

ESTABLISHMENT AND APPLICATION OF NWA SYSTEM IN WATERSHED ECOSYSTEM QUALITY ASSESSMENT BASED ON RS AND GIS

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1. INTRODUCTION

Watershed integrative management has increasingly become important due to human disturbance and climate change. At present, many researchers are focusing on assessment of watershed ecosystem quality. Therefore, more attention is given to study evaluation indicator system. Many indicators, which are made of a certain assessment system, have been used but have no uniform criterion. Natural constraint factor-watershed health indicator factor-anthropogenic disturbance factor (NWA) is proposed to be an assessment system in this study. Our objective is to establish applicable assessment system which will be applied to evaluate Jinchuan River watershed for its integrative management and sustainable development.

2. MATERIALS AND METHODS

2.1 Study area

Jinchuan River Basin is located in Northwest China (101°8' -102°55' E, 37°32' -38°54' N) with an area of 10,880km². The climate is characterized by dry. The mean annual air temperature is 4.6°C. The mean annual precipitation is 140.3mm with 42% of precipitation falls between July and September.

2.2. Data collection

NWA assessment system is made of three parts: natural factors, watershed health indicator factors and anthropogenic disturbance factors. Natural factors, such as precipitation, annual runoff, solar radiation, soil property in the study area, are mainly considered; Watershed health factors include landscape characters, vegetation, biodiversity, water resource, soil erosion. Anthropogenic disturbance factors are population, economic production, land use. Total 12 indicators are in the system. Some of them were spatialized by RS&GIS. The data collected are six images CBERS-02 remote data (July 10, 2006), Landsat5 TM, 1:250000 DEM, and field investigation.

2.3. Methods

First many factors were analyzed in the study. Crucial factors were selected to establish the assessment system. Framework of NWA assessment system is showed in Fig.1. Twelve indicators such as NPP, coverage of vegetation, land deterioration index, ecological flexibility, water density index, landscape index (evenness, fragmentation, diversity), land reclaimed index, non-point source pollution load, population density and per capita GDP were selected. Secondly, Each indicator were normalized to 0-10 and the final score was classified into five levels that indicates the different status of ecosystem quality by 0-3.50, 3.51-5.50, 5.51-7.00, 7.01-8.50, 8.51-10. To quantify and normalize these factors, two approaches must be taken into account: i) indicators computing supported by RS&GIS and their dimensionless transform; ii) determining the weight coefficient of each indicators from experts.

3. RESULTS AND DISCUSSION

Some results can be obtained in the study: 1) the threshold of good quality in Jinchuan River Basin ecosystem ranges from 1.48 to 7.98. The area of good quality status occupied almost 30.3% of total area in Jinchuan River basin, where has high vegetation coverage and the ecosystem can exert its basic function. The other part, which accounts for 69.7% of total area in

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the study area are fragile and unstable area. It includes the edge of oasis, desert area and area disturbed intensively by the human activities. 2) the spatial distribution of the integration five levels are descending from the upper reaches to the middle reaches and then to the lower reaches; 3) as the typical representative towns of mountain (Huangcheng), mountain-oasis (Xinchengzi), oasis (Hongshanyao), oasis-desert (Dongzhai), desert area (Hongshagang), we found the quality of ecosystem in these towns is gradually deteriorated. 4) water resource is the main manipulative indicators of watershed ecosystem quality in the study area.

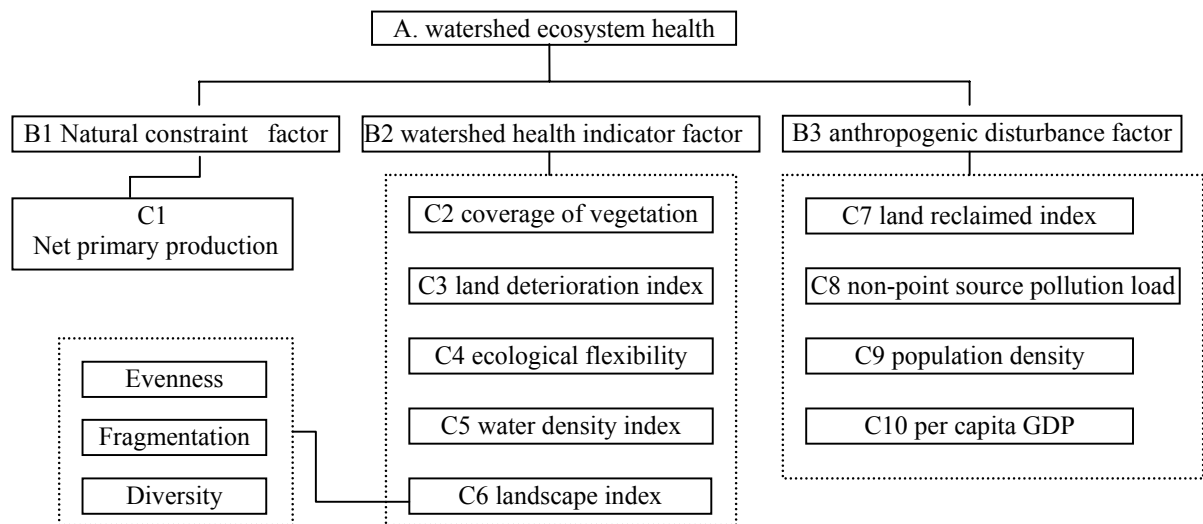


Fig.1 Framework of NWA assessment system

4. CONCLUSION

From the approach, conclusions can be drawn: (1) built the NWA assessment system to evaluate the watershed ecosystem quality. (2) quantified the quality of ecosystem in Jinchuan River Basin and will provide theoretical support for the watershed integrative management. (3) built an comparative ecosystem database with spatial and attribute data based on RS&GIS.

5. REFERENCES

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