RISK ANALYSIS OF FLOOD IN RUTLAND, VERMONT

INTRODUCTION
In comparison to the traditional flood maps, flood risk maps generate more information about the flooding event because they bring into account of the effects of flooding. Risk maps are usually generated as a mathematical combination of damage maps of different return periods. In this project, the study area is the Rutland City, Vermont. The hurricane Irene hit the city on Aug 31 and Sept 1, 2011, and caused a huge flood in the Otter Creek which is a river located at the southwest to the central city. Traditional flood map, land use map, water depth map and population density map are introduced as parameters of the algorithm for estimating flood risk. These results of flood risk analysis can be useful to evaluate policy alternatives and they are important inputs for social cost benefit analysis.

FLOOD RISK MAP
The flood risk is estimated and calculated on the basis of Risk = Probability × Vulnerability. However, the probability of this flood cannot be determined in this project, since there is no flood area images of other flood events available, and the USGS National Water Information System did not have the record of the peak flow of this flood. Therefore, probability will be assumed as 1 in this study, which means the flood area is fixed if there was a flood event. In order to estimate the vulnerability, three major components of it, land use, population density and water depth of the flood, must be determined. Combining with these three layers of rasters, and using the algorithm of Vulnerability = Land Use × Population Density × exp(Water Depth)

Then, by introducing the estimated vulnerability to the previous risk equation, a risk map of the flood areas can be produced.

CONCLUSION
Overall, by looking at the land use ratio of the flood area, the city of Rutland has a fairly good urban planning design. Most of the flood plains were covering by water when the flood came, and they reduced the flood damage by storing and releasing the water. However, there are still some highly developed areas, some of them are even far away from the Otter Creek, suffering the damages caused by the flood. The results of the risk analysis could be used by the insurance companies for risk assessments and land evaluation, and the department of urban planning for damage control and stormwater management. The scientific base for the calculation allows spending financial resources in a more effective and objective way.