The10th Gulf Water Conference

22-24 April 2012, Grand Hyatt Hotel, Doha - Qatar

Groundwater Vulnerability Map For Northeast Missan Governorate, Southern Iraq

Aysar M. Al-Shamaa, *Univ. of Baghdad*

Ala'a M. Atiya, *Univ. of Basrah*

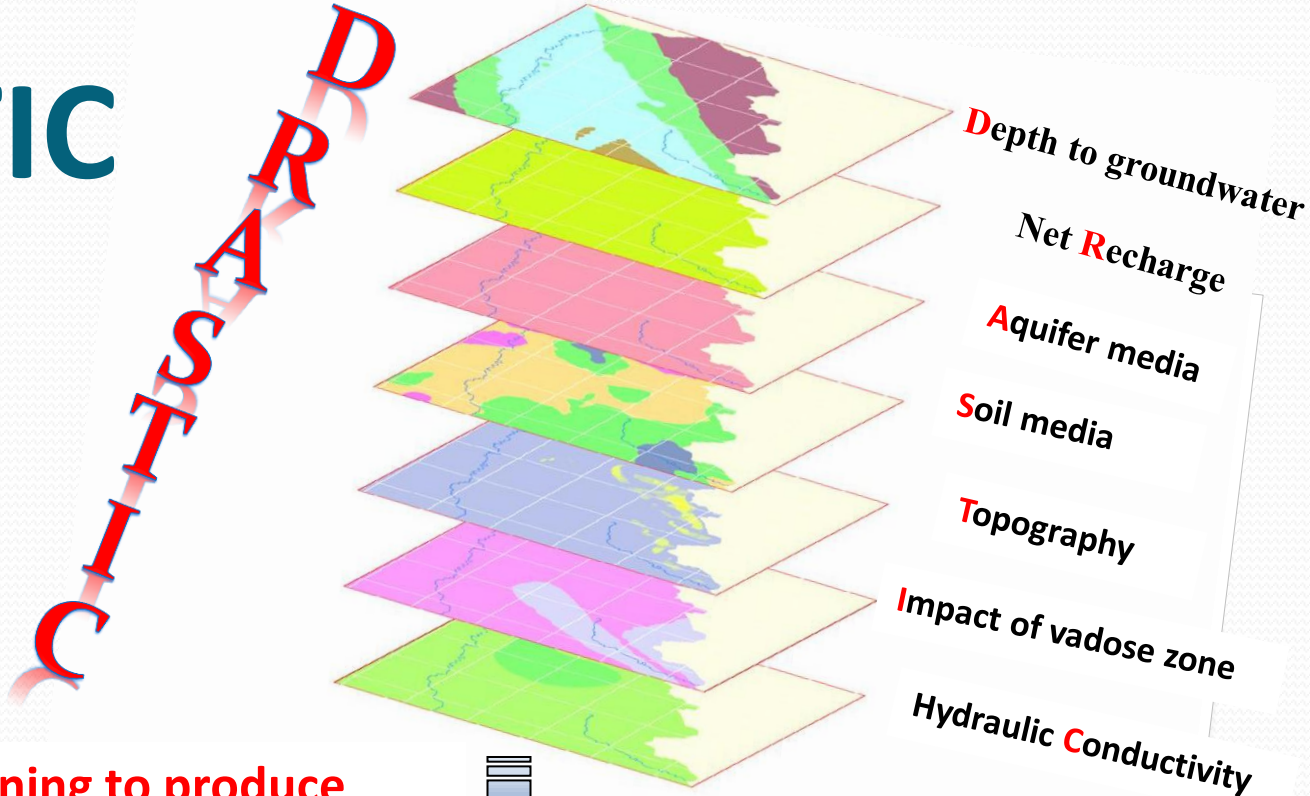
Muqdad, H. Al-Jabbari, *Univ. of Baghdad*

Vulnerabilty ??

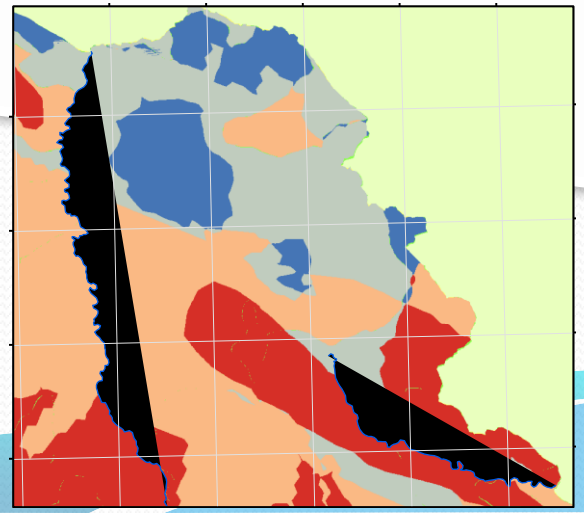
- 1. Usefulness of Aquifer Vulnerability studies.
- 2. Laws of Groundwater Vulnerability.
- 3. Methods to assess AVMs.

DRASTIC

DRASTIC parameters



Combining to produce vulnerability index map



very low

low

sligthly moderate

moderate

Vulnerability index = DrDw + RrRw + ArAw + SrSw + TrTw + IrIw + CrCw

Degree of vulnerability	DRASTIC index
< 80	Very low
80 – 120	Low
120 – 160	Moderate
160 – 200	High
> 200	Very High

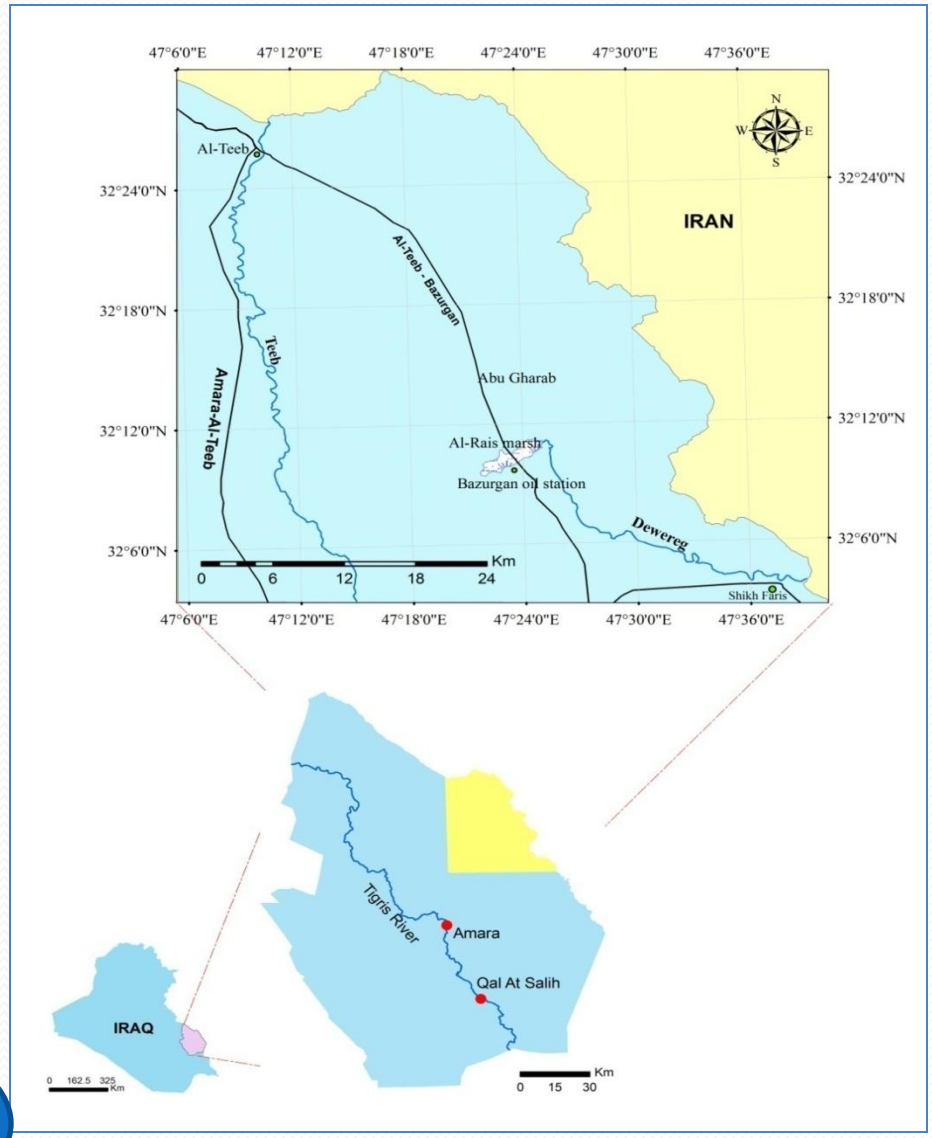
1. **Location** : NE Missan Gov. & SE Iraq.
2. **Topography** : relatively flat bounded in the NE by hills.
3. **Two ephemeral streams;** Teeb & Dewereg. originates from the Iranian Land & ends in marshes.

Purpose & Aim

1.Shortage in surface water.

2. GW is heavily used.

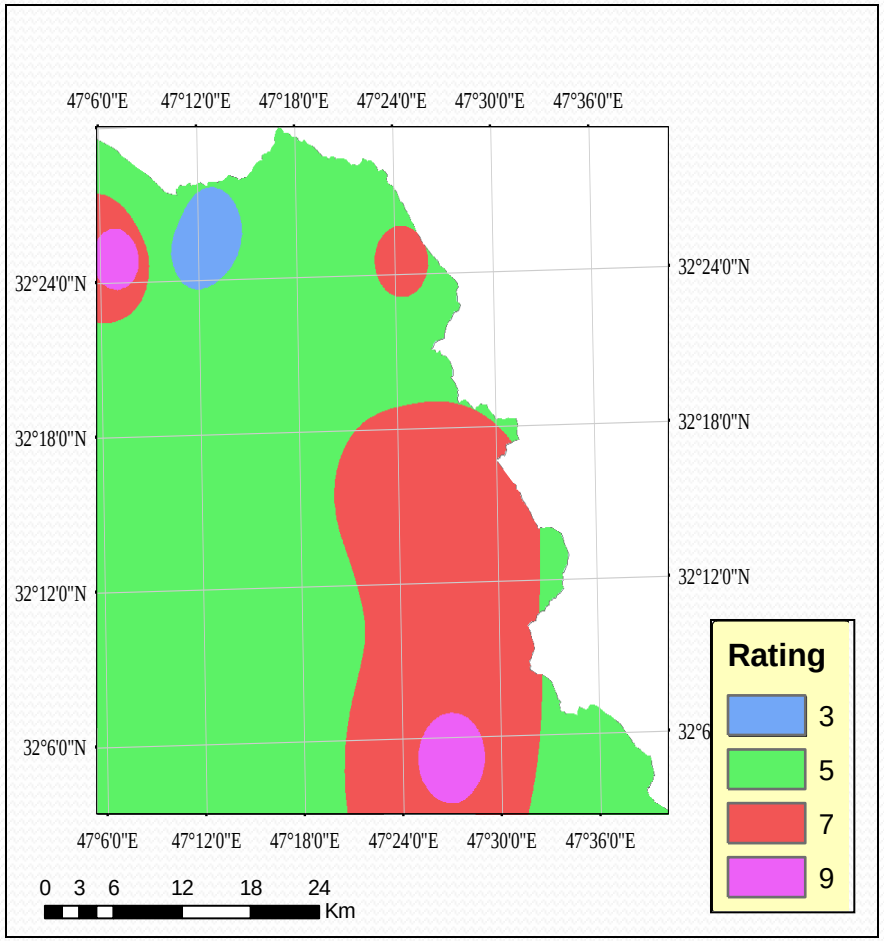
3. Existence of oil & bricks industries, sand & gravel quarries, limited agricultural activities & Livestock.



Assessment of aquifer vulnerability using GIS – DRASTIC based model

Depth to Groundwater Level (D)

Range	Rating	Weight		Total weight (rating × weight)	
		standard	pesticides	standard	pesticides
1.5 – 4.5	9	5	5	45	45
4.5 – 9	7			35	35
9 – 15	5			25	25
15 – 22	1			15	15



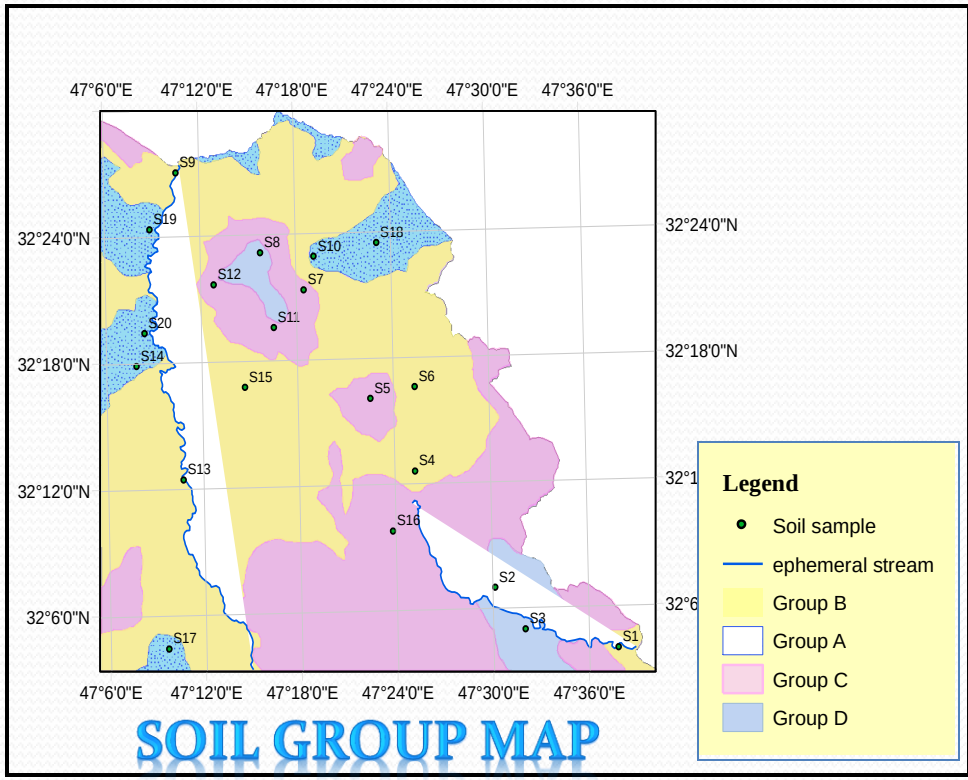
Net Recharge (R)

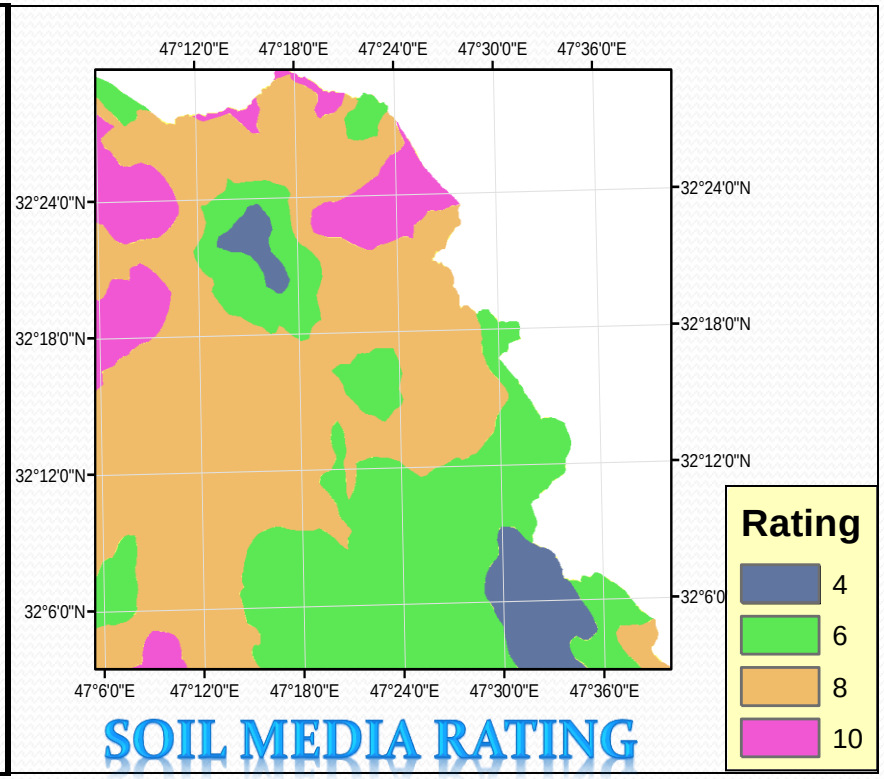
Range	Rating	Weight		Total weight (rating × weight)	
		standard	pesticides	standard	pesticides
< 50	1	4	4	4	4

Aquifer Media (A)

Range	Rating	Weight		Total weight (rating × weight)	
		standard	pesticides	standard	pesticides
Sand and gravel	8	3	3	24	24

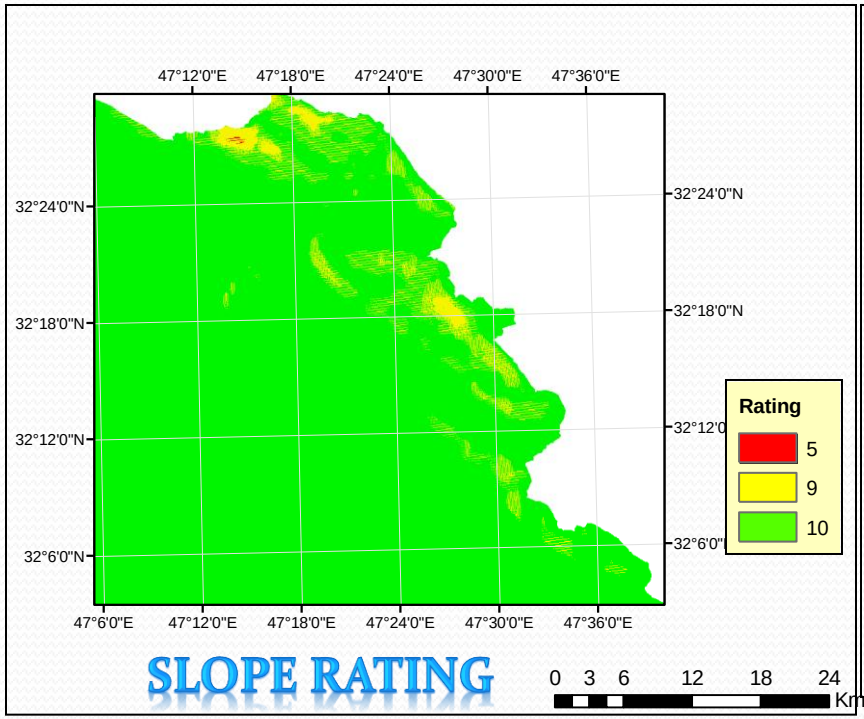
Soil Media Rating (S)

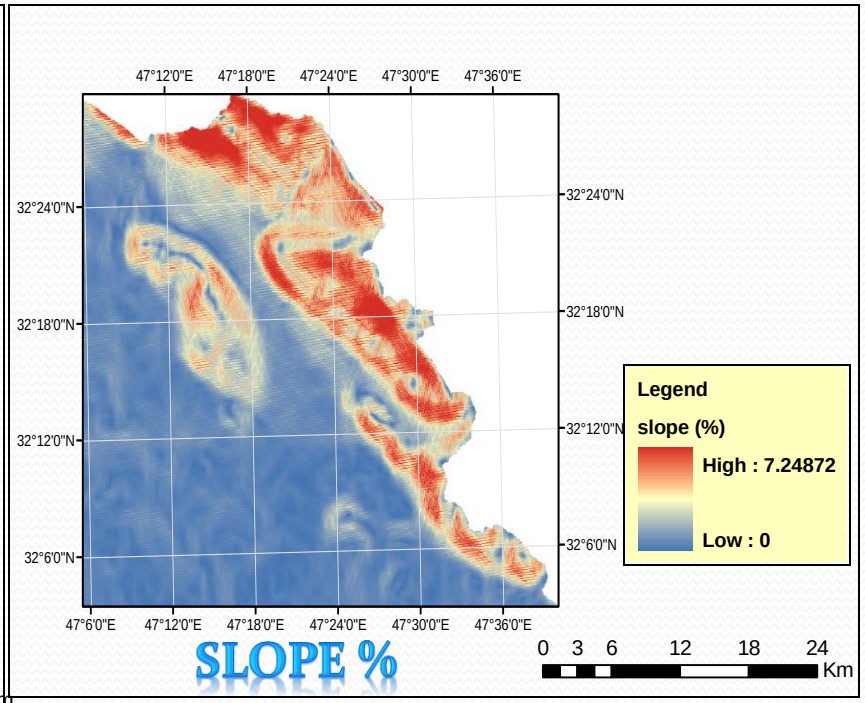




Range	Rating	Weight		Total weight (rating × weight)	
		standard	pesticides	standard	pesticides
Group A	10	5	2	50	20
Group B	8			40	16
Group C	6			30	12
Group D	4			20	8

Topography (Slope) (T)

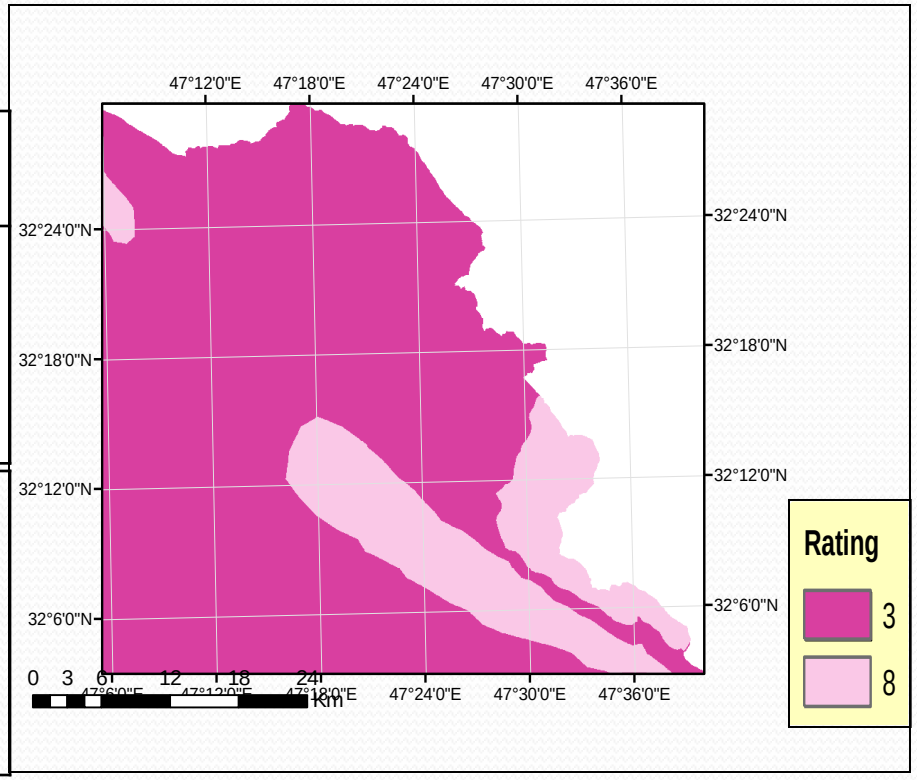




Range	Rating	Weight		Total weight (rating × weight)	
		standard	pesticides	standard	pesticides
0 – 2	10	3	1	30	10
2 – 6	9			27	9
6 – 12	5			15	5

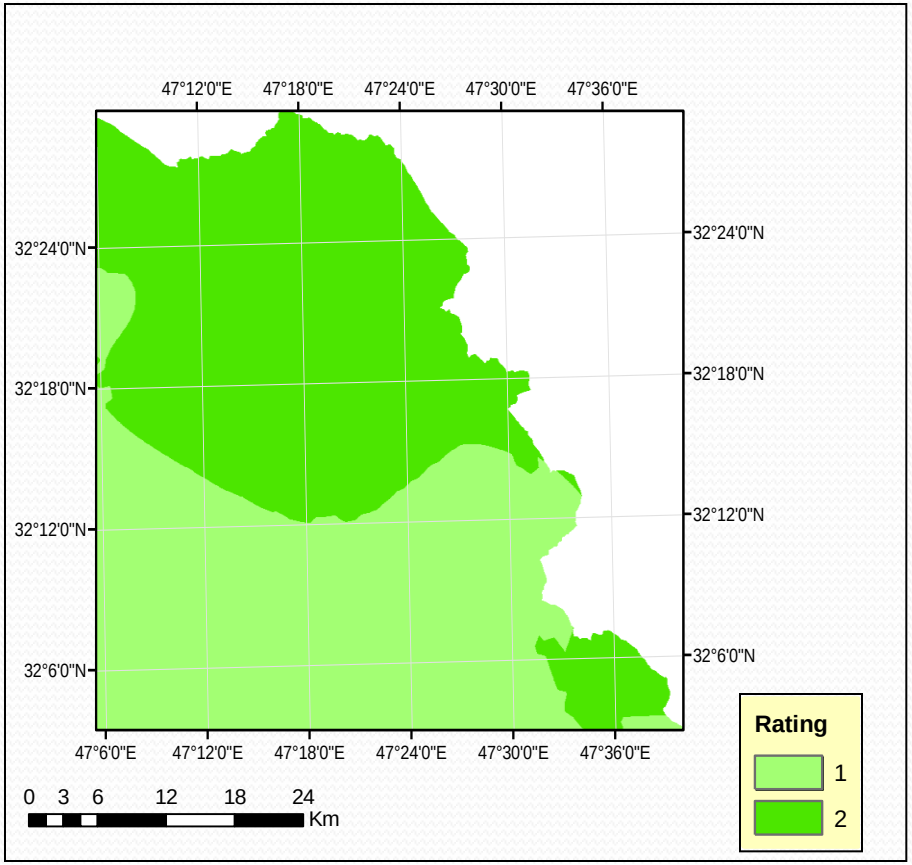
Impact of Vadose Zone (I)

Range	Rating	Weight		Total weight (rating × weight)	
		standard	pesticides	standard	pesticides
Sand – gravel	8	3	5	24	40
Silt - Clay	3			6	15



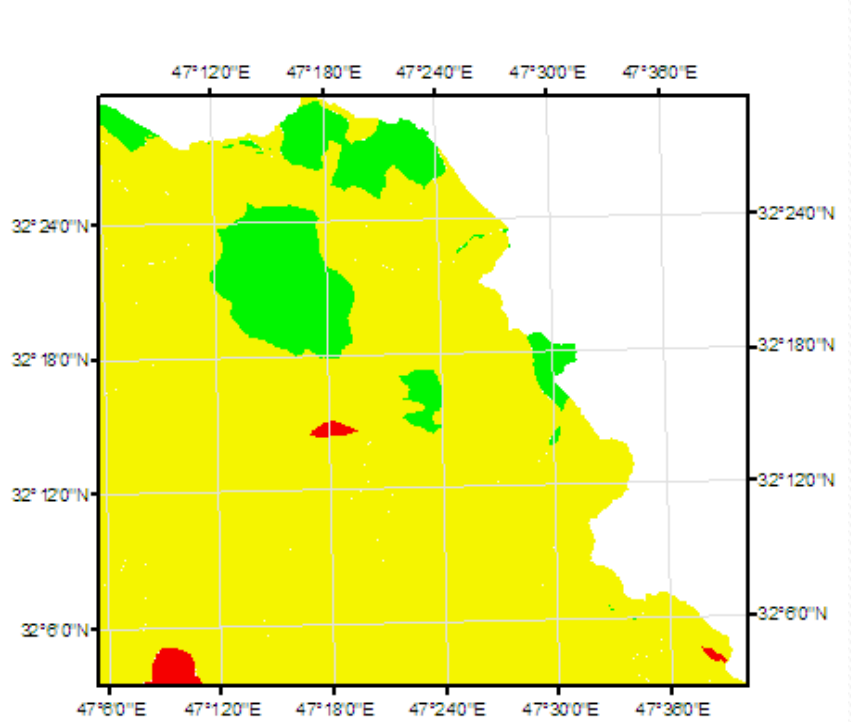
Hydraulic Conductivity (C)

Range	Rating	Weight		Total weight (rating × weight)	
		standard	pesticides	standard	pesticides
0 – 4	1	2	3	2	3
4 – 8	2			4	6



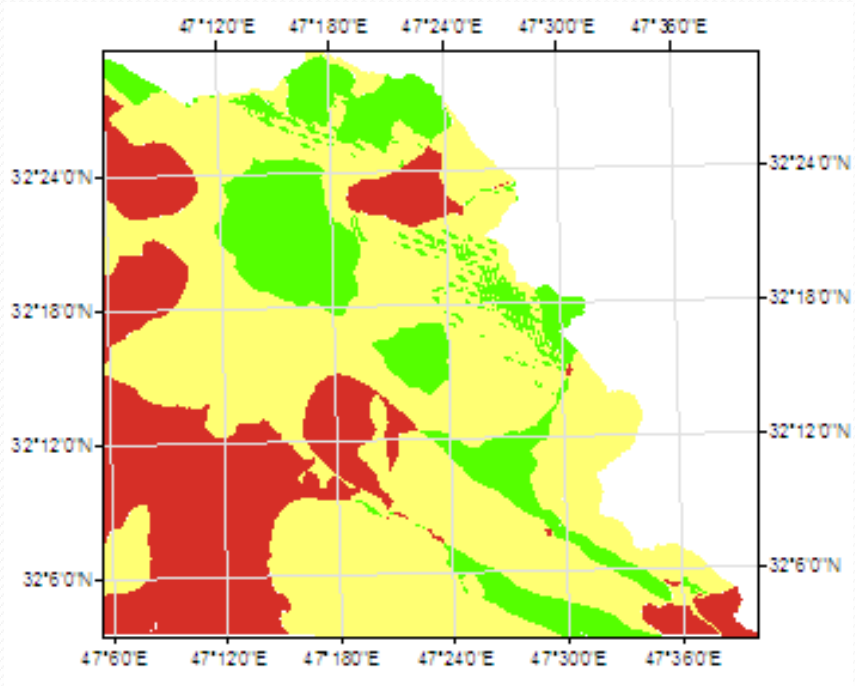
CONCLUSION

DRASTIC CALCULATION & ANALYSIS



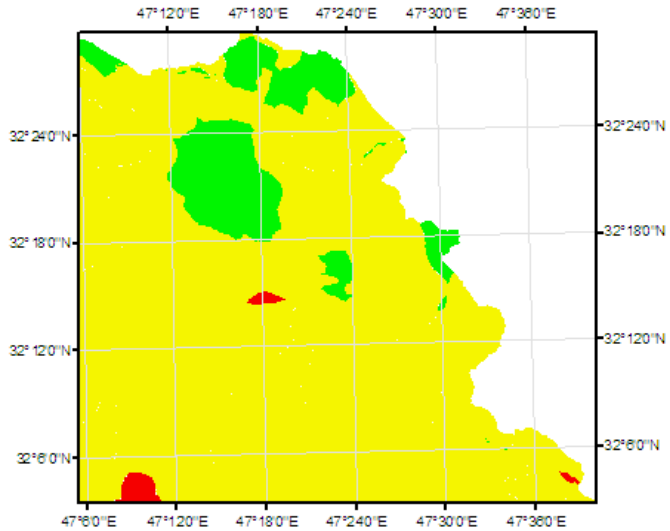
DRASTIC vulnerabilit classes

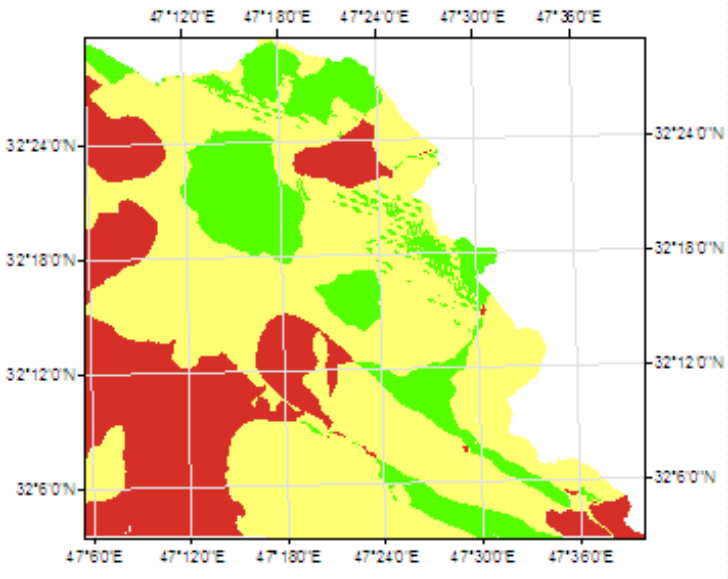
- very low
- low
- moderate



Pesticides DRASTIC classes

- low
- moderate
- high





DRASTIC Version	Vulnerability Classes	Area Occupied Km2	%
Standard	V. Low	280	15
	Low	1563	84
	Moderate	13	1
Pesticides	Low	289	16
	Moderate	1189	64
	High	378	20

High risk of GW contamination originates from :

1. Impact of Vadoze zone.
2. Hydraulic conductivity.
3. Soil media.
4. Depth to groundwater level.

Factor	Min.	Max.	Mean	Standard Deviation	Coefficient of Variation
D	3	9	9.61	1.09	11.34
R	1	1	1	0	0
A	8	8	8	0	0
S	4	10	7.31	1.44	19.69
T	5	10	9.9	0.09	0.91
I	3	9	3.86	1.89	48.96
C	1	2	1.52	0.49	32.24

Recommendations for mitigation of contamination risk

- *Prevent the use of pesticides in the areas of moderate and high vulnerablity and use other safe methods for controlling pests and weeds such as biological methods.*
- *Monitor the industrial and agricultural contaminants in these areas to define the status of contamination and make corrective measures.*

THANK YOU