Supporting Information for

**Supporting Information Ⅰ: Tables**

**Table S1.** Date sources and estimation methods of four EFs

|  |  |  |  |
| --- | --- | --- | --- |
| EFs | Estimation Method | Input Parameters | Datasets and reference |
| Water Containment | Based on the water balance method, WC is estimated as follow,  : the volume of the water containment (m3),  : the annual precipitation(mm),  : the Surface runoff (mm),  : the actual evapotranspiration (mm),  : the regional or pixel area (m2).  The surface runoff is calculated as follow,  : the coefficient of surface runoff. | Land use data (MCD12Q1)  Actual evapotranspiration data (MOD16A2GF) | USGS website https://earthexplorer.usgs.gov/ |
| surface runoff coefficient | (Gong et al., 2017;  Hu et al., 2018;  Yuan et al., 2020) |
| Precipitation data | Sichuan Meteorological Bureau |
| Soil retention | The soil retention (SR) is calculated as follow (Fu et al., 2011; He et al., 2019),  : the rainfall-runoff erosivity factor (MJ·mm/(ha·h)),  : the monthly mean precipitation (mm),  : the annual mean precipitation (mm),  : the soil erodibility factor (t·ha·h/(ha·mm·MJ)),  : the percentage of the sand in the soil (%),  : the percentage of the silt in the soil (%),  :the percentage of the clay in the soil (%),  : the percentage of the organic carbon in the soil (%),  : the slope length factor,  : the slope gradient factor,  : the mean slope length (m),  : the variable changing with the slope,  : the mean percent slope (%),  : the vegetation cover factor,  : the vegetation coverage,  : the erosion control factor,  : the percentile slope gradient. | Land use data (MCD12Q1) | USGS website https://earthexplorer.usgs.gov/ |
| MODIS EVI data  (MOD13A1) |
| DEM data |
| Precipitation data | Sichuan Meteorological Bureau |
| Soil attribute data | Data Center for Resources and Environmental Sciences,Chinese Academy of Sciences http://www.resdc.cn |
| Carbon storage | NPP (net primary productivity) is estimated using the CASA model,  : total solar radiation, estimated using the Ångström-Prescott model based on sunshine hours (),  : the absorption fraction of photosynthetically active radiation by vegetation canopy, calculated using NDVI data,  : the actual light use efficiency (),  : temperature stress coefficients (),  : the water stress coefficient,  : the maximum light use efficiency (). | Land use data  (MCD12Q1) | USGS website https://earthexplorer.usgs.gov/ |
| MODIS EVI data  (MOD13A1) |
| Evapotranspiration data (MOD16A2GF) |
| Sunshine hours data | Sichuan Meteorological Bureau |
| Temperature data |
| Maximum light use efficiency | (Zhu et al., 2007;  Su et al., 2022) |
| Habitat quality | Habitat quality (HQ) is computed as follow,  *j*=1, 2, …, n: the *j*th land use type,  *r*=1, 2, …, R: the *r*th threat,  *y*=1, 2, …, Yr: the *y*th grid on the *r*th threat data,  *Hj*: the habitat suitability of the *j*th land use type,  : the total threat index of the grid of the land use ,  *wr*: the relative weight of the threat factor *r*,  *ry*: the value of the threat factor on the grid *y*,  *βx*: the threat accessibility of the grid x,  *Sjr*: the sensitivity of the *j*th land use to the threat factor *r*,  *z*: scaling parameters,  *k*: the half-saturation constant,  *irxy*: the impact coefficient of threat *r* in the grid *y* on the grid *x*. | Land use data (MCD12Q1) | USGS website https://earthexplorer.usgs.gov/ |
| Sensitivity data | (Terrado et al., 2016; Zahra et al., 2018; Rimal et al., 2019; Zhao et al., 2022) |
| Threat data |

**Table S2.** The average runoff coefficients and maximum light use efficiency of different landscape types

|  |  |  |
| --- | --- | --- |
| Land use type | Average runoff coefficient (%) | Maximum light use efficiency () |
| Evergreen broadleaf forests | 4.65 | 0.985 |
| Evergreen needleleaf forests | 4.52 | 0.389 |
| Mixed forests | 3.52 | 0.720 |
| Deciduous broadleaf forests | 2.70 | 0.692 |
| Deciduous needleleaf forests | 0.88 | 0.485 |
| Closed shrublands | 4.26 | 0.429 |
| Open shrublands | 19.20 | 0.429 |
| Woody savannas | 3.87 | 0.542 |
| Savannas | 3.94 | 0.542 |
| Grasslands | 8.20 | 0.542 |
| Cropland/Natural vegetation Mosaics | 2.40 | 0.542 |
| Water Bodies | 0.00 | 0.000 |
| Permanent wetlands | 0.00 | 0.542 |
| Barren | 3.31 | 0.542 |
| Croplands | 2.40 | 0.542 |
| Urban and Built-up lands | 75.00 | 0.542 |

**Table S3.** Habitat types and their sensitivity to threats

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Land use type | Habitat suitability | Sensitivity | | | |
| Cropland/Natural vegetation Mosaics | Barren | Croplands | Urban and Built-up lands |
| Evergreen broadleaf forests | 1 | 0.6 | 0.35 | 0.6 | 0.4 |
| Evergreen needleleaf forests | 1 | 0.6 | 0.35 | 0.6 | 0.4 |
| Mixed forests | 1 | 0.6 | 0.35 | 0.6 | 0.4 |
| Deciduous broadleaf forests | 0.9 | 0.6 | 0.35 | 0.6 | 0.4 |
| Deciduous needleleaf forests | 0.9 | 0.6 | 0.35 | 0.6 | 0.4 |
| Closed shrublands | 0.85 | 0.6 | 0.1 | 0.6 | 0.5 |
| Open shrublands | 0.7 | 0.6 | 0.2 | 0.6 | 0.55 |
| Woody savannas | 0.8 | 0.8 | 0.7 | 0.8 | 0.5 |
| Savannas | 0.7 | 0.8 | 0.75 | 0.8 | 0.65 |
| Grasslands | 0.7 | 0.8 | 0.75 | 0.8 | 0.65 |
| Cropland/Natural vegetation Mosaics | 0.3 | 0 | 0.5 | 0 | 0.6 |
| Water Bodies | 0.8 | 0.7 | 0.6 | 0.7 | 0.7 |
| Permanent wetlands | 0.85 | 0.75 | 0.6 | 0.75 | 0.65 |
| Barren | 0.2 | 0.1 | 0 | 0.1 | 0.7 |
| Croplands | 0.3 | 0 | 0.5 | 0 | 0.6 |
| Urban and Built-up lands | 0 | 0 | 0 | 0 | 0 |

**Table S4.** Threat factors data

|  |  |  |  |
| --- | --- | --- | --- |
| Threat type | Maximum distance of influence (km) | Weight | Decay form |
| Cropland/Natural vegetation Mosaics | 1 | 0.3 | linear |
| Barren | 2 | 0.5 | exponential |
| Croplands | 1 | 0.3 | linear |
| Urban and Built-up lands | 8 | 1 | exponential |

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