Comments from RC2, replies and revisions

To reviewer:

Based on the revised manuscript you provided, we identified 23 highlighted issues. After reviewing your comments, we consolidated them into 16 points, which we address point by point below.

Comment 1: Check this sentence: it looks like there is too many "consistent".

Replies: Done.

Before revision:

The landscape dissection-rainfall index indicates that steep woodland slopes have lower landslide susceptibility than steep slopes in shrubland, consistent with the lower susceptibility is consistent with the lower landslide density in woodland than in shrubland.

After revision:

The landscape dissection-rainfall index indicates lower landslide susceptibility on steep woodland slopes than on steep shrubland slopes, consistent with the lower landslide density in woodland relative to shrubland.

Comment 2: For comparison, it would be nice to use international climatic standards, e.g. the Koeppen-Geiger classification.

Replies: Done.

Before revision:

The study area lies in the transition zone between semi-humid and semi-arid climates, with a mean annual temperature of 9.9°C and a mean annual precipitation of 579.1 mm.

After revision:

The area has four distinctive seasons and a semi-humid climate. The annual precipitation is approximately 579.1 mm, and the mean annual temperature is 9.9°C.

Comment 3: Add the specific versions of Pix4D, Photoshop CS, and Image-Pro Plus used in the study.

Replies: Done.

Before revision:

(1) Pix4D software was used to generate ortho-mosaics and DEMs.

(2) Profile images were captured with a digital camera at a fixed distance and with a parallel orientation, and subsequently processed using Photoshop CS and Image-Pro Plus.

After revision:

(1) Pix4Dmapper (version 4.6, Pix4D SA, Switzerland) was used to generate ortho-mosaics and DEMs.

(2) Profile images were captured with a digital camera at a fixed distance and in a parallel orientation, and subsequently processed using Adobe Photoshop (version 2021; Adobe Inc., USA) and Image-Pro Plus (version 6.0; Media Cybernetics, USA).

Comment 4: Add the specific directional information for the meteorological station located at the Caijiachuan Forest Station.

Replies: Done.

Before revision:

A meteorological station at Caijiachuan Forest Station is located about 2 km from the study area.

After revision:

A meteorological station at Caijiachuan Forest Station is approximately 2 kilometers to the northwest of the study area.

Comment 5: Replace indicates with indicate.

Replies: Done.

Before revision:

Positive or negative values of R_C indicates whether the increase in soil-water storage exceeds or falls below the rainfall input.

After revision:

Positive or negative values of R_C indicate whether the increase in soil-water storage exceeds or falls below the rainfall input.

Comment 6: Replace "Moving to the R…" with "Moving R to the…".

Replies: Done.

Before revision: Moving to the *R* left-hand side yields the right-hand side of Eq. (4) in an integrated form involving only soil mass parameters:

After revision:

Moving *R* to the left-hand side yields the right-hand side of Eq. (4) in an integrated form involving only soil mass parameters:

Comment 7: Replace "whiskers" with "boxplots".

Replies: Done.

Before revision:

(1) Figure 6. Upslope contributing area and slope gradient condition. **(a)** upslope contributing area and mean slope as a function of slope aspect; **(b)** upslope-contributing area vs. mean slope gradient above the landslide area. The definition of the boxplots is given in the caption of Fig. 5. Circles indicate mean slopes, with radius proportional to the number of landslides. A power-law regression is fitted to the bin-averaged data.

(2) Figure 11. Mechanical indices of slope stability in woodland and shrubland. **(a)** Root area ratio and root-induced cohesion in woodland (*Robinia pseudoacacia*); **(b)** Root area ratio and root-induced cohesion in shrubland (*Rosa xanthina*); **(c)** Relationship between root tensile strength and diameter; **(d)** Slope-stability models for woodland and shrubland. The definitions of the whiskers are given in the caption of Fig. 5.

After revision:

(1) Figure 6. Upslope contributing area and slope gradient condition. **(a)** upslope contributing area and mean slope as a function of slope aspect; **(b)** upslope-contributing area vs. mean slope gradient above the landslide area. The definition of the boxplots is

given in the caption of Fig. 5. Circles indicate mean slopes, with radius proportional to the number of landslides. A power-law regression is fitted to the bin-averaged data.

(2) Figure 11. Mechanical indices of slope stability in woodland and shrubland. **(a)** Root area ratio and apparent cohesion in woodland (*Robinia pseudoacacia*); **(b)** Root area ratio and apparent cohesion in shrubland (*Rosa xanthina*); **(c)** Relationship between root tensile strength and diameter; **(d)** Slope-stability models for woodland and shrubland. The definition of the boxplots is given in the caption of Fig. 5.

Comment 8: For Fig. 5(a) and (b), the label "slope-gradient class" is missing from the plots, and the caption for Fig. 5 does not explain what the X symbols represent.

Replies: Done.

Before revision:

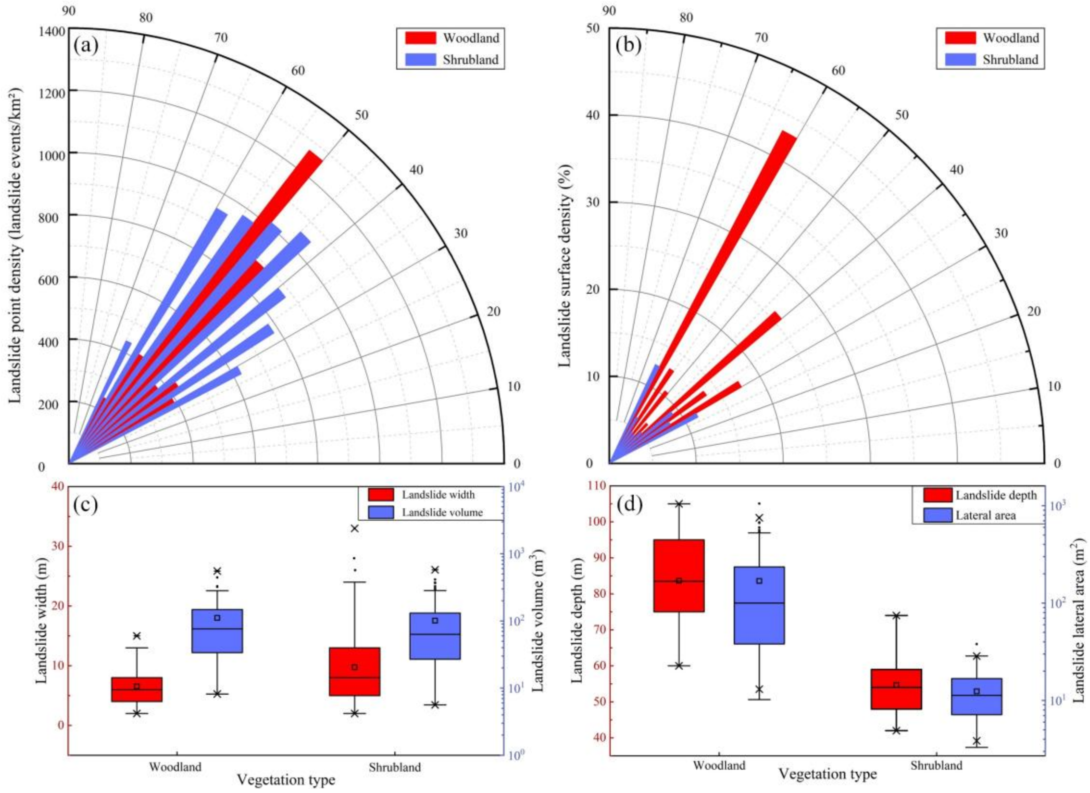

Figure 5. Landslide characteristics in woodland and shrubland. **(a)** point density by slope-gradient class; **(b)** areal density by slope-gradient class; **(c)** landslide depth and lateral area; and **(d)** landslide width and volume. The three crossing lines of box show decreasing order of 75th quantile (Q_3), median (Q_2), and 25th quantile (Q_1). The box length is the interquartile range (IQR=Q_3-Q_1). The small square is the average value. The upper and lower limit of whiskers are Q_3+1.5IQR andQ_1-1.5IQR, respectively. The whiskers extend to the minimum and maximum values, except for mild outliers, which are shown as black dots.

After revision:

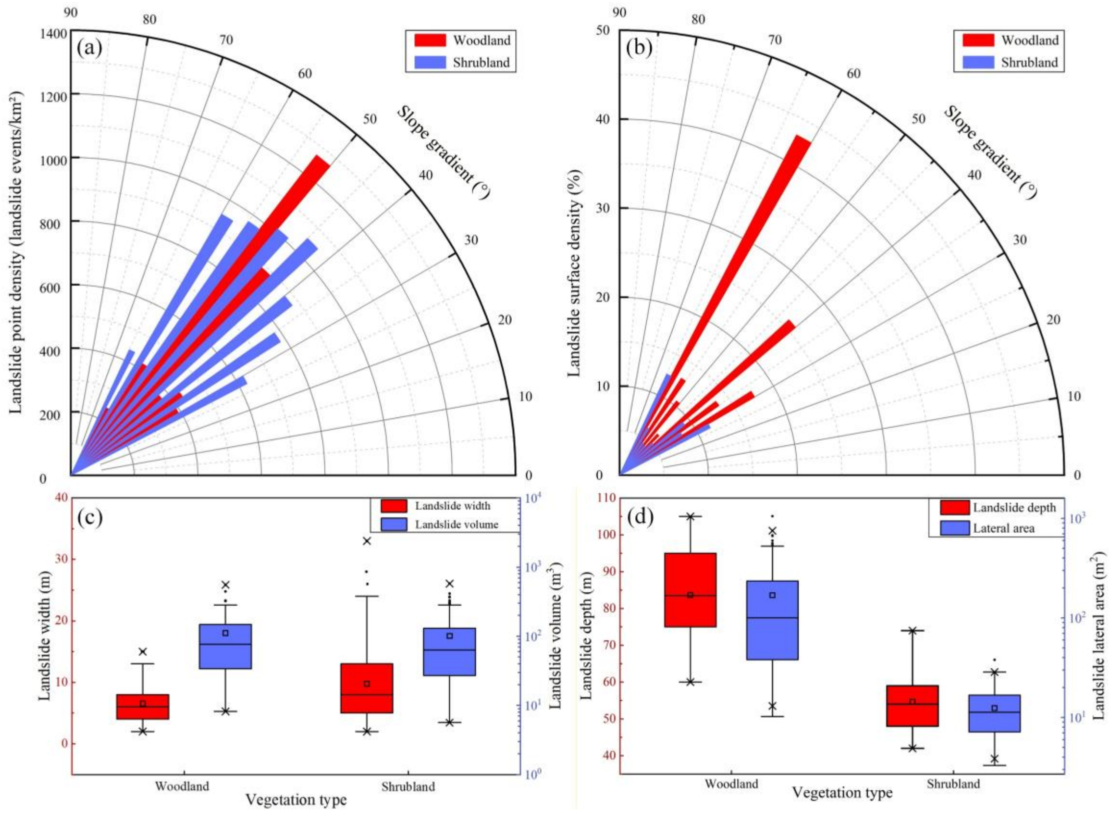

Figure 5. Landslide characteristics in woodland and shrubland. **(a)** point density by slope-gradient class; **(b)** areal density by slope-gradient class; **(c)** landslide depth and lateral area; and **(d)** landslide width and volume. The three horizontal-lines of box show decreasing order of 75th quantile (Q_3), median (Q_2), and 25th quantile (Q_1). The box length is the interquartile range (IQR=Q_3-Q_1). The small square is the average value. The cross symbols denote the 1st and 99th percentiles. The upper and lower limit of whiskers are Q_3+1.5I QR and Q_1-1.5 IQR, respectively. The whiskers extend to the most extreme values within these limits; mild outliers are shown as black dots.

Comment 9: In Table 1, please define what the superscripts "d" and "w" represent, and replace "moisture" with "water content".

Replies: Done.

Before revision:

Table 1. Parameters describing the soil and water characteristic curve (SWCC) and the hydraulic conductivity function (HCF) from Hydrus 1D

Parameters	Definition	Woodland	Shrubland
θ_s^d	Saturated moisture	0.500	0.480
θ_s^w		0.493	0.379
θ_r	Residual moisture	0.055	0.086
n^d	Pore size distribution	1.58	2.19
n^w	Parameter	1.69	1.88
a^d (KPa^{-1})	Inverse of the air entry	5.461×10^{-3}	6.294×10^{-3}
a^w (KPa^{-1})	Pressure head	0.646	0.596

K_s^d (cm·s^{-1})	Saturated hydraulic	2.3×10^{-5}	5.4×10^{-6}
K_s^w (cm·s^{-1})	conductivity	7.1×10^{-2}	5.0×10^{-3}

After revision:

Table 1. Parameters describing the soil and water characteristic curve (SWCC) and the hydraulic conductivity function (HCF) from Hydrus 1D

Parameters	Definition	Woodland	Shrubland
θ_s^d	Saturated moisture	0.500	0.480
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a^d (KPa^{-1})	The inverse of the air entry	5.461×10^{-3}	6.294×10^{-3}
a^w (KPa^{-1})	pressure head	0.646	0.596
K_s^d (cm·s^{-1})	Saturated hydraulic conductivity	2.3×10^{-5}	5.4×10^{-6}
K_s^w (cm·s^{-1})		7.1×10^{-2}	5.0×10^{-3}

Notes: Superscripts "d" and "w" denote the drying and wetting processes, respectively.

Comment 10: "This flow pattern is consistent with differences soil-matrix hydraulic behavior differences inferred from SWCC and HCF… ", not clear, rewrite it.

Replies: Done.

This paragraph seems to be mysterious and don't clear. We rewrite it from the macropore domain matrix pore domain. Such revision shows more clear than previous paragraph.

Before revision:

Overall, the woodland soils more readily develop a stable, efficient vertical percolation system with greater infiltration depth and stronger connectivity. This promotes deep water storage and redistribution. In contrast, insufficient pore connectivity in shrubland soils causes water to remain in shallow layers, prolonging surface wetness and slowing pore-water pressure recovery. Under intense rainfall, this condition favors saturation buildup and thus increases the likelihood of landslide initiation. This flow pattern is consistent with differences soil-matrix hydraulic behavior differences inferred from SWCC and HCF and provides a path-based complement to traditional hydraulic parameters.

After revision:

The dye tracer experiments mainly reflect the stained pathways owing to preferential flow in macropore domain. Overall, the soils in woodland exhibit stronger connectivity, favoring rapid rain-water infiltration. In contrast, insufficient pore connectivity in shrubland soils may cause water remain in shallow layers, prolonging surface wetting and slow rain-water infiltration. In the matrix pore domain, the saturated hydraulic conductivity and the inverse of the air entry pressure head in wetting process sufficiently prove that the soils in woodland exhibit rapid rain water infiltration potential, as exemplified by table 1. Therefore, the rain-water movement in the macro- and matrix-pore can be more readily in woodland.

Comment 11: "Quantifying how rainfall translates into changes in soil-water content is critical for analyzing rainfall-induced landslides in this region.", the sentence is true in any region.

Replies: Done.

We already therefore removed it, as the subsequent text already presents the region-specific hydrological context.

Before revision:

Quantifying how rainfall translates into changes in soil-water content is critical for analyzing rainfall-induced landslides in this region. To characterize how woodland and shrubland soils respond to rainfall, we group rainfall events into distinct episodes based on soil depth and in situ saturated hydraulic conductivity (Fig. 10a).

After revision:

To characterize how woodland and shrubland soils respond to rainfall, we group rainfall events into rain episodes based on soil depth and in situ saturated hydraulic conductivity (Fig. 10a).

Comment 12: Fig. 10c represents Rc vs Soil water storage, not Rc vs Rainfall.

Replies: Thank you for pointing this out.

Before revision:

A steeper R_C–rainfall regression slope indicates a more pronounced soil moisture response to rainfall.

After revision:

A steeper slope in the regression of R_C versus soil water storage indicates a stronger soil moisture response to rainfall.

Comment 13: Table 2, specify the difference between C' and Cr.

Replies: Done.

Before revision:

Table 2 Parameters describing the slope stability model

Parameters	Definition	Woodland	Shrubland
ρ_s (kg·m^{-3})	Dry soil density	1.37	1.41
θ (°)	Slope gradient	31.71–65.27	22.78–67.96
C' (kPa)	Effective cohesion	5.97	7.35
C_r (kPa)		18.59	10.36
φ (°)	Effective friction angle	18.67	14.50
z (m)	Landslide depth	0.84	0.54
K (mm·h^{-1})	Hydraulic conductivity	2.10	0.94

After revision:

Table 2 Parameters describing the slope stability model

Parameters	Definition	Woodland	Shrubland
ρ_s (kg·m^{-3})	Dry soil density	1.37	1.41
θ (°)	Slope gradient	31.71–65.27	22.78–67.96
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C_r (kPa)	Apparent cohesion	18.59	10.36
φ (°)	Effective friction angle	18.67	14.50
z (m)	Landslide depth	0.84	0.54

K (mm·h^{-1})	Hydraulic conductivity	2.10	0.94

Comment 14: Replace "acting as" with "playing"; "In this context, we focused the landslide initiation difference in two representative restoration forests from the hillslope hydrology and failure resistance heterogeneity.", not very clear.
Replies: Thank you for pointing this out.
Before revision:

Long-term vegetation restoration policies may result in the dominant soil erosion process shift from traditional wind and water erosion to landslides (Deng et al., 2022; Yang et al., 2024; Du et al., 2025; Liao et al., 2025). Ecological restoration forests not only increase surface cover, but extend their root systems into potential sliding layers, thereby substantially altering slope hydrological processes and mechanical properties, and acting as an important role in landslide initiation (Zhao et al., 2022; Cai et al., 2024; Chen et al., 2024; Lann et al., 2024). In this context, we focused the landslide initiation difference in two representative restoration forests from the hillslope hydrology and failure resistance heterogeneity.

After revision:

Long-term vegetation restoration policies may result in the dominant soil erosion process shift from traditional wind and water erosion to landslides (Deng et al., 2022; Yang et al., 2024; Du et al., 2025; Liao et al., 2025). Ecological restoration not only increase surface cover, but the recovered vegetation extends their root systems into potential sliding layers, thereby substantially altering slope hydrological processes and mechanical properties, and playing an important role in landslide initiation (Zhao et al., 2022; Cai et al., 2024; Chen et al., 2024; Lann et al., 2024). In this context, we investigated the hydro-mechanical heterogeneity in *Robinia pseudoacacia*–dominated woodland and *Rosa xanthina*–dominated shrubland, and assessed its influence on landslide initiation.

Comment 15: The subject is "Woodland slopes" so the verb cannot be "enhance slope stability", rephrase the sentence**.**
Replies: Done.
Before revision:

Woodland slopes, with deep root systems and stable preferential flow channels, enhance slope stability, whereas shrubland slopes, limited by shallow root systems, are more prone to rapid surface failure.

After revision:

The deep root systems and stable preferential flow channels in woodland slopes may provide greater resilience against slope failure compared to shrubland slopes.

Comment 16: "while their role on landslide initiation hasn’t been addressed," the pronoun "their" is ambiguous; "In this work, we addressed landslide initiation..., " the definite article "the" should be removed.
Replies: Done.
Before revision:

Vegetation recovery in Chinese Loess Plateau may cause the dominant soil erosion process shift from runoff drive to gravitational attraction, while their role on landslide initiation hasn't been addressed. In this work, we addressed the landslide initiation in woodland (*Robinia pseudoacacia*–dominated) and shrubland (*Rosa xanthina*–dominated) by landslide spatial patterns, hydrological response, and slope failure resistance.

After revision:

Vegetation recovery in the Chinese Loess Plateau has altered the dominant soil erosion shifting from runoff-driven to gravity-driven. Though previous studies have extensively investigated vegetation effects on soil erosion, the specific role of vegetation in landslide initiation remains poorly understood. In this study, we systematically examined landslide initiation processes in two contrasting vegetated landscapes: *Robinia pseudoacacia*-dominated woodlands and *Rosa xanthina*-dominated shrublands, focusing on hydro-mechanical heterogeneity.