

Progress on evaluation of Alpine grassland degradation degree in Qinghai Province

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Abstract: The alpine grassland in Qinghai Province is very prone to degradation, and the local ecosystem is fragile. If damaged, it is difficult to recover in a short time. Because of alpine grassland degradation phenomenon will directly threaten the local ecological security and economic development, so the current research scholars strengthen the assessment of the degree of degraded alpine meadow, pay attention to the alpine grassland degradation phenomenon from the perspective of practice to master the spatial distribution law of deep excavation latent information value, in order to provide evidence for effective protection measures. On the basis of understanding the current alpine grassland degradation phenomenon in Qinghai Province, this paper systematically collected local basic geographic, social economic, scientific investigation and other data information, combined with the basic law of alpine grassland degradation, and used geographic information technology and statistical methods to determine the evaluation results of alpine grassland degradation degree in Qinghai Province. The final results showed that although the degradation of the local alpine grassland was still severe, with the improvement of the attention of various departments, the grassland protection work had achieved excellent results.

Keywords: Qinghai Province; Alpine grassland; Degradation degree; Soil degradation; Vegetation degradation

1. Introduction

Grassland, as a very important renewable resource in the ecological environment, contains rich hydrothermal resources and germplasm resources, which can not only guarantee the sustainable development of human production activities, but also have ecological functions such as protecting ecological diversity, greening and beautifying the ecological environment, and preserving soil and water. As grassland is an ecologically fragile zone, it is highly susceptible to degradation caused by external factors, and it is not easy to recover in subsequent treatment, so in the modern ecological environment protection work, researchers have gradually strengthened the research on grassland resources. Liu hong, XiaoLi macro and others, for example, put forward in the research, refers to the adverse natural grassland degradation under the influence of environmental factors, or in the case of human is not reasonable use, retrogressive succession of grassland ecological system, and a fall in production process, the whole process is also called grassland degradation, concrete embodiment in the decline in output, coverage rate is not high, the grassland vegetation height. In the case of continuous large-scale grassland degradation, the local ecological environment will continue to deteriorate, and the productivity of grassland itself will slowly decline, which will eventually harm the survival and development of human beings from multiple perspectives such as quality of life and living environment. In the Earth, the area of native grassland occupies about 40% to 45% of the land area. With the continuous expansion of human activities, the area of grassland on the earth becomes smaller and smaller, and stabilized between 22% and 25% in the late 19th century. As a big country in grassland resources, China has 392,83 million hectares of natural grassland, accounting for 41% of the total land area, ranking second in the world. However, due to the uneven distribution of grassland resources in China, natural grassland resources are mainly distributed in temperate grassland areas in the north, alpine grassland areas on the Qinghai-Tibet Plateau, and grassland areas in the east and south of China, so ecological protection work needs to be comprehensively analyzed according to the growth rules of different regions.[1.2.3]

Taking Qinghai Province as an example, this paper systematically discussed the evaluation results of local alpine grassland degradation degree, so as to provide an effective basis for practical protection and restoration work. The Qinghai-Tibet Plateau is a region with a wide distribution of alpine grasslands, unique ecological species and alpine climate, which constitute a typical alpine ecosystem and make this region the most concentrated area of biodiversity in high-altitude areas. In Qinghai Province, alpine grassland occupies 70% of the total area, which is the basic condition of local ecosystem and biodiversity, and plays an important role in improving water environment and regulating atmosphere. According to the practical research, the alpine grassland ecosystem in Qinghai Province has shown a trend of overall degradation. The cover area of alpine grassland continued to decline, the local grassland water conservation capacity was reduced, soil and water loss was aggravated, and the output of animal husbandry decreased. This will not only threaten THE ecological security and regional sustainable development of Qinghai-TIBET Plateau and the great RIVER basins, but also affect the protection of the overall ecological environment in China. Therefore, the suggestion has been paid high attention to by all aspects of the society, and has gradually become a research hotspot of grassland ecology. At present, there is a lack of necessity to understand the degradation of alpine meadow. The reason is that the remote sensing classification index for evaluating the degradation of alpine meadow is not ideal, and many factors are not considered in practical thinking. Therefore, in this paper, we study the collected data information, the local grassland of qinghai province by using the statistical method to the model, the integration of the basic features of degraded alpine meadow was studied and the main reason, quantitative processing driving factors, comprehensive assessment of degraded alpine meadow in qinghai province, details are shown in figure 1 below, intuitive presented its internal distribution, It has a positive influence on the sustainable development of regional economy.[4.5]

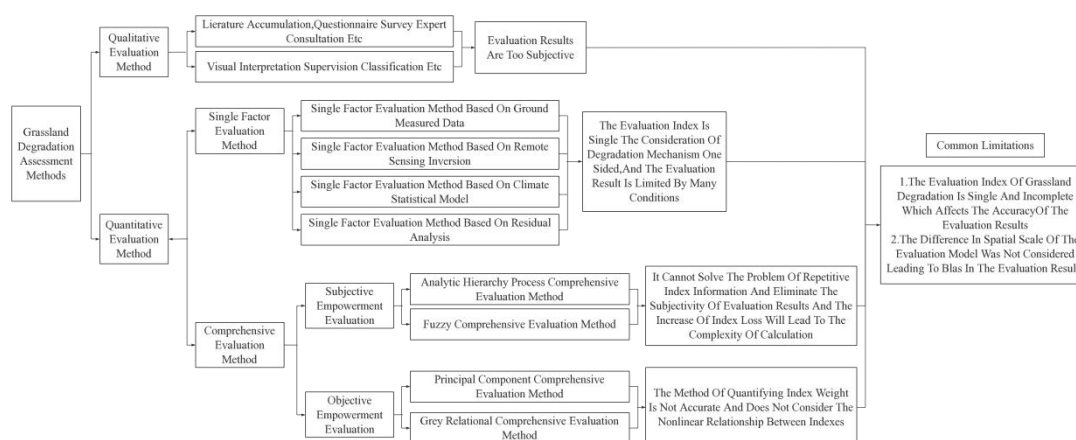


Figure 1. Knowledge structure of grassland degradation assessment method

2. Method

2.1 Grassland Resources

Grass is refers to the growth of vegetation or the wood plant, animal, microbial life of ecosystem and landscape, it is mainly used for land part of human life and production, therefore which contains natural and cultivated land with grass production characteristics, as well as related to the climate, land, water, site features and carry. Before the intervention of human activities, the original grassland area of the Earth is about 40 to 45 percent of the land area, but with the increasing influence of human work and grazing activities, the grassland area on the Earth is gradually reduced, and the modern world grassland area occupies only 24 percent of the Earth's total land area.[6.7.8]

2.2 Alpine grassland

Alpine grassland, as a high-altitude and high-cold arid region, is mainly distributed in the mountains with an average altitude of more than 3 kilometers. The annual average temperature is controlled at about zero degrees Celsius and the annual precipitation is less than 600 mm. It is composed of ultra-xerophytic and cold-temperature tolerant herbs, and belongs to a very typical grassland ecosystem. Nowadays, there is no uniform standard for the classification of alpine grassland vegetation types. In this study, the research results of comprehensive sequential classification are mainly used for analysis. The specific types and classification indexes are shown in Table 1 below:[9.10]

Table 1 Classification results of alpine grassland

Type	>0℃ annual accumulated temperature (℃)	Moisture	The main distribution
Alpine desert grassland	<1300	<0.3	Northern Tibet, southern Xinjiang Kunlun Mountains, Pamir Plateau area
Alpine desert steppe grassland	<1300	0.3-0.9	The northwest of the Qinghai-Tibet Plateau and Tianshan, Kunlun Mountains and other areas
Alpine grassland grassland	<1300	0.9-1.2	The central part of the Qinghai-Tibet Plateau drinks the southern part, the Pamir Plateau and the Tianshan Mountains, the Kunlun Mountains drink the Qilian Mountains and other high mountains in central Asia
Alpine meadow grassland grassland	<1300	1.2-1.5	The eastern Tibetan Plateau, the northwestern Sichuan Plateau and the high mountains of Gannan and eastern Tibet
Alpine meadow meadow	<1300	>1.5	The eastern part of the Qinghai-Tibet Plateau ranges from the southeastern part to the Qilian and Tianshan Mountains in central Asia, extending to the Taibai Mountains in the Qinling Mountains and the XiaoWutai Mountains in Hebei Province

2.3 Evaluation Index

At present, there are not many evaluation index systems proposed by scholars around the world for the degradation degree of alpine grassland. Most of them use a single indicator for research, such as the number of aboveground organisms and vegetation coverage, etc. Some scholars also build a comprehensive evaluation index system to analyze the degradation degree of alpine grassland in Qinghai Province. From the overall point of view, there is no evaluation system that can not only show the essential characteristics of alpine grassland degradation, but also reflect the causes of alpine grassland degradation.

In this study, the selection of the actual evaluation index system should follow the following principles: First, the essential feature of this phenomenon is grassland degradation, and it is not accurate to evaluate the degradation degree of alpine grassland only from a certain Angle, so the selection of evaluation index should comprehensively consider the two characteristics of grassland. Secondly, alpine grassland degradation is the result of the influence of natural factors and human factors, so the selection of alpine grassland degradation indicators should start from these two aspects, only in this way can we accurately judge and evaluate the degradation of alpine grassland. Finally, the evaluation indicators should be concise, which can directly reflect the essential characteristics and main causes of alpine grassland degradation, and each indicator should be easy to understand and independent from each other, so as to prevent duplication of indicators.

According to the evaluation and research results of domestic and foreign scholars on the growth status of grassland vegetation, considering the influence of natural factors and human factors on the growth composition of alpine grassland in Qinghai Province, the most critical influencing factors were selected as evaluation indicators, and the results as shown in Table 2 below were finally obtained:

Table 2 Evaluation index system based on alpine grassland vegetation growth status

Level of influence	The secondary impact	Index of influencing factors
Natural factors	Climate factors	Temperature, precipitation, total solar radiation, wind speed
	Biological factors	Rat hole area
Human factors	Overgrazing	Grazing intensity
	Human exploitation and utilization	Non-urban population density

When studying the phenomenon of soil erosion in alpine grassland, it was found that the evaluation was an intuitive expression of soil degradation. Therefore, appropriate evaluation indexes should be selected correctly and the evaluation index selection method of alpine grassland vegetation growth should be strictly followed, and the results as shown in Table 3 below were finally obtained:

Table 3 Evaluation index system based on soil erosion in alpine grassland

Level of influence	The secondary impact	Index of influencing factors
Natural factors	Climate factors	Precipitation, wind speed
	Soil factors	Soil texture content, soil organic carbon content
	Topographic and geomorphic factors	Long slope, sloping land
	Biological factors	Vegetation coverage
Human factors	Overgrazing	Grazing intensity
	Human exploitation and utilization	Non-urban population density

Combined with the above forms of alpine grassland degradation, the degradation forms were comprehensively analyzed, and the comprehensive evaluation index system as shown in Figure 2 below was finally obtained:

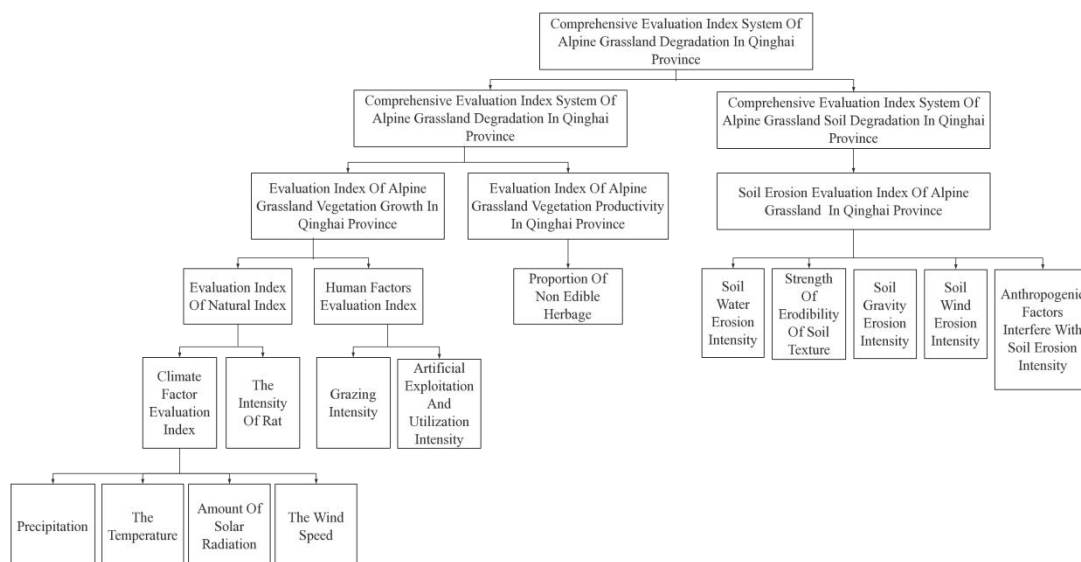


FIG. 2 Comprehensive evaluation of degradation degree of alpine grassland

2.4 Basic Methods

Firstly, the meteorological data space difference method. The meteorological station data obtained in this paper should be combined with ANUSPLIN program to realize the spatial difference of meteorological data. At present, this procedure has become a common spatial difference tool for climate data, and has a unique application value in the evaluation of alpine grassland degradation degree. The specific operation process is shown in Figure 3 below. Secondly, the vegetation information extraction method. The enhanced vegetation index is proposed by combining the spectral features of vegetation. It combines the reflectance of ground objects within two or more wavelength ranges in the satellite detection data to enhance some features or details of the paper cup. At present, because there are many kinds of vegetation index, seven categories with strong practicability are summarized according to the current research results, which involve chlorophyll, broadband rate, narrow-band intensity, light utilization rate, drought or carbon decay and many other indexes. Finally, the integrated sequence classification of grassland. The common grassland classification methods include land botany classification, plant community classification, climate botany classification, agricultural management classification, etc. Among them, the comprehensive sequential classification of climate land plants has become one of the most widely used classification methods after the practice and exploration in recent decades. The specific classification system is shown in Table 4 below:

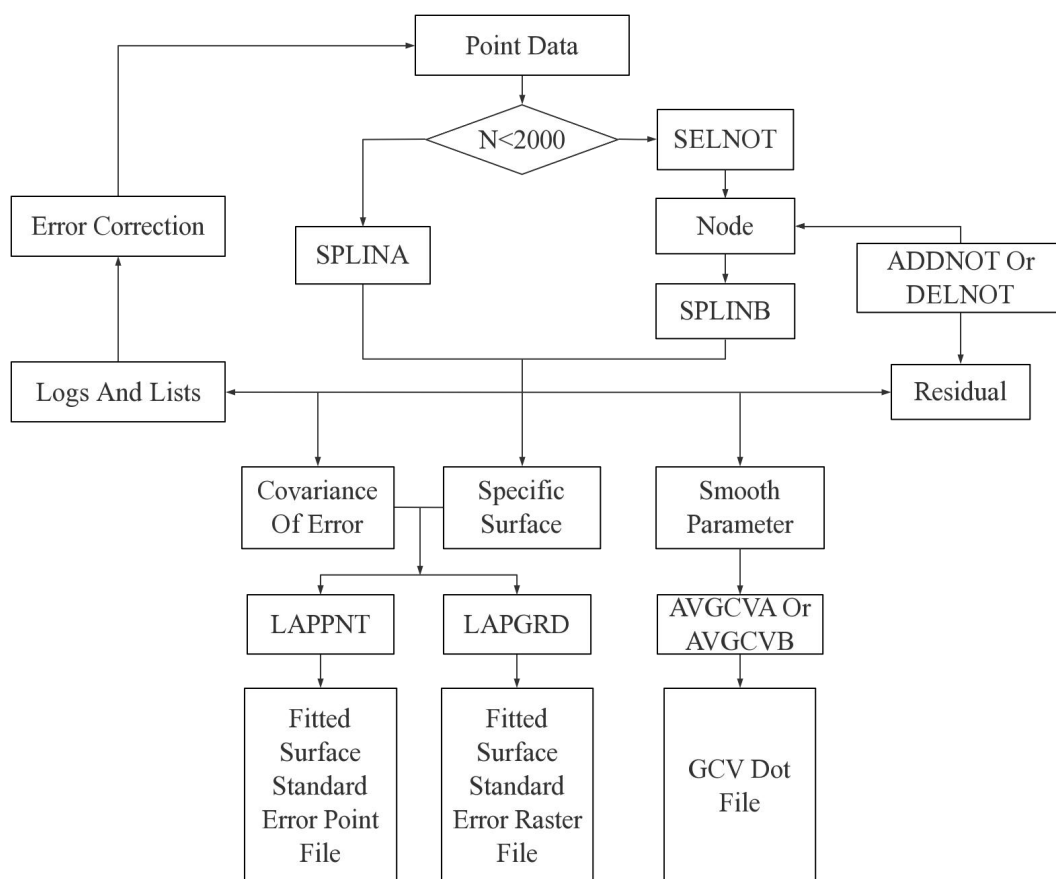


Figure 3 Flowchart of the ANUSPLIN program

Table 4 Classification system of grassland comprehensive order

Years of accumulated temperature	Temperature and humidity					
	<0.3	0.3-0.9	0.9-1.2	1.2-1.5	1.5-2.0	>2.0
<1300	Cold extremely dry boreal desert, alpine desert	Cold arid cold zone semi-desert, alpine semi-desert	Cold dry dry tundra, alpine grasslands	Cold moist little rain tundra, alpine meadow grassland	Cold wet tundra, alpine meadow	Cold wet and rainy tundra, alpine meadow
1300-2300	Cold wet extremely dry mountain desert class	Cold wet arid mountain semi-desert class	Cold and mild dry mountain steppe class	Cold moist mountain meadow grassland type	Cold and humid mountain meadow	Cold warm moist cold warm coniferous forest
2300-3700	Slightly wet and extremely dry temperate desert	Semi-desert of mild humid arid warm temperate zone	A typical type of temperate and dry grassland	Gentle moist meadow grassland	Lukewarm moist forest grassland, broad-leaved forest	Mixed coniferous broad-leaved forest with mild humidity
3700-5300	Mild dry warm temperate desert	Warm temperate arid semi - desert	Warm mild dry warm temperate typical grassland	Warm moist forest grassland type	Warm moist deciduous broad-leaved forest	Warm moist deciduous broad-leaved forest
5300-6200	Warm hot extremely dry subtropical desert	Warm hot arid subtropical semi-desert	Warm - dry subtropical grass shrubby steppe	Warm and moist deciduous broad-leaved forest	Warm moist evergreen deciduous broad-leaved forest	Warm moist deciduous evergreen broad-leaved forest
6200-8000	Subthermal extreme dry subtropical desert	Subthermal arid subtropical desert shrublands	Subthermal microdry subtropical grass shrubby steppe	Subthermal moistening sclerophyll forest grass shrub class	Subthermal moist evergreen broad-leaved forest	Subthermal moist evergreen broad-leaved forest
>8000	A hot, extremely dry tropical desert	Hot arid tropical desert scrub	Hot slightly dry savanna	Hot moist dry forest	Hot humid monsoon rainforest	Hot humid rainforest class

3. Result analysis

In determining of evaluation system and operation process of degraded alpine meadow, alpine grassland ecological condition in this paper, we study the combination of qinghai province in recent years, from the vegetation degradation and soil degradation, these two aspects is analyzed, on the basis of the corresponding comprehensive evaluation model was constructed, using the comprehensive evaluation index to study the degradation, would eventually be able to get the results are shown in table 5 below:

Table 5 Correlation analysis results of the comprehensive evaluation index

		The sum of the trend index of coverage, forage availability and soil organic matter content	Comprehensive evaluation index of alpine grassland degradation
The sum of the trend index of coverage, forage availability and soil organic matter content	Pearson correlation coefficient (R)	1	0.5.4
	Significance (P)		0.001
	Number of samples (N)	43	43
Comprehensive evaluation index of alpine grassland degradation	Pearson correlation coefficient (R)	0.504	1
	Significance (P)	0.001	
	Number of samples (N)	43	43

Combined with the above analysis, it is found that the P value of the two trend indices is lower than 0.01. After the significance test and analysis, the R value reaches 0.504, which proves that the two coefficients are highly correlated and the final evaluation result is accurate. In this paper, the restoration state of alpine grassland in Qinghai Province from 2015 to 2020 was selected as the research experiment. The practical data proved that the local alpine grassland had been well restored, and the relevant departments had made excellent achievements in grassland protection. At the same time, it can be intuitively found that the degradation of alpine grassland in the central and eastern regions of Qinghai Province is still very serious. Due to the different climatic conditions on different kinds of alpine meadow plant growth condition has the difference, the influence of which the influence of climate on all kinds of plant growth status difference minimum, while the solar radiation, wind speed, precipitation and other differences in the composition of, so, when making the grassland recovery solution according to the different parts of the growth regularity and characteristics of deep research.

4. Conclusion

To sum up, combined the technology of computer software simulation analysis of evaluation results of degraded alpine meadow in qinghai province, and connecting with the practice of collecting data, this paper compares and analyzes can prove in this paper, we study the comprehensive evaluation index system and the practice research of consistent, alpine grassland recovery in good condition, at the same time the local authorities has achieved excellent results in the practical work. Therefore, in the future, researchers should continue to discuss how to use artificial intelligence, cloud computing, unmanned aerial vehicles and other advanced technologies to improve the growth status of alpine grassland in Qinghai Province, and pay attention to solving the degradation problem on a basic basis, so as to build a good ecological environment.

Reference

- [1] Youlong He, Qian Zhang,Zhonghua Zhang, et al. Research progress on effects of alpine grassland degradation on soil microorganisms in Qinghai-Tibet Plateau [J]. Qinghai Journal of Animal Husbandry and Veterinary Medicine, 2020, 050(006):43-51.
- [2] Rongrong Ma , Guozhu Yang, Yueming Hu, et al. Application of data mining algorithm in correlation analysis of driving factors of Alpine Grassland Degradation [J]. Earth Science Frontiers, 2021, 28(4):9.
- [3] Zan Wu , Yunfeng Peng , Guibiao Yang, et al. Effects of Alpine grassland degradation on soil and microbial stoichiometry in Tibetan Plateau [J]. Chinese Journal of Plant Ecology, 2022, 46(4):12.

- [4] Chengyi Li, Defei Liang, Xilai Li, et al. Effects of nitrogen addition on vegetation restoration of degraded alpine grassland on different slopes [J]. Journal of Qinghai University, 2020, 38(4):6.
- [5] Jin-Sheng He, Haiyan Bu. Near-natural restoration of degraded alpine grassland: theoretical basis and technical approach [J]. Chinese Science Bulletin, 2020, 65(34):11.
- [6] Ya Min Gao, Hui Qin lu, Tuo Yao, et al. Isolation and identification of arbuscular Mycorrhizal fungi (AMF) from the roots of Alpine degraded grass [J]. Acta Prataculturae Sinica, 2020, 29(1):10.
- [7] Zhi Chen. Changes in plant diversity during artificial restoration of alpine degraded grassland [J]. Agriculture and Technology, 2021, 041(024):81-84.
- [8] Fawei Zhang, Hongqin Li, Libei Yi, et al. Spatial drivers of soil organic carbon, total nitrogen and total phosphorus in alpine meadow surface soil of Sanjiangyuan National Park, China [J]. Acta Ecologica Sinica, 2022.
- [9] Shixiong Li, Yuqin Wang, Yanlong Wang, et al. Vegetation characteristics of alpine meadow at different degradation stages in the source region of the Yellow River [J]. Qinghai Journal of Animal Husbandry and Veterinary Medicine, 2020, 50(2):8.
- [10] Jun Yang, Wei Zhan, Xiang Tao Wang. Effects of 10 years of fencing on plant community characteristics of degraded alpine meadow in northern Tibet [J]. Chinese Journal of Grassland, 2020(042-006).