

WATER MESS

Assessing water quality to determine the populations risk to water-borne diseases in Haiti

BACKGROUND

In 2010, Haiti suffered from a cholera outbreak, claiming the lives of many. Among other factors, poor water quality was a great contributor to the transmission of the disease.

Quality water is critical for our health and well-being. Assessing the state of water quality in Haiti is essential in understanding the population risk to water-borne diseases.

In this project, over 15,000 water sources spread across the Centre, Artibonite, North, and South East Departments in Haiti are assessed to identify communes with a high average number of poor quality water sources. The results are then used to determine the areas at risk and the magnitude of risk.

METHODOLOGY

To determine the water quality state, 6 factors were considered (see figure 1). When regarding the population's risk to water-borne diseases, it is important to hold water quality standards high. For this project, standards for drinking water provided by the World Health Organization's Water Quality Guideline were used (see figure 1).

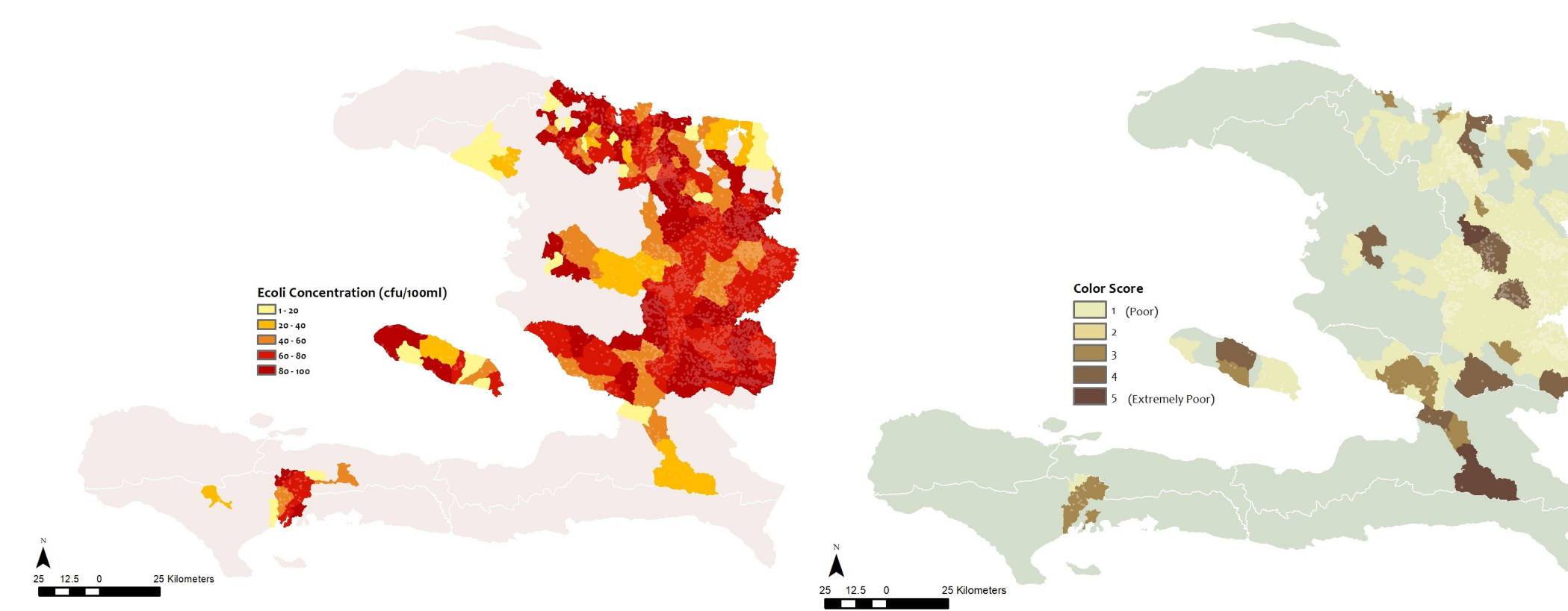
Note that E.coli is considered the only factor that is detrimental to health and is therefore given a higher priority (as discussed to the right).

To obtain the factor maps (to the right), data was filtered to determine water sources whose attributes were below the standards of the 6 factors. The data was then summarized for each commune and averages were taken for each of the 6 factors. The averages were then grouped to give a score of 1–5. A weighted raster analysis was then conducted to determine communes with the lowest water quality standards (given a rank 1-4).

To determine the risk of the population to a high average number of bad quality water, the final water quality map was overlaid with the total population density of each commune.

Factor	Water Standard
E.coli Concentration (cfu/100ml)	0
Conductivity (uS/cm)	250
Total Dissolved Solids (mg/l)	<1000
Odor	No smell
Color	No color

Figure 1. WHO Water Quality Guidelines: Microbial and Chemical factors



E.COLI CONCENTRATION
Of all factors considered, E.coli is deemed the most detrimental for health. It is an indicator for fecal contamination.

35 %
+

Water pH
Low pH makes water corrosive making it more likely for the water to have materials from storage. High pH makes water less receptive to treatment.

15 %
+

Total Dissolved Solids
This measure comprises of inorganic salts, small organic matter and other harmful minerals that cannot be utilized by the human body and accumulate.

15 %
+

Water Conductivity
Water conductivity is an indication of ions and elements that are dissolve in the water. High conductivity is likely to make the water taste weird.

15 %
+

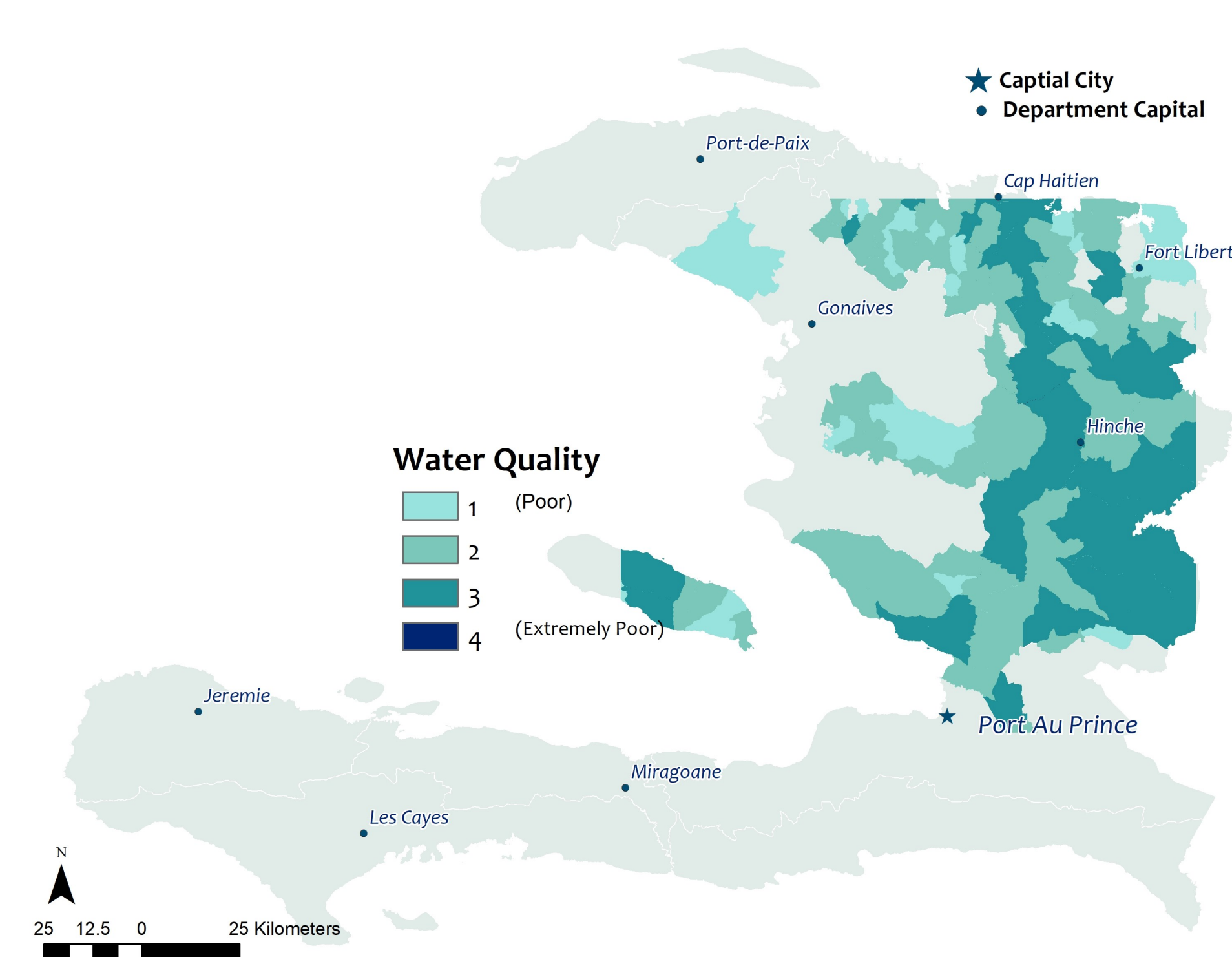
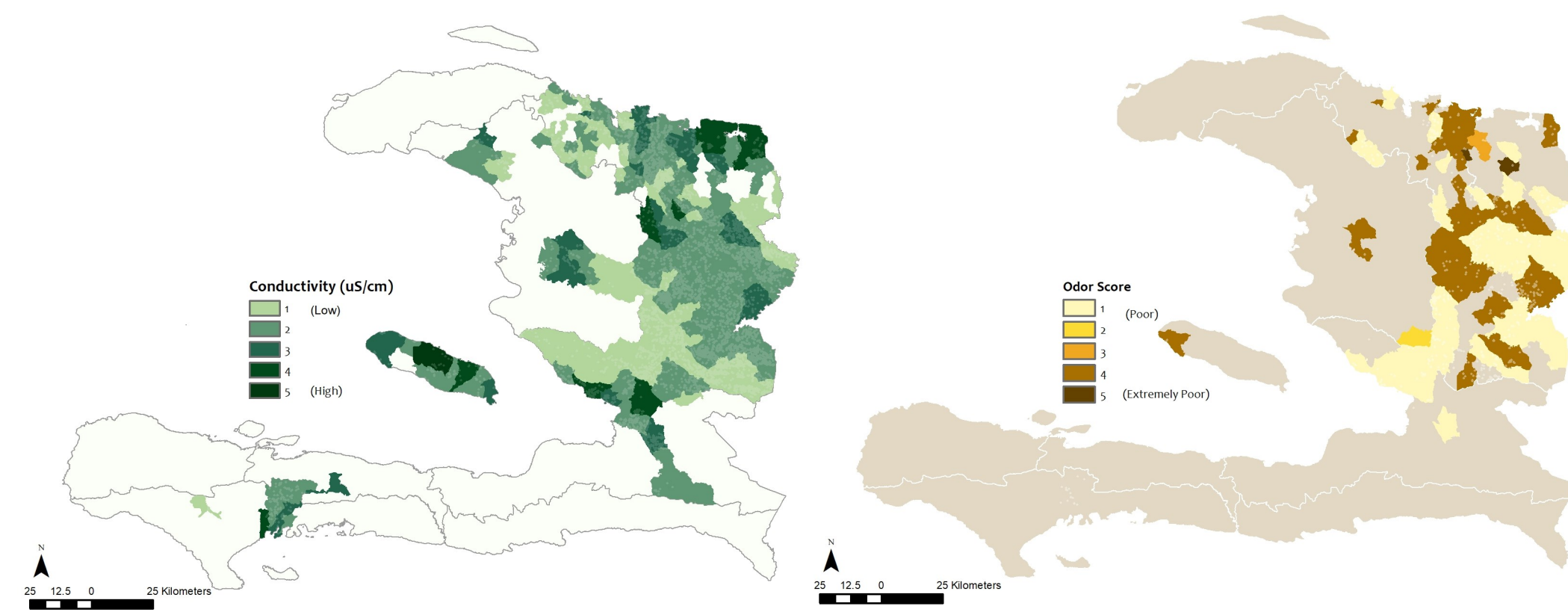
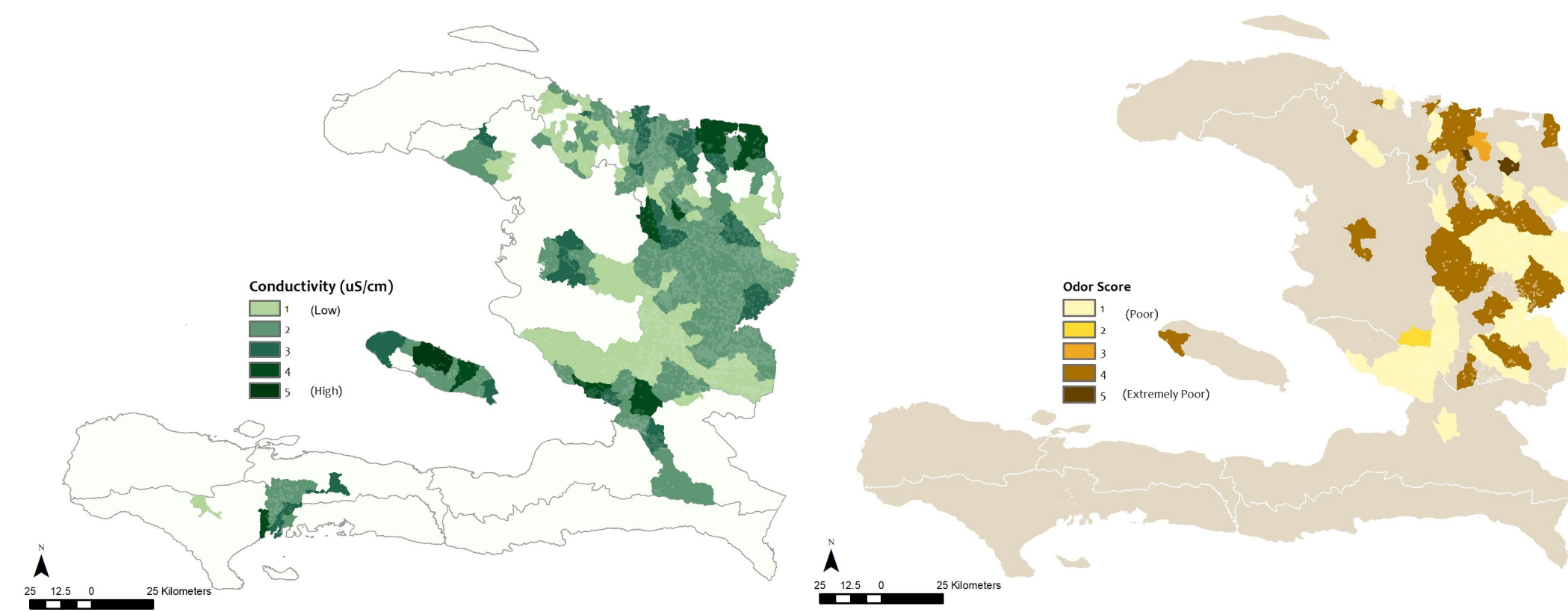
Water Color
Color is greatly associated with the quality of water. The score is mostly associated with general quality standards. Colors range from cloudy to black.

10 %
+

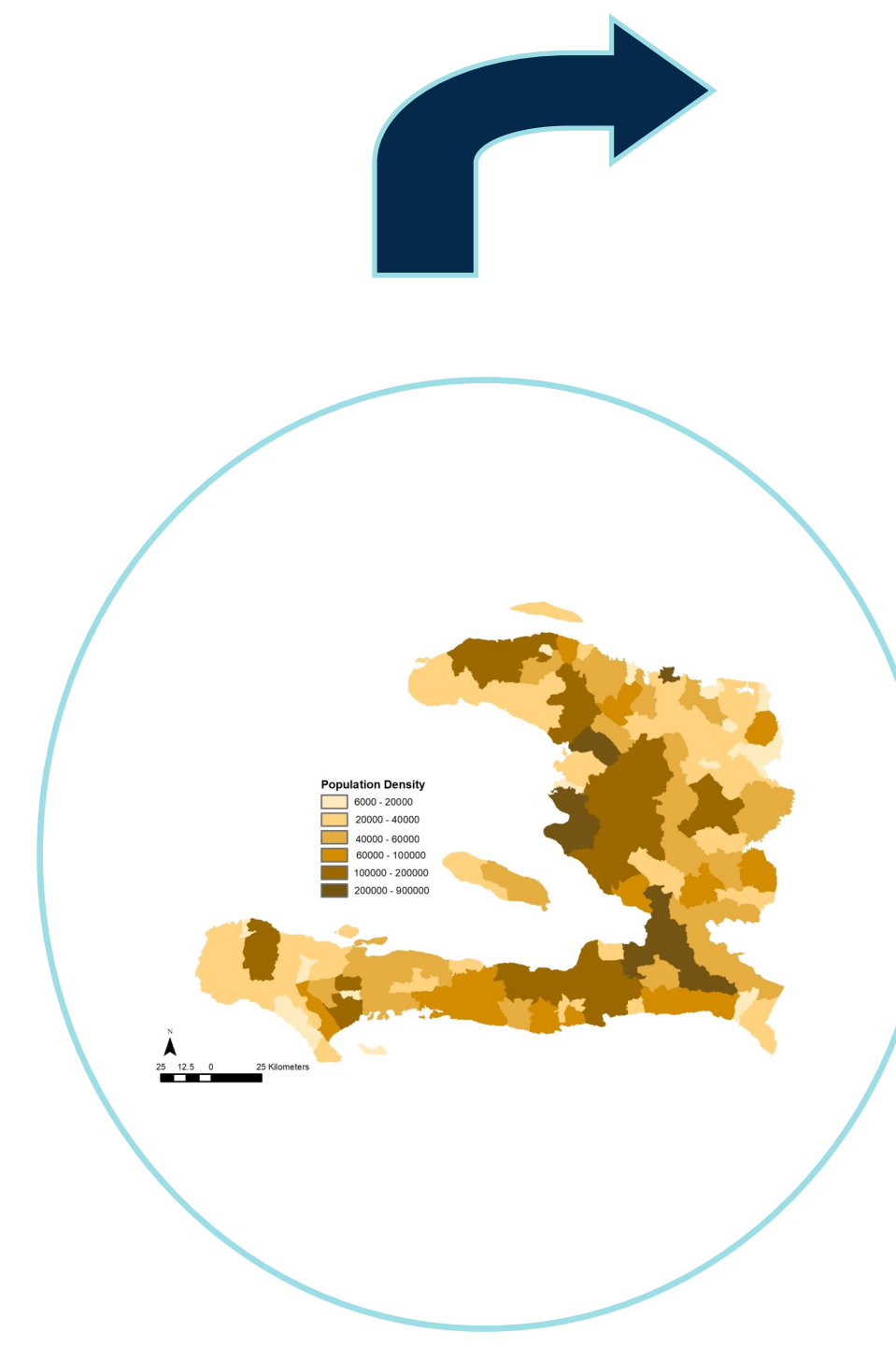
Water Odor
The assumption made for odor is the worse the smell, the more likely it is to be contaminated. The odor ranges from marshy to fishy to acidic.

10 %

OVERLAY
RESULT



X

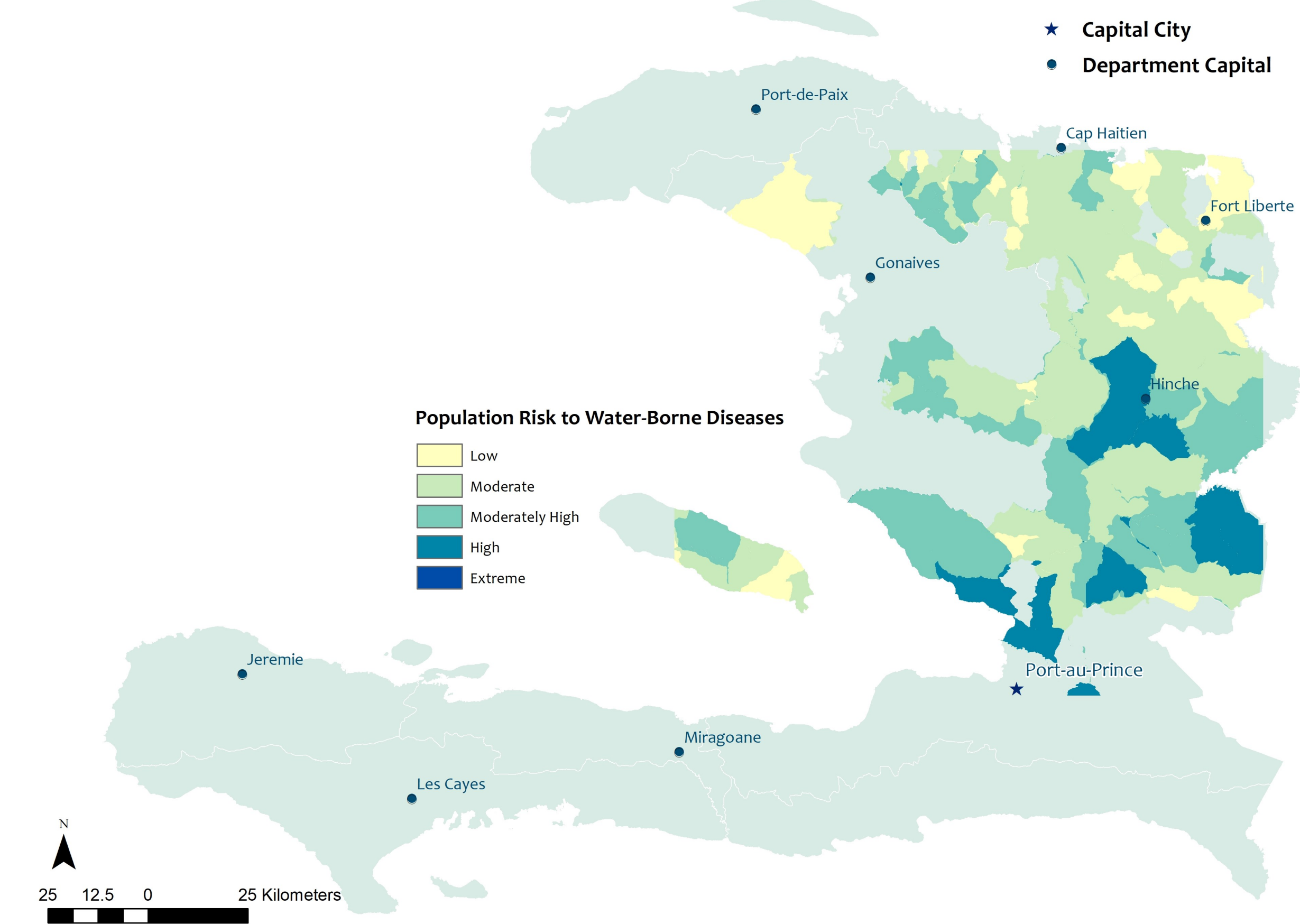


RESULTS and CONCLUSIONS

The results below are determined by the average water quality below the water quality standards as provided by WHO. Population density is prioritized because more people are at risk of water-borne diseases. Areas of high population density and lower water quality standards are at the most risk.

The limitations of this project is the deficit of data. Ideally, this analysis would be more precise if risk of population around a particular distance from water sources. There was no specific data on particular population types around the sources and so I was forced to average the date. The main disadvantage of this is that the standard deviation for the means varied. It is ideal to have low standard deviations to ensure the average is a true representation of the water quality but that was not case.

POPULATION RISK TO WATER-BORNE DISEASE



Cartographer: Joy Kimambo
Date:12/13/2019
Projection GWS
Sources: HaitiData.org Harvard