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gamma = / (Fuzzy logic gamma

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ILWIS 3.3

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Esenov et al.  
Kaushalya  
Metternicht, G. and Zinck, A.  
Bouwer, H.  
Walton, C.W.

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M<sup>m</sup>

M<sup>m1</sup>

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ILWIS 3.3

(Cross )

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Landsat 7

( ) ETM<sup>+</sup>

( ) Google earth

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ILWIS 3.3

Geocordinate Georeference (merge)

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DTM (Digital Terrain Model)

DEM (Digital Elevation Model)

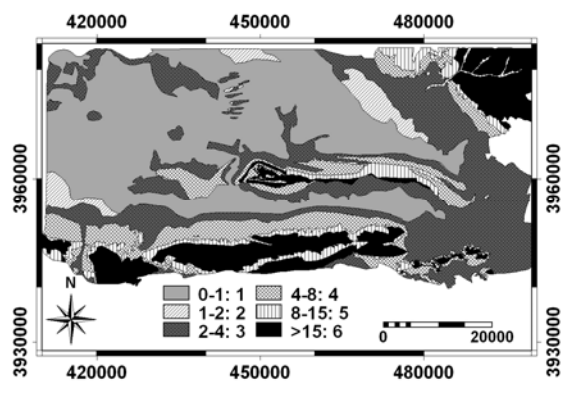
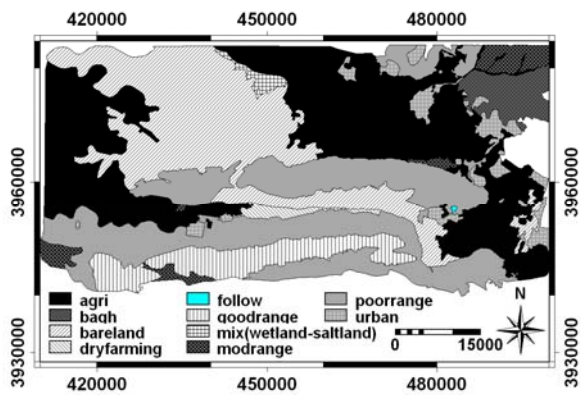
Eshtehard

Karaj

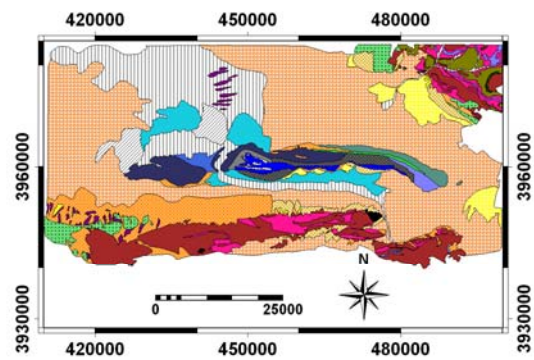
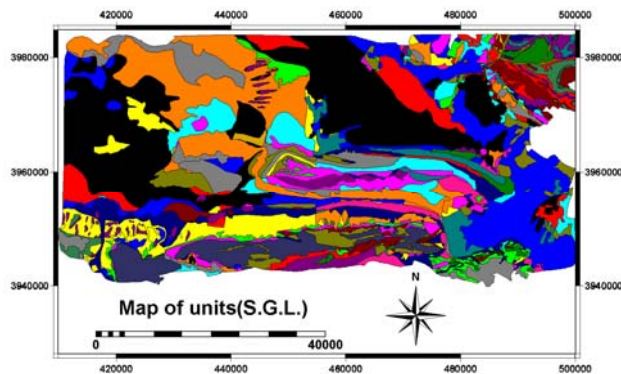
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	$Q_3^t$	$Q^{cu}$
	$M^{m1}$	$M^m$
	$Q^s$	$Q^{sl}$
	$Q^{al}$	$Q^{fp}$
	$Q_3^t$	$Q_2^t$
	$E_2^{ta2}$	$E_2^{ap}$
	$E_2^{t1}$	$E_2^{rt}$
	$M^m$	$M^{m,g}$
	$M^{sc}$	$M^{s,g}$
	$M^{mss}$	$M^{rsh}$



( )



Legend

E1	Mm1	Msh	Qf2
E2	Mmc	Og	Qf3
E3	Mmg	PLQc	Qs
E4	Mmsi	Qal	Qt1
E5	Mmss	Qc	Qt2
Mm	Msc	Qf1	Qt3

( )	( )				
/	/		$Q^{al}$	-	
/	/		$Q^c$	-	
/	/		$Q^s$	-	
/	/		$Q_3^t$	-	
/	/		$Q_3^f$	-	
/	/		$Q_2^t$	-	
/	/		$Q_2^f$	-	
/	/		$Q_1^t$	-	
/	/		$Q_1^f$	-	
/	/		$PIQ^c$	-	
/	/		$M^{msl}$	-	
/	/		$M^{mc}$	-	
/	/		$M^{mg}$	-	
/	/		$M^{m1}$	-	
/	/		$M^{sc}$	-	
/	/		$M^m$	-	
/	/		$M^{sh}$	-	
/	/		$M^{mss}$	-	
/	/		$O^g$		
/	/	( )	$E^1$		
/	/	( )	$E^2$		
/	/		$E^3$		
/	/		$E^4$		
/	/		$E^5$		

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$Q_2^t$ $Q_3^f$ $Q_2^f$ $Q^{al}$ $Q^c$ $Q^s$ $Q_3^t$			
$Q_1^t$ $Q_1^f$			
$M^{m1}$ $M^m$ $M^{mss}$ $M^{sc}$ $M^{sh}$ $M^{msl}$ $M^{mc}$ $M^{mg}$			
$E^5$ $PLQ^c$			
$E^4$ $E^3$			
$E^1$ $E^2$ $o^s$	>		

GPS

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EC

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USSL

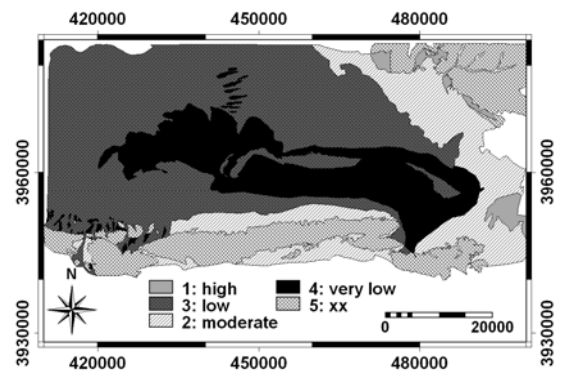
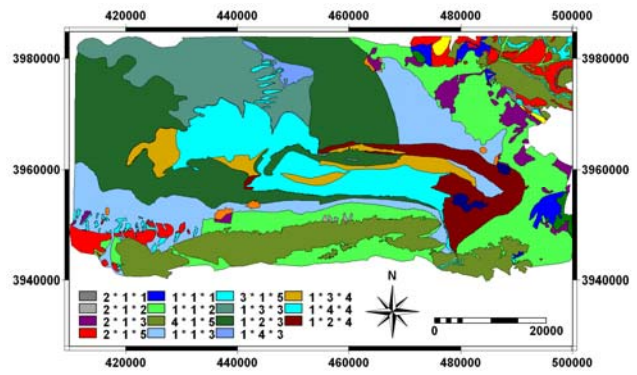
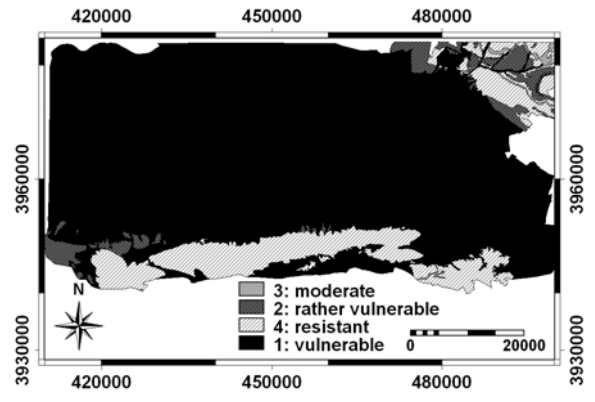
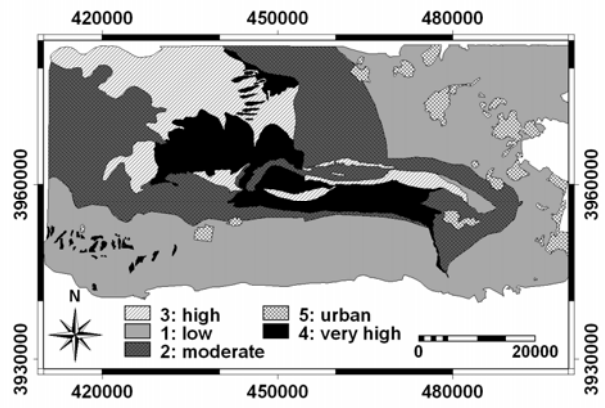
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 cm/min) ( / / cm/min) ( ≤EC<sub>e</sub>) ( ≤EC<sub>e</sub>< )  
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R

N

$$A = \{x, \mu_A(x)\} \quad (1)$$

x

A

A

$\mu_A(x)$  ( $\mu$ )

$\gamma = 1$

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$\gamma = 1 \quad \gamma = 1$

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$$W_i = 1 - e^{-2(i)} \quad (2)$$

$W_i$

I

### ILWIS 3.3

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$$\mu(x) = \begin{cases} 0 & x - a \\ 1 & b \end{cases} \quad (3)$$

a

x

$\mu(x)$

$$b = X_{\max} - h$$

$\gamma = 1 \quad \gamma = 1$

(

$X_{\max}$

ILWIS

$\gamma = 1$

h

Cross

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$$h = \frac{R}{K} = \frac{X_{\max} - X_{\min}}{K} \quad (4)$$

$$K = 1 + 2.3 \log N \quad (5)$$

...

	$(\bar{s})$	$(W_i)$	$(I)$						
				$\mu(x)$	$x$				
I	/	/	/	/		/		(E)	( )
				/	/				
				/	/				
				/	/				
				/	/				
				/	/				
II	/	/	/	/	/	/	/	/	
III	/	/	/	/		/			
IV	/	/	/	/	/	/			
I	/	/	/	/	/	/	/	(S)	( )
				/	/				
II	/	/	/	/	/	/	/		
				/	/				
III	/	/	/	/	/	/	/		
				/	/				
IV	/	/	/	/	/	/	/		
				/	/				
				/	/				
				/	/				
				/	/				



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		$(\bar{S})$		
		/	/ /	I
		/	/ /	II
		/	/ /	III
		/	/ /	IV

$$\gamma = / \quad \gamma = / \quad \gamma = / \quad )$$

$$( \quad )$$

$\gamma = /$ ( )	$\gamma = /$ ( )	$\gamma = /$ ( )	
			0.I
			1.IV

$$\gamma = /$$

$$\gamma = /$$

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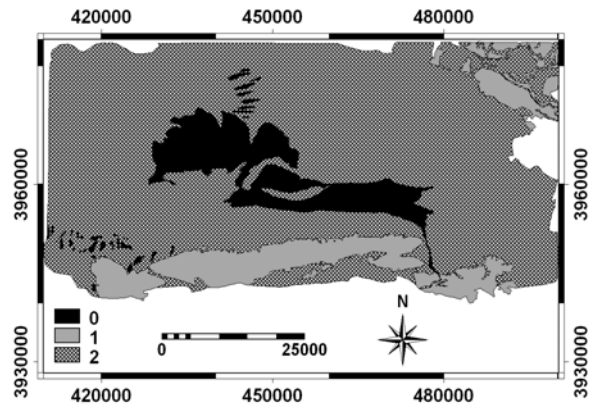
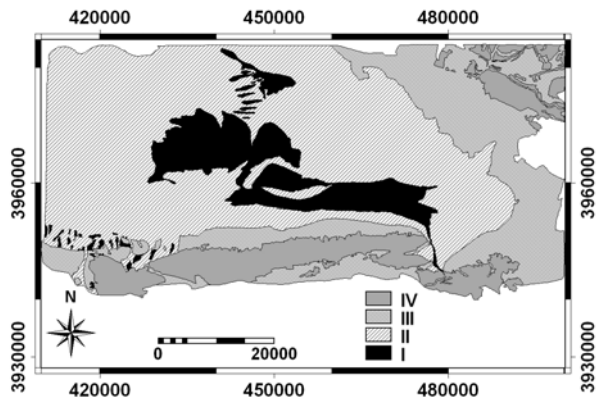
$$= \frac{\quad - \quad}{\quad} \quad ( )$$

$$.( \quad )$$

$$\gamma = /$$

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<b>gamma = /</b>		<b>gamma = /</b>		<b>gamma = /</b>		
	( )		( )		( )	
/		/				I
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$\gamma = /$

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ILWIS 3.3 Cross

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gamma = / gamma = /

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Fuzzy Logic

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$Q^{al}$

I

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gamma

$Q^c$

$Q_2^f$   $Q_3^f$

$Q_2^f$

( ) gamma = /

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$Q^{al}$  II \*

$Q^c$

$Q_1^f$   $Q_1^t$   $Q_2^f$   $Q_2^t$   $Q_3^t$

III \*

)  $Q^{al}$

$Q_1^t$   $Q_2^f$   $Q_2^t$   $Q_3^f$   $Q_3^t$  (

$Q_1^f$

( )	( )	( )	( )			
/		/		$Q^{al}$		I
		/		$Q^c$		
		/		$Q^s$		
		/		$Q_3^f$		
		/		$Q_2^t$		
		/		$Q_2^f$		
		/		$M^{msl}$		
		/		$M^{sh}$		
		/		$M^{mss}$		
/		/		$Q^{al}$		II
		/		$Q^c$		
		/		$Q_3^t$		
		/		$Q_2^t$		
		/		$Q_2^f$		
		/		$Q_1^t$		
		/		$Q_1^f$		
		/		$M^{mc}$		
		/		$M^{mg}$		
		/		$M^{m1}$		
		/		$M^{sc}$		
		/		$M^m$		
		/		$M^{mss}$		

( )	( )	( )	( )			
/		/		$Q^{at}$		III
		/		$Q'_3$		
		/		$Q_3^f$		
		/		$Q'_2$		
		/		$Q_2^f$		
		/		$Q'_1$		
		/		$Q_1^f$		
		/		$PLQ^c$		
		/		$E^3$		
		/		$E^4$		
		/		$E^5$		
/		/		$E^1$		IV
		/		$E^2$		
		/		$O^g$		

( ) GIS  
(GIS)

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## Investigation of geological criterion on land degradation in geomorphological units (Case study: Eastern part of Shoor river watershed)

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### Abstract

Shoor river watershed has the area of 17000 km<sup>2</sup>, 42% of the watershed is plain and the rest is pediment. In investigation of the effect of geological criterion on land degradation in geomorphological units, first a part of Shoor river watershed was selected on geological map in such a way that different consolidated and unconsolidated geological materials which are effective on land degradation and desertification are included. After determination of the studied area, the maps of slope and land uses were prepared and overlaid and the map of homogeneous units was prepared. In this research, three indices consisting of erodibility, salinity and permeability of rock units were chosen, by field and laboratory analyses and finally their classified maps were prepared, they were then overlaid and zonation map of the area according to the three indices were presented. Due to the fact that the determination of desertification intensity or potential in homogeneous units by using mathematical or statistical equations is not possible, therefore, the concept of fuzzy logic was used for zonation that after determination of the weight or value of the factors, fuzzy algebraic sum, fuzzy algebraic product and fuzzy gamma were used. The results obtained from the comparison of maps prepared using different fuzzy operators with a control map and maximum and minimum measured desertification in the studied region, has shown that the most suitable fuzzy operator for desertification potential or intensity in the studied area is 0.8 gamma fuzzy function. Finally by overlaying the zonation map of desertification intensity with respect to geological criterion and the geological map, different geological units were characterized based on their desertification effect.

**Keywords:** Desertification, Fuzzy logic, Geological criterion, Evidence map, Erodibility, Salinity, Permeability.