Results and Discussion

RESULTS

One DRASTIC vulnerability index was calculated for each hydrogeologic basin. The basins were then classified in five vulnerability groups based on their indices (Table 4). Table 5 lists the DRASTIC numbers, indices, and vulnerability classifications by hydrogeologic basin.

Table 4. Vulnerability classification and corresponding DRASTIC indices

DRASTIC Index	Vulnerability Classification
<80	Very Low
80-89	Low
90-119	Moderate
120-139	High
140-160	Very High

The statewide groundwater vulnerability map is displayed in Figure 13. Hydrogeologic basins with very low or low vulnerability are shown in purple and blue; basins with moderate vulnerability are shown in green; and basins with high or very high vulnerability are shown in yellow and orange.

The hydrogeologic basins composed of alluvium and terrace deposits are the most vulnerable, due to their high porosities and permeabilities and shallow water tables. Of the ten major

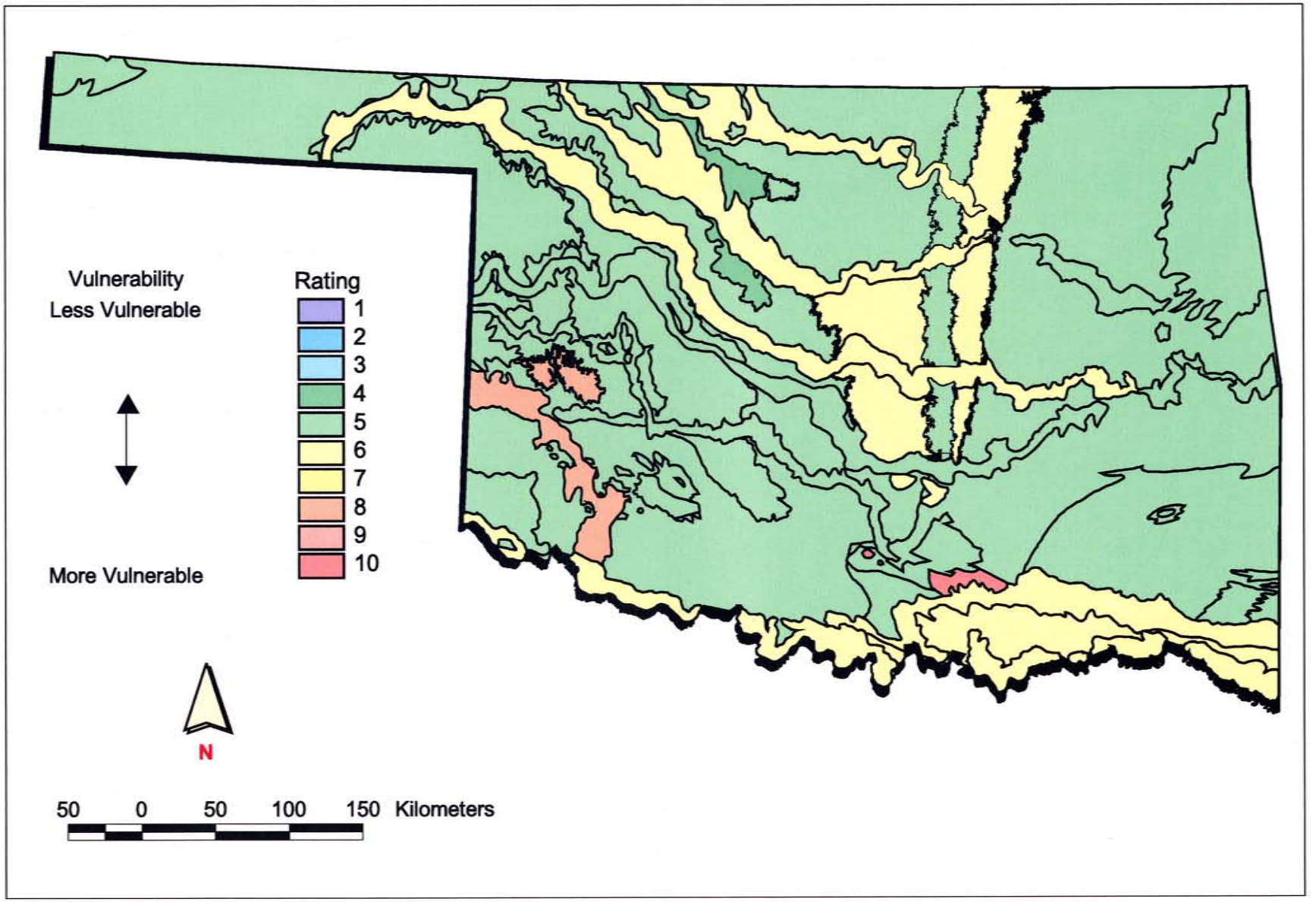

Figure 10. Map showing DRASTIC ratings for soil media (S), by hydrogeologic basin.

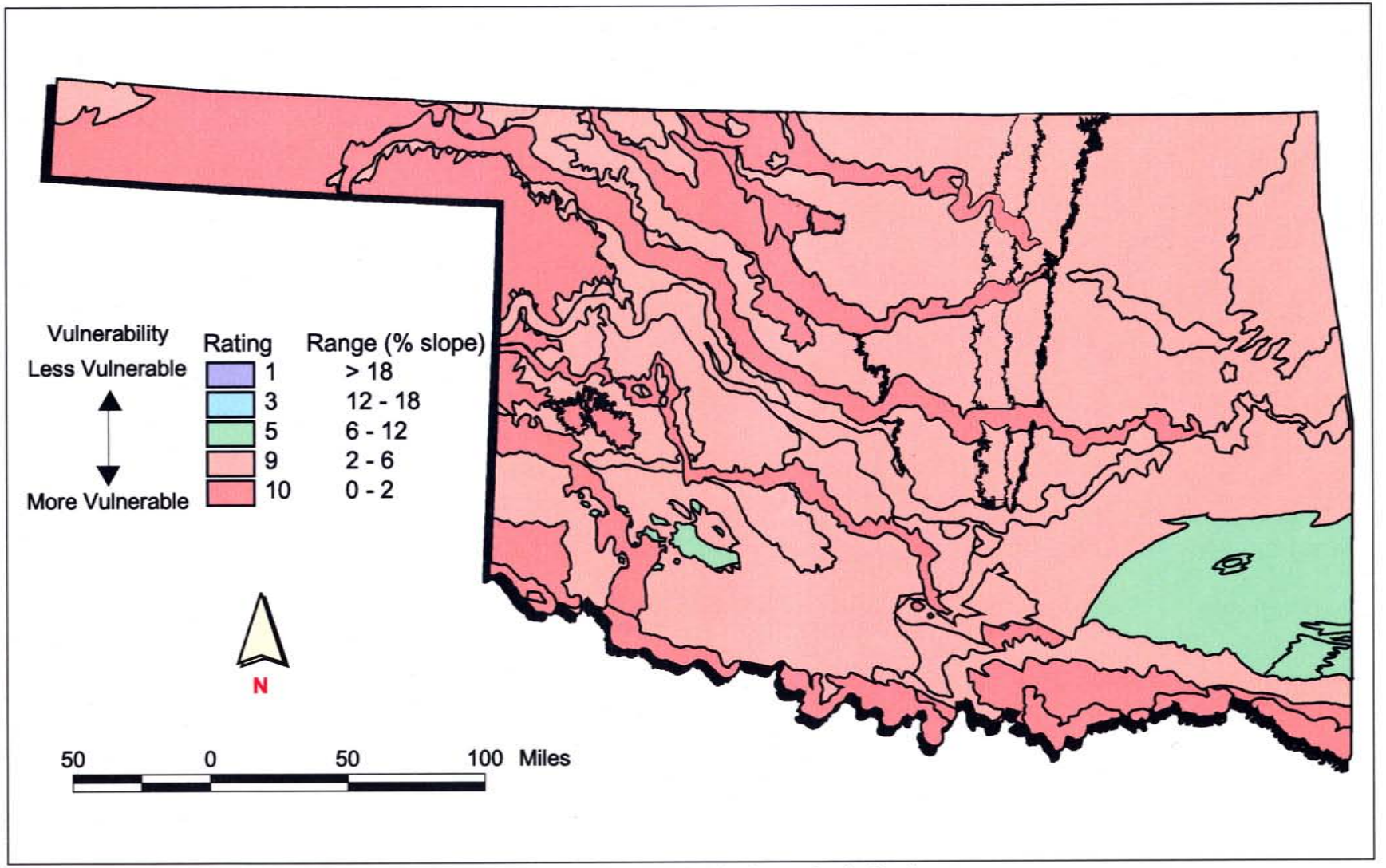

Figure 11. Map showing DRASTIC ratings for topography (T), by hydrogeologic basin.

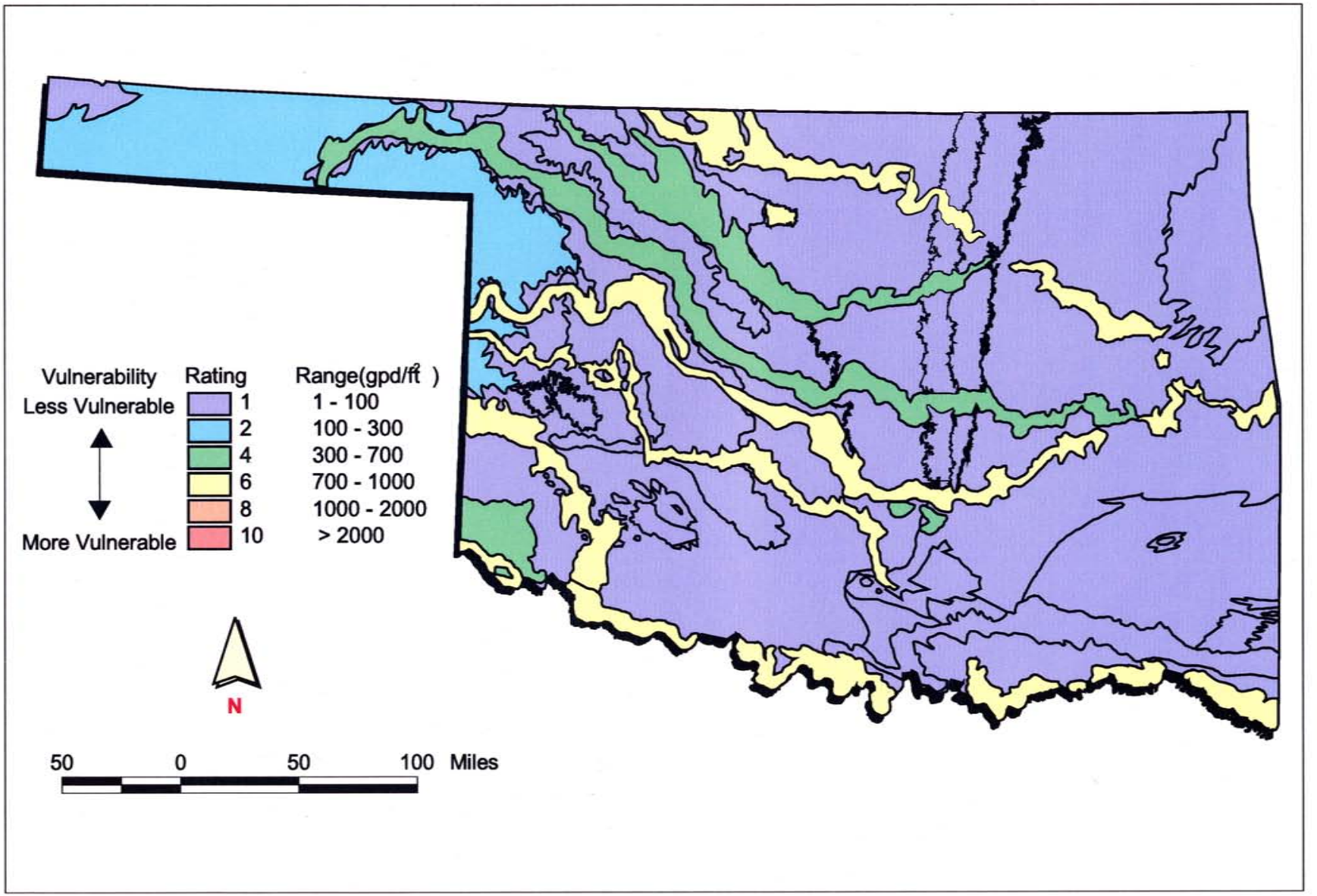

Figure 12. Map showing DRASTIC ratings for hydraulic conductivity (C), by hydrogeologic basin.

Table 5. DRASTIC numbers, indices, and vulnerability classifications, by hydrogeologic basin

	BASIN	D	R	A	S	T	I	C	INDEX	VULNERABILITY CLASSIFICATION
	of the North Fork of the Red River	35	12	24	16	10	40	18	155	
	of the Salt Fork of the Arkansas River	35	12	24	12	10	40	18	151	
	of the Red River	35	12	24	12	10	40	18	151	
	of the Washita River	35	12	24	10	10	40	18	149	
	Enid Isolated Terrace	35	12	24	10	10	40	18	149	
	of the Canadian River	35	12	24	10	9	40	18	148	
	of the Arkansas River	35	12	24	10	9	40	18	148	
	of the Cimarron River	35	12	24	12	10	40	12	145	Very High
Alluvium and Terrace Deposits	of the North Canadian River	35	12	24	12	10	40	12	145	
	Gerty Sand	25	4	24	12	9	40	12	126	High
	all other alluvium and terrace deposits								125-155	High-Very High
	Boone	15	24	27	10	9	45	3	133	
	Arbuckle-Simpson	15	24	27	10	9	45	3	133	
	Blaine	15	4	30	10	10	50	12	131	
	Elk City	25	12	21	16	10	35	3	122	High
	Cedar Hills	25	12	18	8	10	30	3	106	
	Antlers	25	4	21	12	9	30	3	104	
	Arbuckle-Timbered Hills	25	4	18	10	9	30	3	99	
	Arkansas Novaculite	25	4	18	10	5	30	3	95	
	Rush Springs	15	4	21	10	9	30	3	92	
	Vamoosa-Ada	15	4	18	12	9	30	3	91	Moderate
	Central Oklahoma	15	4	18	12	9	30	3	91	
	Ouachita Mountains	25	4	15	10	5	25	3	87	
	Ogallala	5	4	21	10	10	30	6	86	
	Cretaceous	15	4	15	12	12	25	3	84	
	Permian	15	4	15	10	9	25	3	81	Low
	Pennsylvanian	15	4	15	10	9	25	3	81	
	Mesozoic	10	4	15	10	9	25	3	76	
	Tishomingo Granite	10	4	6	20	10	15	3	68	Very Low
Bedrock	Washita Igneous	10	4	6	10	5	15	3	53	

alluvium and terrace aquifers, nine were classified as very highly vulnerable, and one (the Gerty) as highly vulnerable. The DRASTIC indices for all other alluvium and terrace deposits are not displayed on the vulnerability map, but are assumed to range from 125-155, with a high to very high vulnerability. Most bedrock basins are overlain in part by alluvium and terrace deposits. Where overlain by these deposits, the vulnerability rating for the alluvium and terrace deposits should be used.

Four bedrock basins were considered highly vulnerable. The Boone, Arbuckle-Simpson, and Blaine basins are composed of cavernous limestone or gypsum. These basins contain karst features, such as caves, sinkholes, and disappearing streams, which provide direct conduits for

precipitation and runoff to transport contaminants to the water table. The Elk City basin has a shallow water table and consists of porous sandstone overlain by permeable sand.

Seven bedrock basins were classified as moderately vulnerable. The Cedar Hills, Antlers, and Rush Springs basins consist of sandstone; the Vamoosa-Ada, and Central Oklahoma basins consist of sandstone interbedded with shale; the Arbuckle-Timbered Hills is a carbonate aquifer; and the Arkansas Novaculite produces water from highly fractured chert. Although the basins are composed of different types of aquifer media, all contain high-yielding aquifers.

Five basins with DRASTIC indices between 80 and 89 were considered to have low vulnerability. The Ogallala basin, although consisting of porous, semi-consolidated sand and gravel, has a low vulnerability rating because of its deep water table. The Ouachita Mountains, Cretaceous, Permian, and Pennsylvanian basins consist of interbedded sandstone, limestone, and shale. The porosities and permeabilities of these low-yielding rock formations are low, making them less vulnerable than others.

The Mesozoic, Tishomingo Granite, and Washita Igneous hydrogeologic basins have DRASTIC indices less than 80, and have a very low vulnerability. These basins are composed of igneous or sedimentary material of low permeability.

MAP LIMITATIONS

Groundwater vulnerability was assessed for the 30 hydrogeologic basins described in this report. The hydrogeologic basins include both major and minor aquifers, but are not always the same as an aquifer. Because the basins include only geologic formations exposed at the surface, portions of some bedrock aquifers (such as the Central Oklahoma, Rush Springs, Antlers, Arbuckle-Simpson, and the Arbuckle-Timbered Hills) that are overlain by shallower formations are not included in the vulnerability assessment.

The vulnerability map shows the relative vulnerability of the hydrogeologic basins, and is based on average values for each entire basin. The map is acceptable for evaluating relative vulnerability of the basins, but it should not be used in place of site-specific assessments.

The map does not show areas that will be contaminated or areas that cannot be contaminated. Whether a specific site will ever have groundwater contamination depends on the likelihood of contaminant release, the type and quantity of contaminant released, and the hydrogeologic characteristics at that location.

The vulnerability assessment was based on available data. The DRASTIC indices and vulnerability map can be updated as additional or new information becomes available. The OWRB welcomes any additional data, references, or interpretations that may be used in determining the vulnerability of groundwater. Results from this study can be used in combination with other information (such as land use, potential sources of contamination, water quality, OWRB aquifer classifications, population density, and beneficial uses of the aquifer) to identify areas where special attention or protection efforts are warranted.

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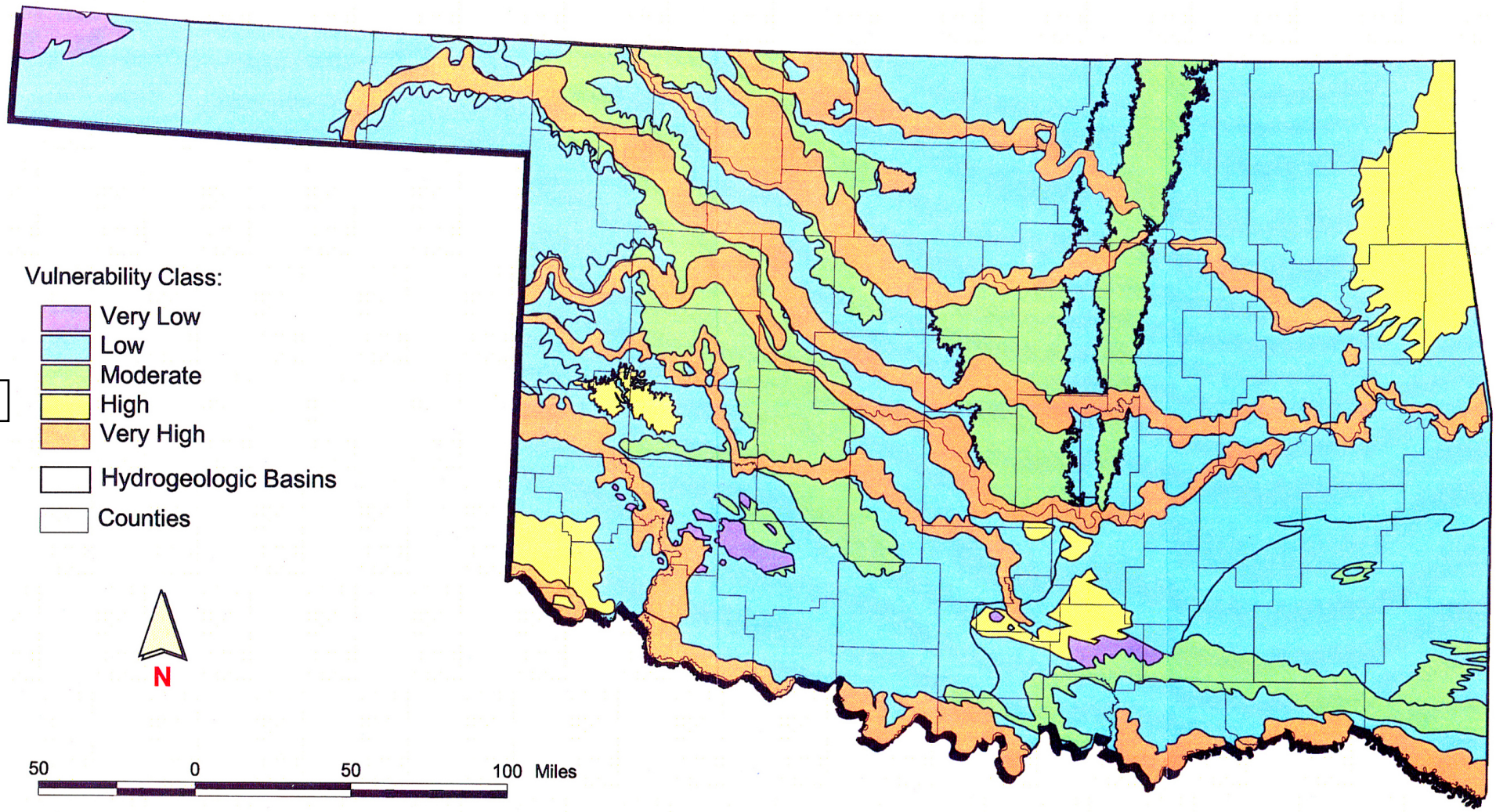

Figure 13. Groundwater vulnerability map of Oklahoma showing vulnerability classifications by hydrogeologic basin.