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Evaluation of Ecosystem Cultural Services in Qilian Mountain National Park, Qinghai Province, China

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Based on the framework of the United Nations Millennium Ecosystem Assessment (MA), this paper evaluated the ecosystem cultural service value in Qilian Mountain National Park, Qinghai Province. The study mainly adopted Condition Value Method (CVM) and questionnaire survey to survey the local residents and tourists in September 2016, and obtained 1,468 valid questionnaires, as well as used the method of payment card to get the consumers' willingness to pay, and then estimated the ecosystem cultural services value in Qilian Mountain National Park, Qinghai Province through the mean of total willingness to pay of ecological tourism and recreation and aesthetic value. Through quantitative analysis, the study concluded that the ecosystem cultural service value of Qilian Mountain National Park in Qinghai Province was 1.045 billion yuan in 2016 and 1.3 billion yuan in 2018. In 2016 and 2018, the average annual values of ecotourism and recreation are 203 million yuan and 332 million yuan respectively, and the average annual values of aesthetics are 842 million yuan and 968 million yuan respectively. In addition, the study also suggests that Qilian Mountain National Park in Qinghai Province should pay attention to reflect the characteristics of the park, focus on enhancing the aesthetic value of it in the management, and build it into a replaceable and referential national park demonstration area and ecological culture demonstration point.

Keywords: cultural service, CVM, national park, willingness to pay, Qilian Mountain, Qinghai Province

Introduction

In 2005, the Millennium Ecosystem Assessment (MA) defined the Cultural Ecosystem Service (CES) as "the intangible benefits of human beings from the ecosystem through spiritual satisfaction, cognitive development, reflection, entertainment and aesthetic experience" (2003, pp. 12-16). The impact of ecosystem degradation on human well-being can be effectively assessed through ecosystem cultural services (Dong, Zhu, Gao, & Li, 2014). Ecosystem cultural service is the added value of ecosystem serving human spiritual level, including aesthetic experience, recreational service, spiritual and religious value, and sense of belonging brought by ecosystem. Compared with regulating support, supply, and other services, ecosystem cultural service is more likely to be directly perceived and experienced by human beings and to play an important role in increasing human well-being (Peng et al., 2019). The outstanding feature of ecosystem cultural service is its

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invisibility. Therefore, how to quantitatively evaluate the impact of ecosystem cultural service on human life and the evaluation of ecosystem service value is crucial.

Qilian Mountain is an important ecological security barrier in Western China, an important source of water in the Yellow River Basin, and a priority protection area of biodiversity in China. In September 2017, the Chinese government approved the construction of Qilian Mountain National Park, which is one of the Top 10 national parks in China. Its main responsibility is to protect the biodiversity of Qilian Mountain and the authenticity and integrity of its natural ecosystem. The key to the management of national parks is to ensure that ecosystems have the ability to provide diversified services to promote human well-being (He, Su, Wang, & Cheng, 2019). Therefore, quantitative assessment of ecosystem services in national parks is the key to the effective management of national parks.

Because the value of cultural services in ecosystems cannot be determined and traded in the market as common commodities, domestic and foreign scholars mainly use Conditional Value Method (CVM) to determine its value. The idea of Conditional Value Method (CVM) was first proposed by Ciriacy-Wantrup in 1947. In the study, they realized that soil erosion control measures would produce “extra market benefits” (Venkatachalam, 2004), which could not be directly measured, but can be evaluated by people’s support for these benefits—pay willingness. For example, Dou and others used the method of conditional value assessment to evaluate the cultural service value of Beijing green space and blue space (Dou et al., 2017). This study takes Qilian Mountain National Park in Qinghai Province as an example, collecting a practical survey of 1,468 valid questionnaires, and then uses the Conditional Value Method to analyze and evaluate the value of eco-cultural services based on the willingness to pay for ecosystem eco-tourism, recreation, and aesthetic value. Then this study puts forward some suggestions on the management of national parks in order to improve the management level of ecological culture of Qilian Mountain National Park in Qinghai Province.

Overview of the Research Area and Research Method

Overview of the Research Area

Qilian Mountain National Park is located in the northeastern part of the Qinghai-Tibet Plateau, at the junction of Gansu Province and Qinghai Province, with a total area of 50,200 kilometers. Among them, the total area in Qinghai is 15,800 kilometers, accounting for 31.5% of the total area of national parks. The administrative scope includes Menyuan County, Qilian County, Haibei Tibetan Autonomous Prefecture, Tianjun County and Delingha City, Haixi Prefecture, with a total of 41,000 people in 60 villages of 17 townships. Because of its unique ecosystem, vast wetlands, grasslands and forests, and extensive glaciers, the park is known as the “solid reservoir” in the northern part of the Qinghai-Tibet Plateau. The park is rich in wildlife, including 15 species of snow leopard, white-lipped deer, black-crowned crane and 617 species of wild higher plants belonging to 257 genera and 68 families. Qilian Mountain National Park in Qinghai Province includes a provincial nature reserve, a national forest park, and a national wetland park. The core area of Qilian Mountain provincial nature reserve is 365,500 ha, the buffer area is 175,100 ha, the experimental area is 261,700 ha, the area of Xianmi National Forest Park is 190,800 ha, and Heiheyuan National Wetland Park covers an area of 64,300 ha. The national park is located in the cultural convergence zone where more than 20 nationalities such as Han, Tibetan, Hui, Mongolian, Tu, Yugur, Kazakh, and Salar live together. It is rich in cultural resources such as ancient sites, relics, and religious buildings, and has diversified ethnic cultures, thus forming the unique “Qilian Mountain Cultural Circle”.

Research Method

According to MA's definition of ecosystem cultural services, the value of cultural services mainly includes ecological tourism, recreational value, and aesthetic value (Millennium Ecosystem Assessment, 2003). Therefore, the evaluation of the value of ecosystem cultural services is mainly based on these two aspects.

Ecotourism and recreational value.

Selection of evaluation methods. The economic value of ecotourism and recreation is characterized by the inability to determine its price directly through the market. It can only be evaluated by "alternative market price" and "shadow price" which are similar to market exchange.

At present, the most popular methods of recreational value assessment in the world are Travel Cost Method (TCM) and Contingent Valuation Method (CVM). The former mainly uses the expenditure of tourists to establish the demand curve of recreational services, and then calculates consumer surplus. Therefore, this method can only be used to calculate the utilization value of recreational value. The latter is to directly investigate and inquire the public their willingness to pay (WTP) for environmental improvement or resource protection in the national park, and the willingness to accept (WTA) compensation for the loss of recreational environment or resource quality, both under the hypothetical market conditions. The value of tourism and recreation is estimated by people's WTP or WTA. This method is not only applicable to the evaluation of scenic spot utilization value, but also to the evaluation of non-use value. In addition, TCM calculates Marshall consumer surplus and CVM calculates Hicks consumer surplus, which have different theoretical basis. However, because CVM can directly investigate consumers' willingness to pay, it is regarded as the most important and promising evaluation method in the field of environmental benefit evaluation. Therefore, this study mainly chooses CVM method to evaluate the value of ecotourism and recreation in Qinghai Province. The specific evaluation steps are shown in Figure 1.

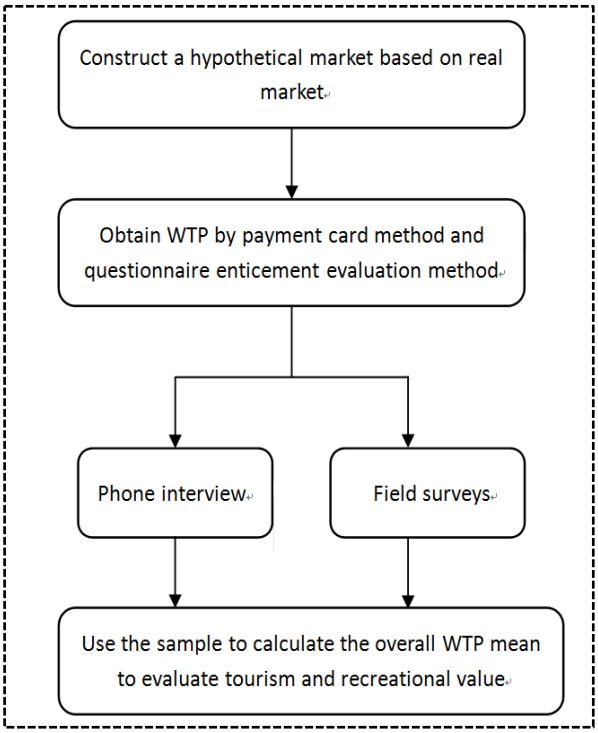

Figure 1. General evaluation steps of CVM method.

Questionnaire design and survey time. The questionnaire mainly includes the following parts: (1) basic situation of tourists' travel; (2) willingness to pay; (3) personal profile.

The first part is mainly about the basic situation of tourists' travel, including the departure place, travel mode, the number of visits in a year, the purpose of visits, expenses (transportation telephone charges, ticket charges, other expenses), destinations, travel time, etc.

The second part is about the content of WTP survey on tourism and recreation. Due to the limitation of the size of the questionnaire, the simulated market plan was not included in the questionnaire, but was elaborated on by the investigators when interviewing tourists. Willingness survey questions include: (1) Utilization value: Designed question is "In order to enjoy the natural scenery here, how much would you most like to pay for this trip to buy a ticket?" (2) Heritage/selective value: The designed question is "How much would you like to donate to protect the scenery so that you and future generations can enjoy it?" This paper emphasizes that whether for the sake of their own future or future generations, they can continue to enjoy or use the natural and cultural landscape; (3) the value of existence, that is, "how much are you willing to donate to preserve the living environment of wild animals and plants here (from the pity of human beings)?" "Money for protection?" The choice of willingness to pay uses interval data, that is: 0 (refusal to pay), 1-50 yuan, 51-100 yuan, 101-150 yuan, 151-200 yuan, 201-300 yuan, 301-400 yuan, and more than 400 yuan.

The third part includes age, sex, average annual salary, education level, occupation, and so on. Occupational and educational levels are answered in a closed way, while age and annual salary are answered in an open way.

Survey time and data analysis method. The survey was conducted during September 1-30, 2016. A total of 1,500 questionnaires were sent out and 1,470 were actually recovered, of which 1,468 were valid. The proportion of valid questionnaires was 97.87%. The survey sites were mainly Qilian County and Xianmi National Forest Park. Among the valid questionnaires, the sex ratios of men and women are 49% and 51% respectively. In the age distribution, the proportion of 20-29 years old is the highest, 43%; the proportion of over 50 years old is the smallest, about 4%. In the distribution of educational level, 22% are under junior middle school education, 23% are in senior middle school, and 55% are above undergraduate education. In the salary income, under 20,000 annual income accounted for 42%, 20,000 to 40,000 accounted for 22%, 40,000 or more accounted for 36%. In addition, in the occupational distribution, teachers/students/researchers accounted for 26%, retirees 29%, civil servants/public institution managers 14%, farmers/herdsmen/workers 28%, and others 3%.

CVM was used to estimate the value of eco-tourism and recreation in Qilian Mountain National Park of Qinghai Province. Payment card method was used to calculate the mean value of WTP. Assuming that the probability of acceptance of each interval of WTP is equal, we can get the cumulative frequency of each scalar interval, that is the conditional acceptance frequency of each scalar interval. The assumption of WTP mean calculation based on payment card method is that the acceptance probability of each scale interval is equal within the accepted scale interval. Therefore, the conditional acceptance probability of each scalar value is:

$$p_i = (2 - i) \times \frac{P_i}{i} + (\frac{P_i + 1}{i + 1} + \frac{P_i + 2}{i + 2} \cdots \frac{P_n}{n}) \quad (1)$$

P_i is the acceptance probability for the condition of each scalar value; i is the ordinal number of each scalar value from small to large; p_i is the frequency of selection for each scalar value.

The lower limit formula of WTP is:

$$\mathrm{WTP}_{min} = \sum_{i=1}^{i} m_i \times P_i \tag{2}$$

The upper limit formula of WTP is:

$$\mathrm{WTP}_{min} = m_{i-1} \times (P_{i-1} + P_i) + \sum_{i=1}^{i-1} m_{i-2} \times P_{i-2} \tag{3}$$

The mean of WTP is:

$$\overline{WTP} = \frac{1}{2}(WTP_{min} + WTP_{max}) \tag{4}$$

The formula for calculating the value of ecotourism and recreation is:

$$\mathrm{RV_{jv}} = \overline{\mathrm{WTP}} \times \mathrm{N_{jyr}} \tag{5}$$

N_{jyr} is the total number of domestic and foreign tourists received by site j in 2016.

Aesthetic value.

Selection of evaluation methods. Aesthetic value belongs to non-use value. It is a "public product", a service that anyone can enjoy. It cannot be determined by market price and trade in the market like ordinary commodities. In the absence of market prices, scholars mainly determine the value of ecosystem aesthetic services through the combination of qualitative evaluation and quantitative evaluation. Therefore, this study uses the combination of qualitative evaluation and Conditional Value Method (CVM) to evaluate the aesthetic service value of Qilian Mountain National Park ecosystem in Qinghai Province.

Application of evaluation methods. The qualitative evaluation of ecosystem aesthetic service value of Qilian Mountain National Park in Qinghai Province is mainly carried out through questionnaire survey, which mainly involves the evaluation content as shown in Table 1.

Table 1

Qualitative Evaluation Index of Ecosystem Aesthetic Service Value of Qilian Mountain National Park in Qinghai Province

First level index	Second level index	Evaluation method	Investigating objects
Aesthetic characteristics	Static beauty, dynamic beauty, Psychological perception, holistic perception	Score assignment (1-5 points), open-ended investigation method	Tourists, local residents
Demographic characteristics	Place of residence Sex Age Income Nation Occupation Educational level	Closed survey	Tourists, local residents

Source: Millennium Ecosystem Assessment, 2003.

For the ecosystem aesthetic service value of Qilian Mountain National Park in Qinghai Province, this study mainly evaluates through the survey of tourists' willingness to pay. Specifically, first, random survey of tourists and inquiry of tourists. In order to maintain the scientific, cultural, and historical value of the reserve,

the value range of the most willing to pay for it every year is mainly the payment card method. Secondly, the frequency of the survey results is analyzed, and the survival function is selected according to the frequency and the willingness to pay is estimated.

Estimation method. The aesthetic service value of ecosystem is the pleasure value and objective aesthetic value that ecosystem brings to people's aesthetic perception in the form of natural landscape and cultural landscape. Therefore, the aesthetic service value of ecosystem is directly related to the area of ecosystem, that is, the value of objective aesthetic landscape.

Therefore, the value of ecosystem aesthetic services can be determined by the ratio of survey site area to total ecosystem area (Xie et al., 2015) shown in the following formula:

$$V = \sum_{i=1}^{n} V_i \frac{S_0}{S_i} \tag{6}$$

V is the overall ecosystem aesthetic value; V_i is the value of the first investigation point; n is the number of ecosystem investigation points; S_i is the area of investigation points; S_0 is the total ecosystem area of Qilian Mountain National Park in Qinghai Province.

Results

Based on the above survey methods and data collected by the questionnaire, the value of ecosystem cultural services in Qilian Mountain National Park of Qinghai Province from 2016 to 2018 was calculated. The specific results are shown in Table 2.

Table 2

Evaluation of Ecosystem Cultural Services in Qilian Mountain National Park of Qinghai Province From 2016 to 2018

Year	Value		Percentage		Total (RMB 100 million)
	Ecotourism and recreation (RMB 100 million)	Esthetics (RMB 100 million)	Ecotourism and recreation (%)	Esthetics (%)	
2016	2.03	8.42	19.4	80.6	10.45
2017	2.20	9.12	19.4	80.6	11.32
2018	3.32	9.68	25.5	74.5	13.00

From the evaluation results in Table 2, it can be seen that the value of eco-cultural services in Qilian Mountain National Park of Qinghai Province increased year by year from 2016 to 2018, from 1,045 million yuan in 2016 to 1,300 million yuan in 2018, with an average annual increase of 11.54%. The growth rate of eco-tourism and recreation value is the fastest, with an average annual growth rate of 27.86%, while the growth rate of aesthetic value is relatively small, with an average annual growth rate of 7.22% (Figure 2).

In recent years, with the gradual development and improvement of tourist attractions and facilities in Qilian Mountain National Park of Qinghai Province, the tourism industry in Qilian Mountain National Park has developed rapidly, and the tourism income has shown a steady upward trend. According to statistics, the tourism revenue of Qilian Mountain National Park in Qinghai Province reached 232 million yuan in 2018 (Zhang, 2015). In addition, with the advancement of the national park construction system, the tourism facilities of Qilian Mountain National Park in Qinghai will be further improved, the value of eco-tourism and recreation will continue to improve, and its value will continue to rise.

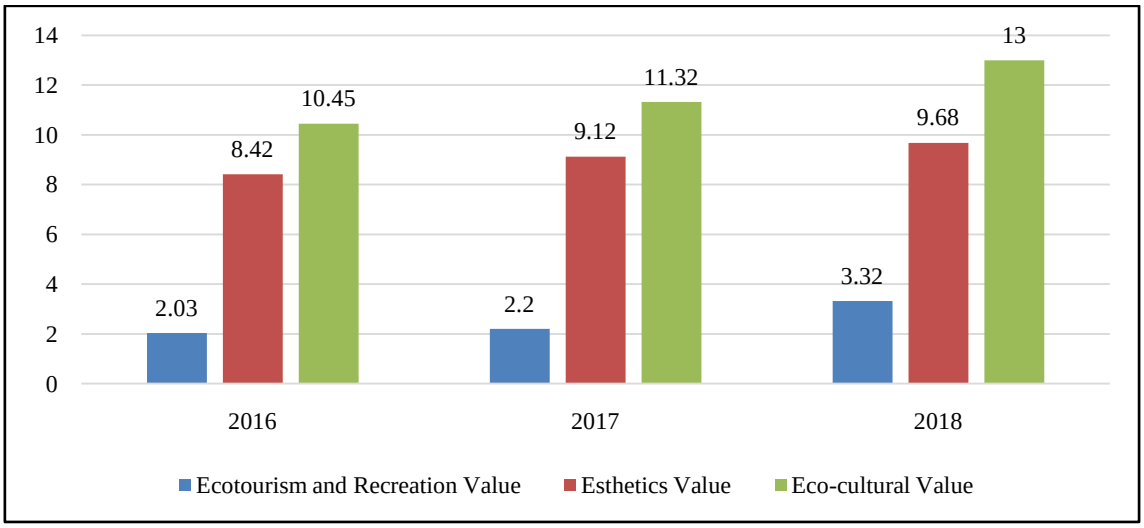

Figure 2. Value assessment map of ecosystem cultural services in Qilian Mountain National Park of Qinghai Province.

In addition, the Qilian Mountain National Park in Qinghai Province has a special geographical location and rich species resources. Its magnificent mountain system, vast grasslands, rare animals and plants, and unique national culture all contain great aesthetic service value. With the steady development of "Great Beauty Qinghai" and the construction of ecological civilization, the proportion of aesthetic service value in the total value of ecosystem cultural services will gradually increase. From 2016 to 2018, although the proportion of aesthetic service value has decreased, in the long run, the relevant value will increase (Liu, Zhang, Zhang, & Chen, 2017; Xie et al., 2015).

Conclusion and Discussion

In this study, the value of ecosystem cultural services in Qilian Mountain National Park of Qinghai Province from 2016 to 2018 was assessed by Conditional Value Method. Through the evaluation, it is found that the value of ecosystem cultural services shows an increasing trend from 2016 to 2018. The value of ecosystem cultural services increased from 1,045 million yuan in 2016 to 1,300 million yuan in 2018. The values of tourism and recreation in 2016 and 2018 are 203 million yuan and 332 million yuan respectively, and the values of aesthetic service are 842 million yuan and 968 million yuan respectively. It reflects that with the improvement of tourism facilities in national parks and the introduction of relevant policies, the value of tourism and recreation is increasing, and the public's willingness to pay for ecosystem cultural services is also increasing. The value of tourism and recreation increases fastest every year, while the value of aesthetic service increases slightly. With the development of national park system and ecological civilization, the value of aesthetic service will be paid more and more attention and the related value will increase (Ridding et al., 2018). Therefore, in the future related management, the government should strengthen propaganda, enhance people's awareness of the ecosystem aesthetic services of Qilian Mountain National Park in Qinghai, focus on management, strengthen the aesthetic value of natural scenery of Qilian Mountain National Park, and build it into a replicable and reference National Park demonstration area. Accordingly, some issues are discussed:

1. Within the framework of MA, the value of ecosystem cultural services in national parks can be evaluated by investigating the willingness to pay of tourists and local residents, but there are some differences in WTP between tourists and local residents.

The invisibility of ecosystem cultural services has to some extent led to the lack of extensive attention to this service (Dong et al., 2014). The ecosystem cultural services proposed by MA framework include spiritual and religious services, knowledge system, educational value, inspiration, aesthetic value, social connection, sense of place, leisure and eco-tourism, etc. (Millennium Ecosystem Assessment, 2003), which is conducive to the use of relevant indicators for evaluation and the management of ecosystem services in national parks. Based on this framework, this study establishes an index system for evaluating the value of ecosystem cultural services, and obtains the value of ecosystem cultural services of Qilian Mountain National Park in Qinghai through questionnaire survey. From the evaluation results, it can be seen that there are some differences between tourists and local residents' willingness to pay. The willingness of tourists to pay is significantly higher than that of local residents, which is mainly due to their different demand for natural scenery in the survey area. According to the theory of "marginal effect", when other inputs are fixed and unchanged, the new output or income will gradually decrease with the continuous increase of one kind of input. Because of the need for natural scenery, tourists are limited by the number of tours, so their marginal benefits are often higher than those of local residents, and their willingness to pay is often higher. Therefore, when investigating willingness to pay, tourists and local residents should be distinguished, the value of ecosystem cultural services should be assessed by the method of classification analysis, and the two should not be mixed together for analysis. In this way, it is not only conducive to the scientific reflection of the value of cultural services, but also conducive to the scientific evaluation of the value of ecosystem cultural services.

2. There is a certain correlation between aesthetic service value and ecotourism and recreational value.

The same landscape can provide aesthetic, recreational, inspirational, and local services, but people may have different perceptions of cultural services in different ecosystems. Recreation and eco-tourism, aesthetic and educational values are often the most easily perceived. The results also show that it is difficult to distinguish tourism from recreation and aesthetic service value, and there is a strong correlation between them. The correlation coefficient of the two is 0.969, and there is a strong correlation between them. Therefore, it is not easy to distinguish ecotourism from recreational value and aesthetic service value in the survey, which requires improving the questionnaire design level and the cognitive ability of the respondents to eco-cultural services. It also shows that in order to improve the value of ecosystem cultural services in national parks, on the one hand, it is necessary to enhance tourists' cultural experience, on the other hand, it is necessary to strengthen the research skills of CVM and the design level of WTP/WAC, which should be paid attention to in the future research and is also the place for further improvement in this study.

References

Dong, L. C., Zhu, W. B., Gao, Y., & Li, S. C. (2014). Research progress in ecosystem cultural services. *Journal of Peking University (Natural Science Edition), 50*(6), 1155-1162.

Dou, Y., Zhen, L., Groot, R. D., Du, B. Z., & Yu, X. B. (2017). Assessing the importance of cultural ecosystem services in urban areas of Beijing municipality. *Ecosystem Services, 24*, 79-90.

He, S. Y., Su, Y., Wang, L., & Cheng, H. G. (2019). Realization of national park recreation function—Tourist ecosystem service demand and and willingness to pay in Wuyishan National Park pilot area. *Journal of Natural Resources, 34*(1), 40-53.

Liu, Y., Zhang, Y. J., Zhang, J., & Chen, J. Y. (2017). Study on the aesthetic value of ecosystem based on AHP and CVM method—Take Beishan National Forest Park in Qinghai as an example. *Forestry Economy, 39*(7), 95-102.

Millennium Ecosystem Assessment. (2003). *Ecosystems and human well-being: A framework for assessment*. Washington, DC: Island Press.

Peng, W. T., Liu, W. Q., Cai, W. B., Wang, X., Huang, Z., & Wu, C. Z. (2019). Value evaluation of ecosystem cultural services in urban protected areas based on participatory mapping: Taking Shanghai Gongqing Forest Park as an example. *Journal of Applied Ecology, 30*(2), 439-448.

Ridding, L. E., Redhead, J. W., Oliver, T. H., Schmucki, R., McGinlay, J., Graves, A. R., … Bullock, J. M. (2018). The importance of landscape characteristics for the delivery of cultural ecosystem services. *Journal of Environmental Management, 206*, 1145-1154.

Venkatachalam, L. (2004). The contingent valuation method: A review. *Environment Impact Assessment Revie, 24*, 89-124.

Xie, G. D., Zhang, C. X., Zhang, L. M., Chen, W. H., & Li, S. M. (2015). Improvement of ecosystem services valuation method based on unit area value equivalent factor. *Journal of Natural Resources, 30*(8), 1243-1254.

Xu, Y. D., Chen, J. Y., & Zhang, Y. J. (2016). Review of ecosystem cultural services. *Hebei Forest and Fruit Research, 31*(2), 210-216.

Zhang, J. (2015). Comprehensive evaluation of aesthetic value of ecosystem in Qinghai Province based on qualitative and quantitative methods (Doctoral dissertation, Beijing Forestry University, 2015).

Zhang, Y. (2015). *Ecological benefit assessment and balance sheet compilation: A case study of forest resources in Zhalantun City, Inner Mongolia*. Beijing: China Economic Publishing House.

Zhang, Z. (2019-03-18). Solving the practical problems of Qilian Mountain National Park system pilot area. *China Social Science Journal*. Retrieved from http://ex.cssn.cn/skjj/skjj_jjgl/skjj_xmcg/201903/t20190318_4849424.shtml