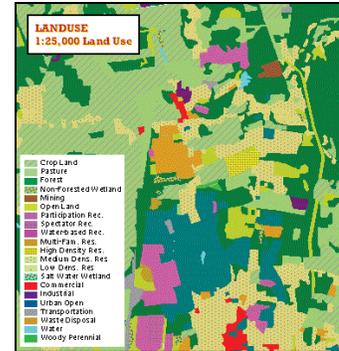# The MassGIS Project

This is three-week project combines more-or-less all the GIS tools and skills that we have learned over the course of the semester.

Project Objective

- To quantitatively analyze and visualize land use changes over the last 30 years for Massachusetts cites and towns.
- To create a professional and meaningful ArcGIS map and project report.

Project Overview

Create a map (for a town or city in Massachusetts) showing land use in 1971 and 1999 (using the 21 category classification system) as two data frames. Aggregate the 21 detailed land use categories into 10 broader categories and quantify the land use changes between 1971 and 1999 using a table and two pie charts. Your map also includes three additional data frames showing topographic maps, aerial photographs, town lines, roads, streams, etc. to provide a spatial context for the land use change analysis.

- Create your map in 24 inches wide by 18 inches tall.
- Your map will contain 5 data frames, each with a meaningful legend and title.
- The overview data frame should be about 6 by 4 inches and show an overview map of Massachusetts.
- The four other data frames should be about 7 by 7 inches and show as much of your city or town as possible. They have to show exactly the same areal extent and zoom level (use spatial bookmarks to define a common zoom level and spatial extent).
- Arrange the data frames on your 24 inch by 18 inch map – leaving sufficient space for 2 graphs, a table, the standard map elements, and some explanatory text.
- Leave at least a 0.5 inch margin around all map elements.
- Include all the standard map elements on the map and data frames.
- The final map and report have to be professional and beautiful – something that you could use in a job interview to demonstrate your GIS skills.

That's a lot of content to fit onto a 24 by 18 inch piece of paper: 5 data frames, a table, 2 graphs, some text, etc. – arranging all that is one of the challenges here. Your final map will look stunning! We will print these maps in beautiful color and display them in the hallway outside of Bates 022.

Remember: This project is worth 30 percent for your final course grade!

This project is time-consuming so plan your work accordingly. The deadlines, especially the final one, are not negotiable (see Section 4). You have four weeks for this project and there is no justification whatsoever for not getting this done in-time.

1) Mapping Task

1.1) Overview Data Frame

This data frame shows where your town or city is located within Massachusetts. Show your city/town using a red outline or fill. Also include the city/town name and the name of the county where your city/town is located.

- Show the town boundaries and county boundaries.
- Add additional data layers and features as appropriate, for example the Mass Pike, I91, and the Connecticut River, but don't clutter the map.

1.2) Topographic Map Data Frame

This data frame has to be the same size as the other data frames (expect for the Overview data frame) and show exactly the same area/zoom level/location.

- Show the 1:25,000 topographic maps for your city or town, grouped into a group layer.
- Show the MASSDOT roads, using different symbols for the different road classes.
- Show the town lines and add the names of your city/town and the surrounding cities/towns.

1.3) Aerial Photograph Data Frame

This data frame has to be the same size as the other data frames (expect for the Overview data frame) and show exactly the same area/zoom level/location.

- Show the 1:5,000 aerial photographs from 2005 or 2008/2009 (contrast-stretched).
- Show the rivers and lakes (= hydrography) in blue. Choose the most detailed hydrography data layer available.
- Show the town lines and add the names of your city/town and the surrounding cities/towns.

1.4; 1.5) Land Use Data Frames

These two data frames have to be the same size as the other data frames (expect for the Overview data frame) and show exactly the same area/zoom level/location.

Land use coverage is complete statewide for 1971, 1985, and 1999, based on interpretation of aerial photographs. Land use data are quite complicated! Make sure you read and understand the data layer description: http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/lus.html

- Download the land use polygon data for your city or town.
- Download the symbolization files.

On your map, include two data frames, one showing Land Use in 1971, the other Land Use in 1999, using the 21 category classification system. The symbolization files can be used as symbolization for the 21 different land use categories. Make sure you show land use in 1971 and 1999 using the same symbolization. You can also create your own classification system, using 21 different colors/patterns of your choice.

2) Analysis Task

You will analyze land use changes between 1971 and 1999 and present your results as a table and two pie charts.

2.1) Land Use Change Table (1971 vs. 1999)
Using the 'Select by Attribute' tool, sub-sample the land use attribute tables and create a summary table in Microsoft Excel that aggregates the detailed 21 categories into 10 'broader' land use categories:

1. Agriculture (Codes 1, 2, 21)
2. Open Undeveloped Land (Code 6)
3. Commercial (Code 15)
4. Industrial/Transportation/Mining (Codes 5, 16, 18, 19)
5. Higher Density Residential (Codes 10, 11)
6. Medium Density Residential (Code 12)
7. Low Density Residential (Code 13)
8. Urban Open/Institutional/Recreation (Codes 7, 8, 9, 17)
9. Natural Land/Undisturbed Vegetation (Codes 3, 4, 14)
10. Water (Code 20)

Create a summary table in Microsoft Excel with these seven columns:

Col. 1	Land Use Type
Col. 2	Area in 1971 (in acres)
Col. 3	Area in 1971 (in percent of total town area)
Col. 4	Area in 1999 (in acres)
Col. 5	Area in 1999 (in percent of total town area)
Col. 6	Differences between 1999 and 1971 (in acres)
Col. 7	Differences between 1999 and 1971 (in percent)

Include this summary table on the map, making sure that the table lines and the table text are readable when the map is printed. Include a table caption.

2.2) Land Use Change Pie Charts (1971 vs. 1999)
Create two meaningful pie charts in Microsoft Excel, one showing land use in 1971, the other showing land use in 1999, using the table you created.

- Make sure these graphs are the same size and use the same color scheme.
- You also have to include a legend and caption for each graph.

3) Project Report

The written project report is as much a part of this project as the GIS analysis and mapping task – I expect a high-quality map and a high-quality written report. The report should be professional enough to be presented to your city or town together with your map.

Part I – Your Hypothesis
Phrase your overall objective of this land use change analysis in form of a hypothesis, for example:

> *I hypothesize that the following land use changes occurred between 1971 and 1999:*
> *a) agricultural land use and open spaced decreased.*
> *b) residential and commercial land use increased.*

Your hypothesis may be different, depending on your previous knowledge of the city or town. State your hypothesis before you start your GIS analysis to test it!

Part II – Your Town or City
- Include basic demographic data (e.g. population in 1980, 1990, and 2000, race, income, etc.) as a table.
- Form of town or city government (if a mayor: name of mayor).
- What is special about this city or town? (e.g. the birth place of volley ball, location of the largest university in MA, etc.)
- Include a relevant picture or two of your city or town and the town website in the report.

Part III – Your Methods
- Where and how did you get the data?
- Include a description of each data layer used (you can find the necessary information in the data layer description). Also include the website for each data layer.
- Describe and explain your main mapping steps.
- Describe and explain how you aggregated the land use data from 21 to 10 land use classes (selection, query, etc.)?

Part IV – Interpretation / Questions
1. How did land use change between 1971 and 1999?
2. What land use types decreased? What land use types increased? Why?
3. What is largest/smallest land use type? Why?
4. Given that you know the city or town: How has the city/town developed between 1971 and 1999? Is the development reflected in the land use changes?
5. It's been 14 years since 1999 – what has happened in your town since then – do you expect that the changes you quantified between 1971 and 1999 continued? Why?
6. Did you verify or falsify your hypothesis?
7. There are some concerns regarding the accuracy of the MassGIS land use data. What do you think? How do you judge the data quality? How were the land use data created?

Part V – Figures and Tables
- Include a relevant picture or two of your city or town in the report.
- Include the land use change summary table and the two pie charts in your report.
- Include a jpg image of your map in the report.

Make sure that you provide figure/table captions, sources (as needed), etc. for all your figures and tables.

4) Project Timeline and Due Dates

The project timeline below is merely a suggestion to help you with project organization and time management. Plan your work and time accordingly!

Week 12 (4/8 to 4/15)
- Select your city/town, define your hypothesis, organize your project folders, and set-up your map and data frames.
- Finish the overview data frame, topographic maps data frame, and aerial photographs data frame.

Week 13 (4/15 to 4/22)
- Finish the two land use data frames.
- Start land use change analysis and summary table.
- Start writing the project report.
- Send me your draft map and report for review.

Week 14 (4/22 to 4/29)
- Finish land use change analysis and create the summary table and pie charts.
- Finish your map and report.

Week 15 (4/29 to 5/6)
- Extra time…just in case.
- Schedule time to print the map on our large-format printer.
- Submit your final project map report by Monday 6 May 2013.

5) Tips and Suggestions

I'm happy to review your project and make suggestions for improvements before the final due date. Whether or not you take advantage of this offer is up to you, but you have to give me sufficient time.

- Read the data layer description and meta data. Everything you need to know about land use classes, road classes, etc. is described in the data layer description, so use it!
- For MrSIDs - download the .sid (image), .sdw (header) and .aux (spatial reference for ArcGIS) files for each topographic map or aerial photograph.
- Start a Microsoft Word document called projectdocumentation.doc to document your progress. Each time you work on this project (even for only 10 minutes), you add what you did and when you did it. This gives you a chronological documentation of your progress and the basis for your project report.
- Make sure you organize your folders and files and create a dedicated project folder, with sub-folders for the different project parts.
- Use your \data folder for all data. Create dedicated sub-folder for each data layer.
- Save your work often!
- Back-up your USB flash drive…don't lose all your work!

➔ *Please contact me for help or clarification of this project or my expectations.*