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Time Series Dataset of Land Use/Cover Change in the Jingchuan Basin

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Abstract: The Jingchuan basin refers to the river catchment area above Jingchuan county of the upper reaches of the Jing river, which is the largest tributary of the Wei river. The land use classification system of the Jingchuan basin consists of six first-level categories and 14 second-level categories. The first-level categories include forest land, grass land, wetland, cultivated land, artificial surface, and bare land. On the basis of multitemporal Landsat MSS/TM/OLI series images from 1976 to 2015 and platforms of eCognition and ENVI, a time series dataset (1976–2015) of land use change in the Jingchuan basin was extracted using the methods of decision tree classification and object-oriented information extraction based on knowledge rule sets. The datasets include (1) Jingchuan basin boundary data; (2) land use spatial distribution dataset of ten periods from 1976 to 2015 (including 1976, 1991, 1995, 2000, 2003, 2007, 2010, 2013, and 2015), the spatial resolution of which in 1976 was 60 m, 15 m in 2013 and 2015, and 30 m in other years; (3) land use change dataset during 1976–1991, 1991–2000, and 2000–2015 periods, the resolution of the latter is 15 m, and the resolution of the former two phases is 30 m. The datasets are archived in the format of .shp or .tif, and comprise 73 files with 252 MB (compressed into two files with 6.83 MB data size).

Keywords: Jingchuan baisn; land use/cover; 1976–2015; Yellow River basin

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The dataset supporting this paper was published and is accessible through the *Digital Journal of Global Change Data Repository* at: https://doi.org/10.3974/geodb.2021.09.03.V1 or https://cstr.escience.org.cn/CSTR:20146.11.2022.09.03.V1.

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1 Introduction

The Jing river is the first tributary of Wei river, which rises in the eastern foot of the Liupan Mountain and is located at 106°14′E–108°42′E, 34°46′N–37°19′N, in the northwest part of the Loess Plateau. It runs through Shaanxi, Gansu and Ningxia provinces and finally flows into the Wei river. The Jingchuan basin has good irrigation conditions, developed agriculture and great potential for economic development, all of which make it a grain-producing area in northwest china[1]. However, the terrain is fragmented, vegetation coverage is low, forestland and grassland only account for 10% of the total area of the basin, and soil erosion is serious. Thus, it was listed as one of the first demonstration areas of the returning farmland to forestland and grassland project in China in 2000. It was also listed as a new round of poverty alleviation projects to return farmland to forestland in 2014[2]. The Jingchuan basin refers to the river catchment area upstream of the Jingchuan hydrologic station, located in the southwest of the Jing river basin with the terrain high in the west and low in the east. It belongs to the semi-humid transitional zone with the characteristics of warm temperate climate and mountain climates on the Loess Plateau[3]. According to the observation data of Pingliang meteorological station, the annual average temperature is 8.9 °C, and the annual precipitation is 355–845 mm. The precipitation in summer is more than that in the Jingchuan basin, and the interannual variation of precipitation is significant. In recent years, China has carried out large-scale ecological restoration projects in the Yellow River basin; changes in land use patterns, such as returning farmland to forestland and restricting arbitrary mining and exploitation, have led to great changes in land use in the Jing river basin[4,5], resulting in corresponding changes in its ecosystem structure.

Therefore, based on the American Landsat MSS/TM/OLI series remote sensing images, long time series datasets of land use distribution and their changes in the Jingchuan basin from 1976 to 2015 were extracted using decision tree classification and object-oriented information extraction based on knowledge rule set with visual interpretation. The regional characteristics of the Jingchuan basin were considered, and the land use /cover classification system[6] of ecological decade environmental remote sensing were referred to. The accuracy of land use datasets were validated using high resolution Google images, field sampling point data and the existing ecological decade dataset (2010) to comprehensively understand the land use types and their dynamic trends in the Jingchuan basin. Such validation can provide data support for the evaluation of ecological services and the formulation of guidelines and policies for the sustainable development of the basin, and serve as a scientific basis for the ecological protection and high-quality development of the Yellow River basin.

2 Metadata of the Dataset

The metadata of Time series land use/cover change dataset in Jingchuan basin (1976–2015)[7] is summarized in Table 1. It includes the dataset full name, short name, authors, year of the dataset, temporal resolution, spatial resolution, data format, data size, data files, data publisher, and data sharing policy, etc.

3 Methods

3.1 Data Sources

Landsat MSS/TM/OLI series images which were used in the production of datasets in this study, were taken from USGS. According to the requirements of land use interpretation and the cloud coverage and quality of images in the study area, 21 images of 10 periods were obtained. Table 2 shows the sensor, data time, spatial resolution and column-number-mode. The ecological decade data (2010) of 30 m spatial resolution were collected from a Chinese ecosystem survey and assessment. The DEM with a 30-m spatial solution for the field survey was obtained from USGS. The monthly meteorological data of the Pingliang station in the Jingchuan basin were derived from the monthly dataset of China surface data of the National Scientific Meteorological Center.

Table 1 Metadata summary of the Time series land use/cover change dataset in Jingchuan basin (1976–2015)

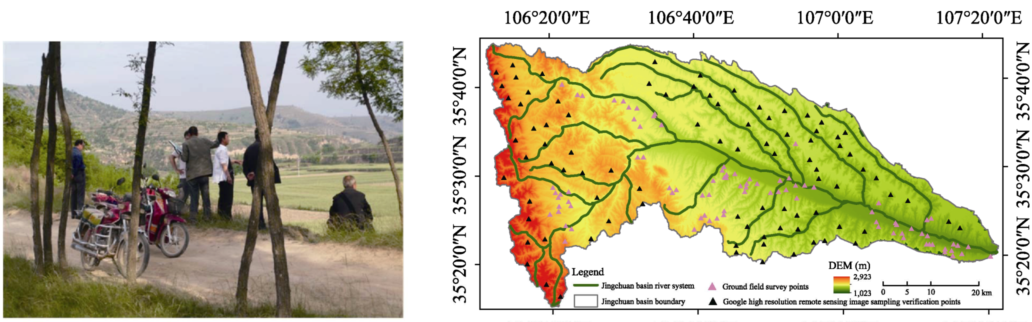
Items	Description
Dataset full name	Time series land use/cover change dataset in Jingchuan basin (1976–2015)
Dataset short name	LanduseJingChuanBasin_1976-2015
Authors	Wang, R. 0000-0001-5497-3447, Tianshui Normal university, 0119061@stu.lzjtu.edu.cn Wang, Y. Q. 0000-0002-1791-3741, Chinese Land Surveying and Planning Institute, freefly_99@126.com Hu, L. B. 0000-0002-1265-5309, Tianshui Normal university, 398361732@qq.com
Geographical region	Jingchuan basin
Year	1976, 1991, 1995, 2000, 2003, 2005, 2007, 2010, 2013, 2015
Temporal resolution	Year
Spatial resolution	60 m×60m in1976; 30 m×30m in 1991, 1995, 2000, 2003, 2005, 2007, and 2010; 15 m×15m in 2013 and 2015
Data format	Jingchuan basin boundary data, .shp; land use/cover types and their dynamic change data, .tif
Data size	252 MB
Foundations	School-listed Innovation Foundation of Tianshui Normal university in 2020 (CXJ2020-14); Higher Education Innovation Ability Promotion Project of Gansu Provincial Education Department in 2019 (2019B-134)
Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	***Data*** from the Global Change Research Data Publishing & Repository includes metadata, datasets (in the *Digital Journal of Global Change Data Repository*), and publications (in the *Journal of Global Change Data & Discovery*). ***Data*** sharing policy includes: (1) ***Data*** are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use ***Data*** subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute ***Data*** subject to written permission from the GCdataPR Editorial Office and the issuance of a ***Data*** redistribution license; and (4) If ***Data*** are used to compile new datasets, the 'ten per cent principal' should be followed such that ***Data*** records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset[7]
Communication and searchable system	DOI, CSTR, Crossref, DCI, CSCD, CNKI, SciEngine, WDS/ISC, GEOSS

3.2 Research and Development Processing

Taking the land cover classification system of the Ecological Environment Remote Sensing Monitoring Annual Reports in the past decade as references, the land use classification system was formulated. Considering the regional characteristics of the Jingchuan basin, the evergreen broad-leaved forest, evergreen broad-leaved shrub and evergreen coniferous shrub and tree were excluded from the secondary forest classification. No wetlands or lakes are found in the Jingchuan basin; thus, only reservoirs/pits and rivers were reserved in the secondary wetland classification. Table 3 presents the classification system and codes of land use/cover in the Jingchuan basin. On the basis of the Landsat MSS/TM/OLI series images, land use information was extracted through decision tree classification and objected-oriented multiresolution segmentation, combined with DEM and its derived slope data. Doing so determined the interpretation marker on the basis of object classes and established corresponding rules. The object-oriented information extraction results were further processed through visual interpretation. To analyze the land use types and the corresponding dynamic change trends, the accuracy was validated and evaluated using Google Earth high-resolution remote sensing images, field sampling data and ecological decade data (2010). Figure 2 illustrates the R&D technical flow chart.

Table 2 Data sources of Land use/cover time series dataset of the Jinchuan basin (1976–2015) products

Year	Sensor	Data time	Spatial resolution	Row and path
1976	MSS	1976-6-10	60 m	138035/138036
1991	TM	1991-8-23, 1991-8-30	30 m	128035/129035
1995	TM	1995-8-18, 1995-8-25	30 m	128035/129035
2000	TM	2000-4-16, 2000-7-30	30 m	128035/129035
2003	TM	2003-6-6, 2003-6-5	30 m	128035/129035
2005	TM	2003-8-15, 2005-7-12, 2005-10-7	30 m	128035/129035
2007	TM	2007-5-6, 2007-8-3, 2007-9-20	30 m	128035/129035
2010	TM	2010-4-28, 2010-5-23	30 m	128035/129035
2013	OLI	2013-10-6, 2013-11-14	15 m	128035/129035
2015	OLI	2015-5-12, 2015-7-24	15 m	128035/129035



(a) Field survey sampling photos (b) Spatial distribution of sample points

Figure 1 Field sampling and spatial distribution of samples

Table 3 Classification system used for the dataset

Level Ⅰ classification and code	Level Ⅱ\Ⅲ classification and code	Level Ⅰ classification and code	Level Ⅱ\Ⅲ classification and code
1 Forest	101 Broadleaved deciduous forest	3 Wetland	32 River
	102 Evergreen coniferous forest	4 Cultivated land	41 Dryland
	103 Deciduous coniferous forest	5 Artificial surface	51 Residence
	104 Coniferous and broad-leaved mixed forest		52 Industrial land
	105 Deciduous broad-leaved bush		53 Transportation
2 Grass land	21 Grass land		54 Stope
3 Wetland	31 Reservoir/Pit	6 Others	61 Bare land

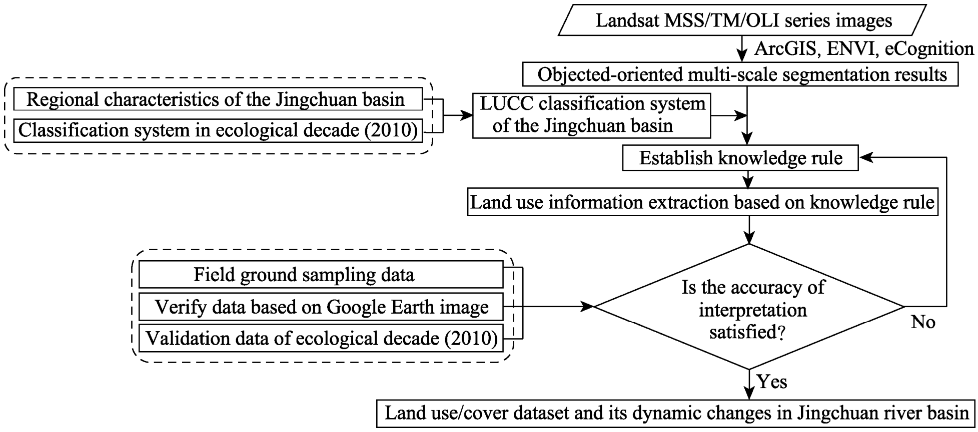


Figure 2 Research and development technical flow chart

4 Data Results and Validation

4.1 Data Composition

The land use/cover time series dataset of the Jingchuan basin (1976–2015) has 73 data files, which include the land use/cover distribution dataset, land use/cover change dataset and Jingchuan basin boundary dataset. The data are as follows:

(1) The land use/cover distribution dataset includes 10 periods of land use/cover type distribution data in 1976, 1991, 1995, 2000, 2003, 2005, 2007, 2010, 2013 and 2015 (Figure 2) in .tif format; the temporal resolution is year, and the spatial resolution was 60 m × 60 m in 1976; 30 m × 30 m in 1991, 1995, 2000, 2003, 2005, 2007 and 2010; 15 m × 15 m in 2013 and 2015. It is labelled “LandCover_JingchuanBasin_year.tif” where the grid value represents the land use/cover type code, as shown in Table 3 (e.g., the grid value “41” represents “dryland”).

(2) The land use/cover change dataset comprises three periods (i.e., 1976–1991, 1991–2000 and 2000–2005) of land use/cover change dataset (Figure 4) in.tif format; the temporal resolution is 16, 10 and 16 years, respectively; the spatial resolution was 30 m × 30 m in 1976–1991 and 1991–2000 and 15 m × 15 m in 2000–2015. It is named “LandCoverChange_JingchuanBasin_start year_end year.tif” (e.g., the land use/cover change data from 1976 to 1991 are labelled as LandCoverChange_JingchuanBasin_1976_1991.tif where the grid value represents the change of land use/cover types; “4121” indicates that the land use type changes from “dryland (41)” to “grassland (21)”).

(3) The Jingchuan basin boundary dataset has a scale of 1:50000 in .tif format, and the file was labelled “Jingchuan Basin_Boundary.shp”.

4.2 Data Results

4.2.1 Land Use of the Jingchuan Basin from 1976 to 2015

Figure 3 shows the land use information extraction results of ten periods from 1976 to 2015.

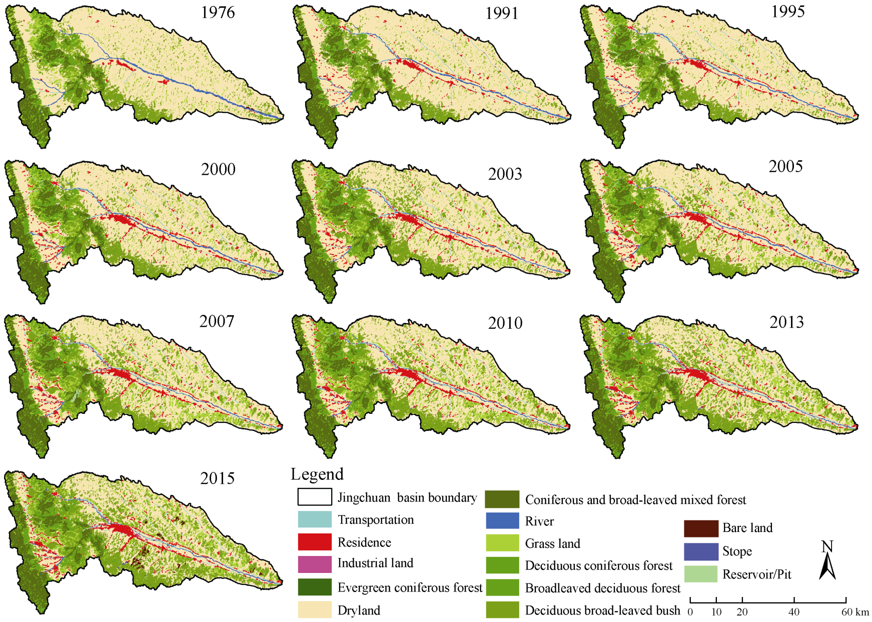


Figure 3 Spatial distribution of ten periods land use classification dataset from 1976 to 2015

Table 4 Statistics of land use area in the Jingchuan basin from 1976 to 2015 (Area unit: km^2)

Land use types	Year									
	1976	1991	1995	2000	2003	2005	2007	2010	2013	2015
X_1	12.51	42.19	50.85	71.82	71.69	79.69	82.20	87.94	94.58	95.32
X_2	15.03	17.29	18.11	18.19	22.68	22.62	22.61	22.93	22.80	22.83
X_3	1,776.95	1,929.14	1,892.25	1,594.63	1,565.87	1,522.03	1,345.47	1,264.61	1,187.54	1,124.85
X_4	43.20	32.12	27.20	29.32	20.78	24.55	20.83	20.67	18.49	21.28
X_5	653.94	469.14	498.37	731.18	703.47	725.50	889.07	919.10	917.89	899.38
X_6	153.76	152.37	162.16	164.61	161.77	161.37	160.73	163.70	166.30	166.59
X_7	309.30	293.83	291.76	328.07	387.07	395.34	406.49	442.96	510.82	562.50
X_8	1.80	0.21	–	–	–	–	–	–	–	19.62
X_9	180.46	194.01	186.67	188.25	191.34	192.08	191.77	194.27	195.80	195.77
X_{10}	0.92	9.22	10.84	10.62	11.30	12.38	14.47	16.23	16.89	17.13
X_{11}	–	0.89	0.89	1.05	0.84	0.99	1.81	1.17	1.17	1.71
X_{12}	4.13	12.41	13.70	13.66	13.74	13.75	13.76	13.88	13.86	13.83
X_{13}	–	–	–	1.13	1.30	1.66	2.05	2.84	2.42	6.89
X_{14}	–	0.01	0.05	0.06	0.84	0.71	1.42	2.40	3.61	4.56

Notes: Residence (X_1), Evergreen coniferous forest (X_2), Dryland (X_3), River (X_4), Grass land (X_5), Broadleaved deciduous forest (X_6), Deciduous broad-leaved bush (X_7), Bare land (X_8), Coniferous and broad-leaved mixed forest (X_9), Transportation (X_{10}), Reservoir/Pit (X_{11}), Deciduous coniferous forest (X_{12}), Industrial land (X_{13}), Stope (X_{14}), and "–"represent that there is no conversion between the two types of land use.

Figure 3 shows that the land use types were relatively single in 1976 and have tended to be stable since 1991. The grassland and residential areas have significantly increased through the years. Coniferous and broad-leaved mixed forests, deciduous broad-leaved bushes and broad-leaved deciduous forests were mainly distributed in high altitudes. The residence was mainly distributed at the sources of the Xie river and Houxia river and the valley on both sides of the Jing river. Since 2003, the area of stope has gradually expanded, which is mainly distributed in the rock mining areas in the southern Kongtong district of Pingliang. Industrial land is mainly distributed in the industrial park on the south side of the Jing river in the middle of the Kongtong district. The main reservoir is Wolongshan reservoir in Jingchuan county. As presented in Table 4, the dryland area decreased by 647.10 km^2 from 1976 to 2015, but the areas of grassland and deciduous broad-leaved shrub increased year by year, that is, 245.44 and 252.19 km^2, respectively. Except for the average annual expansion rate of residential areas, which was 2.12 km^2/a that reached the maximum in 1991, areas of other human activities, such as transportation, industrial land, stope and reservoir/pit, increased year by year from 1991 to 2015. The increased area of transportation has reached 17.13 km^2, 18.62 times of 1976, the largest amongst the areas of human activities.

4.2.2 Dynamic Change of Land Use in the Jingchuan Basin from 1976 to 2015

Figure 4 shows land use dynamic changes during 1976–1991, 1991–2000, and 2000–2015 periods, and corresponding transfer matrixes are shown as Table 5–7.

Table 5 Dynamic transfer matrix of land use from 1976 to 1991 (Area unit: km^2)

Types before transfer	Land use/cover types after transfer											Sum
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_9	X_{10}	X_{11}	X_{12}	
X_1	–	–	1.81	–	–	–	–	–	0.03	–	–	1.84
X_2	–	–	0.04	–	–	–	–	–	--	–	–	0.04
X_3	19.05	–	–	2.32	1.41	1.40	5.42	–	4.89	–	–	15.44
X_4	0.10		10.73	–	–	–	–	–	0.08	0.25	–	11.06
X_5	0.16	0.88	146.78	–	–	2.89	11.86	5.20	0.24	–	3.22	170.19
X_6	–	0.12	–	–	–	–	0.81	6.88	–	–	0.19	7.88
X_7	–	–	19.82	–	2.64	–	–	0.85	–	0.28	2.76	27.59
X_8	–	–	1.19	0.15	–	–	–	–	–	–	–	1.34
X_9	–	–	–	–	0.07	0.31	0.04	–	0.06	–	–	0.48
Sum	19.31	1.00	178.52	2.47	4.12	5.84	18.13	12.93	5.27	0.53	6.17	233.98

Notes: Residence (X_1), Evergreen coniferous forest (X_2), Dryland (X_3), River (X_4), Grass land (X_5), Broadleaved deciduous forest (X_6), Deciduous broad-leaved bush (X_7), Bare land (X_8), Coniferous and broad-leaved mixed forest (X_9), Transportation (X_{10}), Reservoir/Pit (X_{11}), Deciduous coniferous forest (X_{12}), and "–" represent that there is no conversion between the two types of land use.

In summary, a large amount of grassland was reclaimed in the Jingchuan basin to increase the acreage of dryland from 1976 to 1991. At this stage, residence, industrial land and transportation were the main types of human activity. The total area of human activity land converted from other land use types was 24.58 km^2, which was mainly converted into residential and transportation lands. However, the total area of human activity land converted to other land use types was only 3.20 km^2. As shown in Figure 4b and Table 6, the area of conversion from dryland to another land use type was the largest from 1991 to 2000, which was 363.93 km^2, and it was mainly distributed in middle and low altitude areas. The area converted from dryland to grassland was the largest, which is 301.23 km^2, followed by areas that were converted from grassland to dryland and from dryland to deciduous broad-leaved bushes, which were 37.99 and 32.13 km^2, respectively. Therefore, grassland was reclaimed for cultivated land from 1991 to 2000; meanwhile, large areas of cultivated land were converted to grassland and forestland in the Jingchuan basin. In this phase, the land use types of human activities were diverse, including residence, transportation, slope and industrial land. The area that was converted into human activity land was 27.44 km^2, most of which were converted into residential and transportation. Compared with the former, the area of human activity land that was changed into another land use type was only 1.43 km^2. That is, compared with the previous phase, the area of human activity land increased by 26.01 km^2.

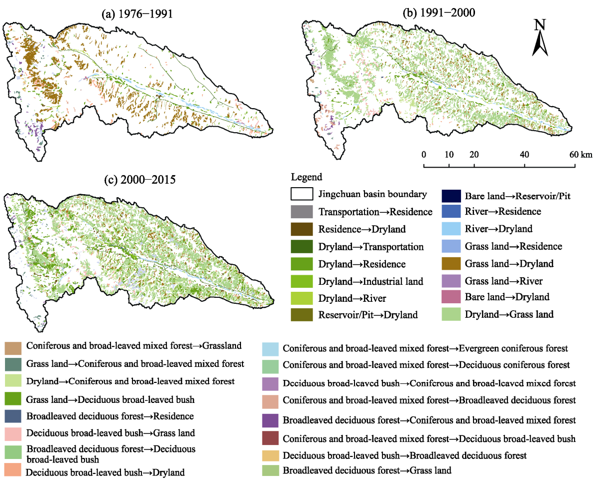


Figure 4 Visualization of land use dynamic changes in three phase during1976–2015

Figure 4c and Table 7 illustrate that similar to the trends of the previous phase, the total area converted from dryland to other land use types was the largest from 2000 to 2015, reaching 509.31 km^2 in which the areas converted from dryland to grassland and deciduous broad-leaved bush were the largest, reaching 345.65 and 104.61 km^2, respectively; followed by the area converted from grassland to deciduous broad-leaved bush, which was 129.99 km^2.

Table 6 Dynamic transfer matric of land use from 1991 to 2000 (Area unit: km^2)

Types before transfer	Land use/cover types after transfer												Sum
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_9	X_{10}	X_{11}	X_{12}	X_{13}	
X_1	–	–	1.08	–	–	–	–	–	–	–	–	–	1.08
X_3	24.10	–	–	2.85	301.23	0.47	32.13	0.71	1.32	–	–	1.12	363.93
X_4	0.31	–	7.04	–	–	–	–	–	–	–	–	–	7.35
X_5	0.35	–	37.99	0.09	–	–	14.93	2.76	–	–	–	–	56.12
X_6	0.04	–	–	–	0.30	–	1.31	2.26	–	–	–	–	3.91
X_7	–	–	4.55	–	13.78	0.26	–	2.76	–	–	–	–	21.35
X_8	–	–	0.05	–	–	–	–	–	–	0.15	–	–	0.20
X_9	–	0.74	–	–	1.86	10.89	0.82	–	–	–	1.33	–	15.64
X_{10}	0.05	–	–	–	–	–	–	–	–	–	–	–	0.05
X_{11}	–	–	0.10	–	–	–	–	–	–	–	–	–	0.10
Sum	24.85	0.74	50.81	2.94	317.17	11.62	49.19	8.49	1.32	0.15	1.33	1.12	469.73

Notes: Residence (X_1), Evergreen coniferous forest (X_2), Dryland (X_3), River (X_4), Grass land (X_5), Broadleaved deciduous forest (X_6), Deciduous broad-leaved bush (X_7), Bare land (X_8), Coniferous and broad-leaved mixed forest (X_9), Transportation (X_{10}), Reservoir/Pit (X_{11}), Deciduous coniferous forest (X_{12}), Industrial land (X_{13}), and" –" represent that there is no conversion between the two types of land use.

Table 7 Dynamic transfer matric of land use from 2000 to 2015 (Area unit: km^2)

Types before transfer	Land use/cover types after transfer														Sum
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	
X_1	–	–	8.25	0.35	1.23	–	0.24	–	–	0.07	–	–	0.69	–	10.83
X_3	30.46	0.19	–	2.25	345.65	1.22	104.61	14.39	0.10	4.41	0.09	–	4.56	1.38	509.31
X_4	0.42	–	7.02	–	0.19	–	–	–	–	0.56	–	–	–	–	8.19
X_5	0.59	0.48	46.04	0.12	–	3.19	129.99	3.52	5.11	0.36	0.26	0.06	–	–	190.51
X_6	–	1.32	0.24	0.16	0.28	–	0.86	–	0.13	–	–	–	–	–	3.03
X_7	0.25	1.28	5.45	0.39	14.22	0.17	–	0.29	2.23	–	–	–	–	1.58	25.86
X_9	–	–	0.03	–	0.46	–	0.24	–	–	–	0.03	–	–	–	0.76
X_{11}	–	–	0.08	–	–	–	–	–	–	–	–	–	–	–	0.08
X_{13}	–	–	0.03	–	–	–	–	–	–	–	–	–	–	–	0.03
Sum	31.72	3.27	67.14	3.27	362.03	4.58	235.94	18.20	7.57	5.40	0.38	0.06	5.25	3.79	748.60

Notes: Residence (X_1), Evergreen coniferous forest (X_2), Dryland (X_3), River (X_4), Grass land (X_5), Broadleaved deciduous forest (X_6), Deciduous broad-leaved bush (X_7), Bare land (X_8), Coniferous and broad-leaved mixed forest (X_9), Transportation (X_{10}), Reservoir/Pit (X_{11}), Deciduous coniferous forest (X_{12}), Industrial land (X_{13}), Stope (X_{14}), and "–" represent that there is no conversion between the two types of land use.

Thus, the project of returning farmland to forestland or grassland was still carried out during the 2000–2015 period, and the area converted from grassland to forestland continued to increase. Since 1991, the state has been paying extra attention to the ecological restoration and protection of the Jingchuan basin[2].

4.2.3 Monthly Variation Trend of Meteorological Elements from 1960 to 2015

Figure 5 shows the trends of sunshine hours, monthly minimum temperature, monthly maximum temperature and monthly average temperature from 1960 to 2015 in the Jingchuan basin.

Figure 5a displays that the variation trend of each temperature factor is identical, and distribution is arched. The temperature gradually increases from January to July, reaches the maximum in July and gradually decreases from July to December. Moreover, the difference between the monthly mean temperature and the monthly minimum temperature at both ends of the arch is the smallest. The difference between the monthly maximum or minimum temperature in June and July is the largest in the middle of the arch. The quadratic function is the best choice to fit the relationship between temperature and month, $R^2 \geq 0.910,3$. Figure 5b shows that the average annual sunshine duration in the Jingchuan basin was about 200 h during the 1960 and 2015 period, with an arch distribution in months, reached peak sunshine hours in July but fell to the bottom in February and November. Amongst which the sunshine duration in July 2000 was the largest, reaching 304.3 h; and that in September 1975 was the smallest, with only 60.2 h. The distribution of annual sunshine hours is relatively concentrated in January, March–May and December, whereas it is scattered in February and September–November.

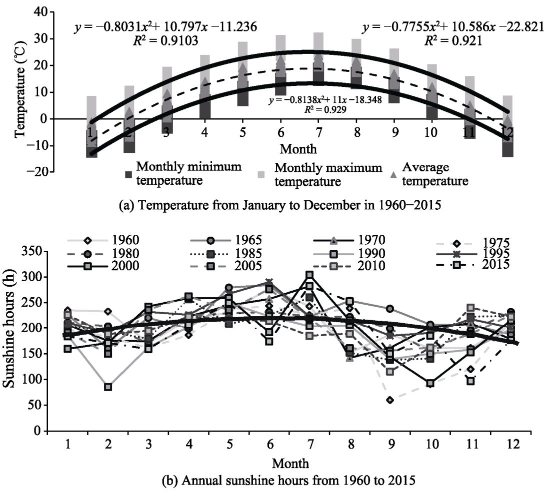


Figure 5 Change trends of meteorological elements in Jingchuan basin from 1960 to 2015

4.3 Data Validation

Due to the long time series of the datasets, validating the accuracy of all land use/cover information extraction results from 1976 to 2015 through field surveys or by using high-resolution images is difficult. Moreover, the practical feasibility is poor. Therefore, only the datasets of 2010 and 2013 were validated in this study to represent the interpretation accuracy of all-time series images. The field survey sampling points of 2013 and high-resolution remote sensing images were used to verify the accuracy of image interpretation results in 2013. Meanwhile, the accuracy of land use interpretation result in the Jingchuan basin in 2010 was verified on the basis of the existing ecological decade dataset (2010) and sampling point data of high-resolution remote sensing images. The confusion matrix indicated that the Kappa coefficient is greater than 0.853,2, the secondary classification accuracy is higher than 86.65%, and the accuracy of the first classification is above 90%. In general, when the Kappa coefficient is greater than 0.61, the classification effect is considered good. Therefore, the classification accuracy of land use datasets in this study is reliable. However, distinguishing coniferous and broad-leaved mixed forests from broad-leaved deciduous forests is sometimes difficult, especially vegetation types with similar spectral bands. The identification accuracy of other land use types, such as reservoir/pit, residence, bare land, industrial land, human activity land, grassland, dryland and deciduous broad-leaved bush, is high, reaching 82%–96%.

5 Discussion and Conclusion

Based on the Landsat MSS/TM/OLI images from 1976 to 2015, land use and corresponding dynamic change information were extracted using the methods of decision tree classification and object-oriented information extraction. The accuracy of the second classification is higher than 86.65%. The data indicated: (1) the area of dryland decreased, whereas the areas of grassland and broad-leaved deciduous forest increased over the years; (2) the land area of human activities constantly increased, but the land use types in the Jingchuan basin have remained stable since 1991; (3) the variation trend of every meteorological element in the Jingchuan basin was basically the same, with an arch distribution, and all reached the maximum in July. The quadratic function was the best choice to fit the variation trend between temperature factor and month from 1960 to 2015, and $R^2 \geq 0.910,3$.

Author Contributions

Wang, Y. Q. guided the research and development of the dataset. Hu, L. B. contributed to the data collecting and preprocessing. Wang, R. contributed to the data analysis and wrote the data paper.

Conflicts of Interest: The authors declare no conflicts of interest.

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