Woodland	*Tecomella undulata*	5	0	3.66±0.89a
	Pistacia atlantica	9	0	5.13±0.56b
	Juniperus excelsa	8	0	6.34±1.49b
Rangeland	Meadow	5	0	4.05±0.66a
	Semi-shrubland	18	0	12.09±1.55c
	Shrubland	9	0	5.82±0.93b
Water body	Dam	4	0	2.41±0.82a
	Wetland	9	0	4.13±1.86a
	Water fall	5	0	3.63±0.59a

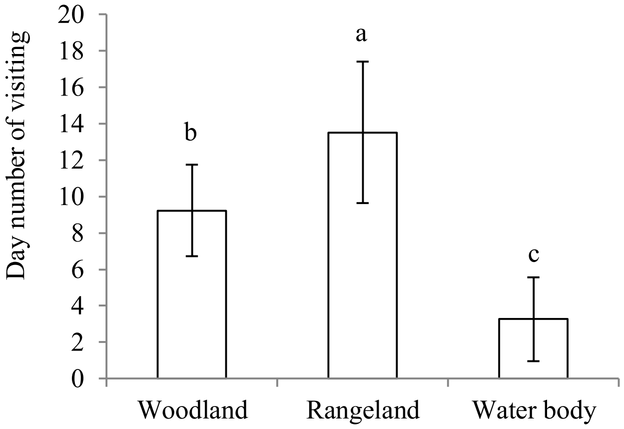

Figure 2. Mean comparison of day number of visiting of woodlands, Rangelands and water bodies. Significant differences obtained by the LSD test are showed by the superscripts a, b and c (p < 0.05).

The results of ANOVA showed that the Woodlands were significantly different in terms of the number of visits for the study (p<0.05, Table 4). The results also showed that rangelands had significant differences with each other in terms of the number of visits for study (p<0.01). Among the water bodies, no significant difference was observed in terms of the number of visits for the study (p>0.05). Comparison of averages showed that *Juniperus excelsa* and *Pistacia atlantica* had the highest number of visits for study with averages of 6.34±1.4 and 5.13±0.56, respectively, and they have a significant difference with *Tecomella undulata* (p<0.05, Table 5). Semi shrubs with an average of 1.55 ± 12.09 among different rangelands had the highest number of visits for study, which had a significant difference with meadow and shrubland (p<0.05). The results of comparing the average of Woodland, rangelands, and Water Bodies in terms of the day number of visits for the study showed that the rangelands with the highest average number of visits (Figure3).

A regression model was used to declare the main drivers of education services based on people in three field studies separately (Table 6). Results showed that the coefficient of determination (R2) was 84%, 86%, and 83% for people in Environmental science, ecological engineering, and fisheries respectively at a 99% confidence level. The standardized (regression) coefficient (Beta coefficient) was used to assess the importance and role of independent variables in predicting the dependent variable. According to Table 6, diversity of plant species and severity of destruction were the main drivers of education services based on people in ecological engineering ($p<0.001$). The diversity of animal species and severity of destruction were the main drivers of education services based on people in environmental science ($p<0.001$). The diversity of animal species was the main driver of education services based on people in fisheries ($p<0.001$).

Table 6. The relationship between drivers of education services is based on multiple regressions.

Study field	MS	F	Sig	R^2	R
Environmental science	1.49	7.31	0.00	0.88	0.94
Ecological engineering	0.86	11.20	0.00	0.92	0.96
Fisheries	0.72	5.35	0.00	0.86	0.93

Table 7. The relative importance of variables and their impact on education services. Significant relations are shown by: *p = 0.05; **p = 0.01.

Drivers of education services	Environmental science		Ecological engineering		Fisheries	
	Standard B	t	Standard B	t	Standard B	t
Diversity of plant species	0.235	1.23	0.502	6.87**	0.123	0.84
Rare plant species	0.213	1.13	0.252	1.28	0.138	0.85
Diversity of animal species	0.486	5.23**	0.321	4.12*	0.532	7.12**
Rare animal species	0.326	4.13*	0.259	1.30	0.358	4.26*
Geomorphology	0.267	1.32	0.265	1.32	0.213	1.15
Soil	0.135	0.85	0.213	1.13	0.138	0.85
High economic value	0.237	1.23	0.331	4.15*	0.268	1.32
Vital value for social life	0.237	1.23	0.263	1.31	0.213	1.31
Easy access	0.327	4.13*	0.375	4.23*	0.324	4.12*
Aesthetic	0.286	1.35	0.271	1.34	0.132	0.84
High tourism value	0.263	1.31	0.246	1.23	0.138	0.85
Mismanagement	0.312	4.05*	0.328	4.13*	0.286	1.45
Land use	0.238	1.23	0.268	1.32	0.237	1.23
Degradation	0.396	4.53*	0.465	5.20**	0.321	4.12*

Discussion

The results of this study showed that rangelands are more valuable than woodlands and water bodies in terms of educational service. Rangelands provide multiple ecosystem services such as food, fiber, water, recreation, and minerals which are important to the livelihoods of people across the world (Yahdjian et al., 2015). Rangelands cover 51% of the land and provide 78% of livestock needs (Asner et al. 2004). Livestock grazing provides food and income for more than 1.2 billion people (FAO, 2008). Scientific studies of rangeland ecosystems play an important role in the success of ecosystem management. Bedunah and Angerer (2012) concluded that there is an association relation between science, education, and rangeland management in developed countries. In many developing countries, where rangeland is the dominant land type and vital for the people's livelihood, overuse of rangelands has created significant social, economic, and environmental problems, and more scientific research is needed. Rangeland scientists should continue to support the multiple uses and values of rangelands and provide information about threats to sustainable use and their effects on different users over time.

Semi-shrubs were the most important in terms of educational service compared to other rangeland land covers. Semi-shrub species play an important role in providing ecosystem function in arid ecosystems (Khosravi Mashizi and Sharafatmandrad, 2019). Semi-shrubs have been of interest to ecologists from various points of view, including being a shelter from the sun and wind (Ploughe et al., 2019), the effect on soil nutrients (Ploughe et al., 2019), Impact on animals through attraction and repulsion of herbivores (Bustamante et al., 2021), seed predators (Ziffer-Berger et al., 2017) and pollinators (Braun and Lortie, 2020). Common species are also inherently easier to monitor and study than rare species. Therefore, it is not surprising that the majority of biodiversity studies examine species that are not at risk (Binley et al., 2023). The dominant plant in our study area was the *Artemisia* species. *Artemisia* is one of the largest genera of the Asteraceae or Compositae family, which is the largest family of flowering plants. *Artemisia* has about 600 species on all continents except Antarctica, mostly distributed in the Northern Hemisphere. *Artemisia* has great ecological flexibility and extends from plains to high mountains and from dry areas to wetlands (Vallès et al., 2011). *Artemisia* are usually drought, cold, and salinity tolerant and can prevail in arid and semi-arid regions and play an important ecological role in terms of wind and sand control. (Ling, 1988) In addition, some of them are rich in essential oils and Terpenes that have anti-malarial, anti-cancer and anti-diabetic properties (Shahzadi et al., 2020). Due to the spread of *Artemisia* in Iran and its ecological importance, it has more educational value than other species.

The woodlands had the second place of importance in terms of education service. *Juniperus excelsa* and *Pistacia atlantica* had the highest educational value in woodlands. People's culture has a great influence on their beliefs about nature. The tree is a symbol of prosperity an indicator of greenness and abundance, and a manifestation of life in Iran (Zomorrodi, 2008). Especially evergreen trees that people believe come from heaven (Masse, 1974). Evergreen trees are a symbol of stability and eternity, which represent stability (Zomorrodi, 2008). The existence of evergreen trees near religious places represents the sanctity of these trees in Iranian beliefs (Bahar, 1997). *Juniperus* woodlands also have a high social and economic value. The exploitation of the juniper plant includes the usage of its stable and termite-resistant wood in house construction, the use in perfumery, and also medicine (Ramin et al., 2012). The *Pistacia* tree is one of the valuable plants occupied a considerable area in different regions of Iran (Mahjoub et al., 2018). Economically, this species has a special value and importance in terms of gum production and its use in the production of various medicinal and health materials, fruit, and foliage in nutrition and fodder production in Iran (Daneshpour, 2015). This species has plant seeds with an oily kernel. In addition to creating jobs, the harvest of these products is also a source of income for the local people (Dewes, 1993). Wetland had the most value in terms of education service compared to other water bodies. Jazmurian wetland is located in the migratory direction of birds from Siberia to India and has had valuable applications in the past. This wetland played an important role in the preservation of native plant communities, animals, and birds (Rahdari et al. 2014). Unfortunately, the wetland has lost many of these functions. Several factors such as high evaporation, overexploitation of groundwater, dam construction on the rivers feeding the wetland, and the effect of drought and climate changes have caused Jazmurian wetlands to dry out during the recent years. Accordingly, this wetland has become one of the main sources of dust generation in the southeast of Iran (Qaderi Nasab and Rahnama, 2019).

Conclusion

The diversity of plants and animals was the most important indicator of educational services. Former studies have shown that the diversity of ecosystem components (Kubalíková 2013) or the number of processes (Kedro 2011) explained by learners play important role in the scientific value of ecosystems. The results of Shi et al. (2023) indicated the importance of biodiversity in the education service. They reported that biodiversity includes 80% of the variance of the educational value of ecosystems. Biodiversity conservation studies, as one of the global environmental issues, are of interest to international communities in many disciplines and research fields (Wang et al., 2020). The valuation of ecosystems is possible through the recognition of biodiversity (Seidl et al., 2024). Biodiversity has a great economic value in people's well-being (Heal and Pascual, 2024). The global conservation budget is insufficient (McCarthy et al., 2012). In recent years, the number of endangered species has grown rapidly (Johnson et al., 2017), and there is a need for more research for effective conservation programs and the recognition of the most important biodiversity regions (Cimatti et al., 2021). Degradation was the second most effective factor in education service. Peñan et al., (2015) showed that with the destruction of the landscapes, the visual value of the landscapes decreases and as a result, the quality of cultural services decreases significantly. The results of Yang, et al. (2014) also showed that the cultural service value of landscapes is influenced by landscape characteristics and human activities in the landscape. The degradation of natural ecosystems is the primary cause of the decline in global biodiversity (Singh et al., 2022). Environment destruction as the main global challenge is conceded by many researchers. Scientists assert that human activity has pushed the earth into a sixth mass extinction event (Kolbert, 2014). Hence, the degradation of ecosystems plays an important role in educational services. Knowing the hotspot areas of educational service helps a lot to direct future scientific studies towards sustainable management. This study can help improve our knowledge about educational value of environments and it provides the possibility of using educational values in decision-making.

References

Afzali, Z., Zare Mehrjerdi, M., and Nbabian, S. 2018. Prioritizing allocation of water resources of Jiroft dam under drought approach by Fuzzy Technique Order-Preference by Similarity to Ideal Solution (FTOPSIS). Iranian of Irrigation and Water Engineering. 9 (33), 112-124.

Ament, J.M., Moore, C.A., Herbst, M., and Cumming, G.S. 2016. Cultural ecosystem services in protected areas: Understanding bundles, trade-offs, and synergies. Conservation Letters.10 (4), 440–450.

Asner, G.P., Elmore, A.J., Olander, L.P., Martin, R.E., and Harris, A.T. 2004. Grazing systems, ecosystem responses and global change. Annual Review Environmental Resources. 29, 261–299.

Bahar, M. 1997. From myth to history. Edited by Esmailpour, A. Tehran: Cheshmeh Publication.

Bedunah, D.J., and Angerer, J.P. 2012. Rangeland degradation, poverty, and conflict: How can rangeland scientists contribute to effective responses and solutions? Rangeland Ecology and Management. 65, 606-612.

Binley, A.D., Vincent, J.G., Rytwinski, T., Proctor, C.A., Urness, E.S., Davis, S.A., Soroye, P., and Bennett, J.R. 2023. Patterns of community science data use in peer-reviewed research on biodiversity. Biological Conservation. 280, 109985.

Böhnke-Henrichs, A., Baulcomb, C., Koss, R., Hussain, S.S., and de Groot, R.S. 2013. Typology and indicators of ecosystem services for marine spatial planning and management. Journal of Environmental Management.130, 13–145.

Braun, J., and Lortie, C.J. 2020. Facilitation with a grain of salt: reduced pollinator visitation is an indirect cost of associa-tion with the foundation species creosote bush (*Larrea tridentata*). American Journal of Botany. 107(10), 1342–1354.

Brown, G., and Hausner, V.H. 2017. An empirical analysis of cultural ecosystem values in coastal landscapes. Ocean and Coastal Management. 142, 49–60.

Brown, G., Pullar, D., and Hausner, V.H., 2016. An empirical evaluation of spatial value transfer methods for identifying cultural ecosystem services. Ecological Indicators. 69, 1–11.

Bustamante, G.N., Soler, R.M., Blazina, A.P., and Arena, M.E. 2021. Association between native tree sapling and spiny shrub mitigates browsing damage produced by large herbivores in fire-degraded forests. Flora. 285,151938.

Cimatti, M., Brooks, Th.M., and Di Marco, M. 2021. Identifying science-policy consensus regions of high biodiversity value and institutional recognition. Global Ecology and Conservation. 32, e01938.

Cochran, W. G. 1977. Sampling techniques (3rd ed.). New York, NY: John Wiley & Sons.

Coratza, P., and Waele, J.D. 2012. Geomorphosites and natural hazards: teaching the importance of geomorphology in society. Geoheritage. 4, 195–203.

Daneshpour, F. 2015. Optimizing the pistachio supply chain and logistics network for Fresno county using geographic information systems network analysis method: California Polytechnic State University, San Luis Obispo;

Dewes, W. 1993. Introduction traditional knowledge and sustainable in S.H.Davis and K.Ebbe (Eds) Proceedings of a Conference held at The World Bank Washington D.C., Sept. 27-28, Environmentally Sustainable Proceeding Series, No.4.

Dramstad, W.E., Sundli Tveit, M., Fjellstad, W.J., and Fry, G.L.A. 2006. Relationships between visual landscape preferences and map-based indicators of landscape structure. Landscape and Urban Planning. 78, 465–474.

Food and Agricultural Organization (FAO). 2008. Livestock policy and poverty reduction. Rome, Italy: Food and Agricultural Organization. Livestock policy brief 04. 8 p.

Haines Young, R., and Potschin,M., 2013.CommonInternationalClassificationof Ecosystem Services (CICES): Consultation on Version 4, August–December 2012, EEA Framework Contract No. EEA/IEA/09/003.

Heal, G., and Pascual, U. 2024. Biodiversity as a Commodity, Editor(s): Samuel M. Scheiner, Encyclopedia of Biodiversity (Third Edition), Academic Press. 152-166.

Hiwasaki, L., Luna, E., Syamsidik, and Shaw, R. 2014. Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities. International Journal of Disaster Risk Reduction. 10, 15–27.

Ingold, K., and Zimmermann, W. 2011. How and why forest managers adapt to socio-economic changes: a case study analysis in Swiss forest enterprises. Forest Policy and Economics. 13, 97-103.

Johnson, C.N., Balmford, A., Brook, B.W., Buettel, J.C., Galetti, M., Guangchun, L., and Wilmshurst, J.M., 2017. Biodiversity losses and conservation responses in the Anthropocene. Science. 356, 270–275.

Kedro n, K. 2011. Changeability of the value in educational potential for the southern part of the Kraków – Czestochowa ̨ Upland. Probl. Landscape Ecology Journal. 30, 419–422.

Khosravi Mashizi, A., and Sharafatmandrad, M. 2019. Assessing the effects of shrubs on ecosystem functions in arid sand dune ecosystems. Arid Land Research and Management, 34(12), 1-17.

Kolbert, E. 2014. The Sixth Extinction: An Unnatural History. New York City: Henry Holt and Company. ISBN 978-0805092998

Kubalíková, L. 2013. Geomorphosite assessment for geotourism purposes. Czech Journal of Tourism. 2 (2), 80–104.

Le Lay, Y.F., Piégay, H., and Rivière-Honegger, A. 2013. Perception of braided river landscapes: implications for public participation and sustainable management. Journal of Environment Management. 119, 1–12.

Mahjoub, F., Akhavan Rezayat, K., Yousefi, M., Mohebbi, M., and Salari, R. 2018. Pistacia atlantica Desf. A review of its traditional uses, phytochemicals and pharmacology. Journal of Medicine and Life. 11(3), 180–186.

Masse, H. 1974. Croyances et CoutumesPersanes Vol. I. Translated to Persian by Roshanzamir, M. Tabriz: University Institute of Iranian History and Culture.

McCarthy, D.P., Donald, P.F., Scharlemann, J.P.W., Buchanan, G.M., Balmford, A., Green, J.M.H., Bennun, L.A., Burgess, N.D., Fishpool, L.D.C., Garnett, S.T., Leonard, D.L., Maloney, R.F., Morling, P., Schaefer, H.M., Symes, A., Wiedenfeld, D.A., and Butchart, S.H.M. 2012. Financial costs of meeting global biodiversity conservation targets: current spending and unmet needs. Science. 338, 946–949.

MEA (MillenniumEcosystemAssessment), Ecosystems and HumanWell-being: Biodiversity Synthesis. World Resources Institute, Washington, DC. 2005.

Menaut, J.C., Lepage, M., and Abbadie, L. 1995. Savannas, woodlands and dry forests in Africa. Seasonally dry tropical forests (ed. by S.H. Bullock, H.A. Mooney and E. Medina), pp. 64–92.

Mocior, E., and Kruse, M., 2016. Educational values and services of ecosystems and landscapes – An overview. Ecological Indicators. 60, 137–151.

Opdam, P., Albert, C., Fürst, C., Grêt-Regamey, A., Kleemann, J., Parker, D., La Rosa, D., Schmidt, K., Villamor, G., and Walz, A. 2015. Ecosystem services for connecting actors—lessons from a symposium. Change Adapt. Socio-Eecological System. 2 (1), 1–7.

Paracchini, M.L., Zulian, G., Kopperoinen, L., Maes, J., Schägner, J.P., Termansen, M., Zandersen, M., Perez-Soba, M., Scholefield, P.A., and Bidoglio, G., 2014. Mapping cultural ecosystem services: a framework to assess the potential for outdoor recreation across the EU. Ecological Indicators. 45, 371–385.

Peñan, L., Casado-Arzuaga, I., and Onaindia, M. 2015. Mapping recreation supply and demand using an ecological and a social evaluation approach. Ecosystem Services. 13, 108–118.

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

Ploaie, G., and Turnock, D. 2001. Public perception of environment in the mountains of Vâlcea County. GeoJournal. 54, 683–701.

Ploughe, L., Jacobs, E.M., Frank, G.S., Greenler, S.M., Smithm, M.D., and Dukes, J.S. 2019. Community Response to Extreme Drought (CRED): a framework for drought-induced shifts in plant-plant interactions. New Phytologist. 222(1), 52-69.

Qaderi Nasab, F., and Rahnama, M.B. 2019. Developing restoration strategies in Jazmurian wetland by remote sensing. International journal of Environmental Science and Technology.17(14), 1-16.

Rahdari, V., Maleki, S., Rahdari, M., and Pakniyat, D. 2014. Preparing a map of the ecological resources of the Jazmorian Wetland and introducing it as one from areas protected by the Environmental Protection Agency using RS and GIS, Environmental Protection Agency of Sistan and Baluchestan Province (in Persian)

Ramin, M., Shataei, S.H., Habashi, H., and Khoshnevis, M. 2012. Investigation on some quantitative and qualitative characteristics of juniper stands in Aminabad of Firouzkoh. Wood Science and Technology. 19 (3), 21-40.

Seidl, A., Cumming, T., Arlaud, M., Crossett, C., and Van den Heuvel, O. 2024. Investing in the wealth of nature through biodiversity and ecosystem service finance solutions. Ecosystem Services. 66, 101601.

Shahzadi, I., Abdullah, M.F., Ali, Z., Ahmed, I., and Mirza, B., 2020. Chloroplast genome sequences of *Artemisia maritima* and *Artemisia absinthium*: comparative analyses, mutational hotspots in genus *Artemisia* and phylogeny in family Asteraceae. Genomics. 112(2), 1454–1463.

Shi, X., Zhang, Y., Wang, Y., and Chang, Q. 2023. Understanding and improving nature-related educational ecosystem services in urban green spaces: Evidence from app-aided plant identification spatial-hotspots. Ecological Indicators. 151, 110332.

Shin, Y.J., Park, S.J., and Park, C.R. 2016. Valuation of cultural ecosystem services using the choice experiment method (CE). Korean Institute of Forest Recreation and Welfare. 20, 65–77.

Spalie, N., Utaberta, N., Abdullah, N.A.G., Tahir, M., and Ani, C. 2011. Reconstructing sustainable outdoor learning environment in Malaysia from the understanding of natural school design and approaches in Indonesia. Procedia - Social and Behavioral Sciences. 15, 3310–3315.

Tilliger, B., Rodriguez-Labajos, B., Bustamante, J.V., and Settele, J. 2015. Disentangling values in the interrelations between cultural ecosystem services and landscape conservation a case study of the Ifugao Rice Terraces in the Philippines. Land. 4 (3), 888–913.

Vallès, J., Garcia, S., Hidalgo, O., Martín, J., Pellicer, J., Sanz, M., and Garnatje, T. 2011. Chapter 7 Biology, Genome Evolution, Biotechnological Issues and Research Including Applied Perspectives in Artemisia (Asteraceae), Editor(s): Jean-Claude Kader, Michel Delseny, Advances in Botanical Research, Academic Press. 60, 349-419.

Wang, X., Wang, B., and Cui, F. 2024. Exploring ecosystem services interactions in the dryland: Socio-ecological drivers and thresholds for better ecosystem management. Ecological Indicators, 159:111699.

Willis, Ch. 2015. The contribution of cultural ecosystem services to understanding the tourism–nature–wellbeing nexus. Journal of Outdoor Recreation and Tourism. 10, 38-43.

Yahdjian, L., Sala, O.E., and Havstad, K.M. 2015. Rangeland ecosystem services: shifting focus from supply to reconciling supply and demand. Frontiers in Ecology and the Environment, 13, 44-51.

Yang, D., Luo, T., Lin, T., Qiu, Q., and Luo, Y. 2014. Combining Aesthetic with Ecological Values for Landscape Sustainability. PLoS ONE. 9(7), e102437.

Ziffer-Berger, J., Weisberg, P.J., Cablk, M.E., Moshe, Y., and Osem, Y. 2017. Shrubs facilitate pine colonization by controlling seed predation in dry Mediterranean dwarf shrublands. Journal of Arid Environments. 147, 34-39.

Zomorrodi, H. 2008. Vegetal Symbols and Secrets in Persian Poetry. First Edition. Tehran: Zavarbook Publication.