Slide 2:

All of this can be summarized as:
"This is an attempt to provide a case study for using FEMA's HAZUS tool in a GIS environment to predict areas of liquefaction in the event of an earthquake in the low country of South Carolina."

Slide 3:

This is the general location of the 'COG' area where we focused our model on and
Wilmington will be about here for those of you like me who have no sense of direction. (Laser)

Slide 4:

Despite begin on a passive margin SC experiences severa EQs every year, Of particular note is this area down here the…

Slide 5:

Middleton Place- Summerville Seismic Zone located just north of Charleston and it sees 10 to 30 EQs each year most are too small to feel

Slide 6:

And this is the culprit: the inferred Woodstock fault

Slide 7:

While most earthquakes are virtually harmless larger ones have occurred
It's estimated that there is a 40 60 % chance of a Magnitude 6 EQ in the Eastern US over the next 30 years

Slide 8:

What would this look like?
Well 1886 saw one such EQ it was estimated to be between a Magnitude 6.9 and 7.3 and was felt on nearly every part of eastern North America
1000 of structures were heavily damaged,
And the best part 1,300 sq. km s saw liquefaction

Slide 9:

here is a one of many pictures of down town Charleston in the aftermath

Slide 10:

Liquefaction is a really cool occurrence it happens to saturated sediments that experience very strong ground motions (or the jerking between seismic wave crests)- near the fault its analogous to lifting a dumpster 2 feet off the ground and dropping it ever second but side to side

This causes the water pressure between the grains to increase- the grains are pushed apart and lose contact with each other- this results in a loss of internal friction- the sediment loses internal cohesion thus turns to soup and the gravity takes over- waters light so it goes to the surface and buildings sink

Slide 11:

Here’s a map of known 1886 liquefaction events

Slide 12:

And here’s one of them – it would have looked like a water and sand blast that was 15 feet high

Slide 13:

By comparison here are some small ones from the recent 9.0 in Japan- the water just squirts right up

Slide 14:

What is HAZUS? - It’s a program that helps to model most disasters that can affect the public in general: where who and to what degree

Its most powerful used in a GIS environment

Slide 15:

What is a GIS?- a headache inducer

Slide 16:

The cool thing about HAZUS is that most of the data it eats is already available, and the process is fairly straight forward.

Slide 17:

A little daunting a first but in a nut shell all you need is the surface geology the surface age an earth quake shake map and ground water depth

Slide 18:

Step 1- determine susceptibility using this little cart here you can take the …

Slide 19:

…Surface geology layer and combine it with the …

Slide 20:

… sediment age layer to get…

Slide 21:

… a map that gives how vulnerable a patch of soil is to liquefaction in a worst case scenario…

Slide 22:

Step 2 is taking that new layer and combining it with a shake map from a hypothetical earthquake to give the rough probability of liquefaction

Slide 23:

Here is one of the shake maps we used in the study

Slide 24:

The moment magnitude correlation factor is simply a way to adjust the model- plug in the magnitude of the hypothetical earthquake and go.

Slide 25:

Even the name 'Liquefaction' implys that water is important. So knowing the depth to the water table gives how saturated the soils are

Slide 26:

So the red is shallower water tables and its bad

Slide 27:

And one last little control before we start chugging the model

Slide 28:

The final formula how everything ties together simply multiplying this my 100 gives the values in percent chance of liquefaction
The hole unit will not liquefy it's nearly impossible, at most only 25 percent will go

Slide 29:

The final result for a magnitude 6.9 as you can see liquefaction is restricted to near the rivers and near the rupture zone

Slide 30;

Here it is for a mag 7.3. these large areas you see here are spoils from phosphate mining other places are artificial fill (which is the worst)

Slide 31:

So its pretty but what do we do with it?

Slide 32:

We plan for the worst- the point is to save lives and property this is done by doing things like picking the right spot to build a hospital or figuring out what challenges will arise beforehand.

Slide 33:

Layers like my two final maps do not decide where to put things the simply limit the options
A good analogy is chess board- you don't want to move into your opponent's line of attack

Slide 34:

For instance we might want to figure out which bridges will be destroyed to determine aid distribution center locations

Slide 35:

There are some problems with the model like
(follow on screen)

Slide 36:

Questions?