Sean McCartney

Final Project

GEOG 385 – Web Applications

Autumn 2011

Summary:

My final project dealt with publishing a map resource and geoprocessing services to servers, creating a web application for the services, and deploying the web application to the web. The datasets used in my project dealt with certified Sacramento farmers' markets, and were acquired from surveys conducted at three separate farmers' markets in the county.

It was challenging to publish my GIS resources because much time was involved troubleshooting problems, and constraints were imposed by having to work only in the computer lab on American River College's campus. After stumbling through problems publishing my geoprocessing tools through ArcCatalog, I was able to adopt a different workflow and publish my geoprocessing services as tool layers within an ArcMap document. This solved my issues with publishing resources, and from there it was relatively straight forward creating my tasks and deploying the application onto the web.

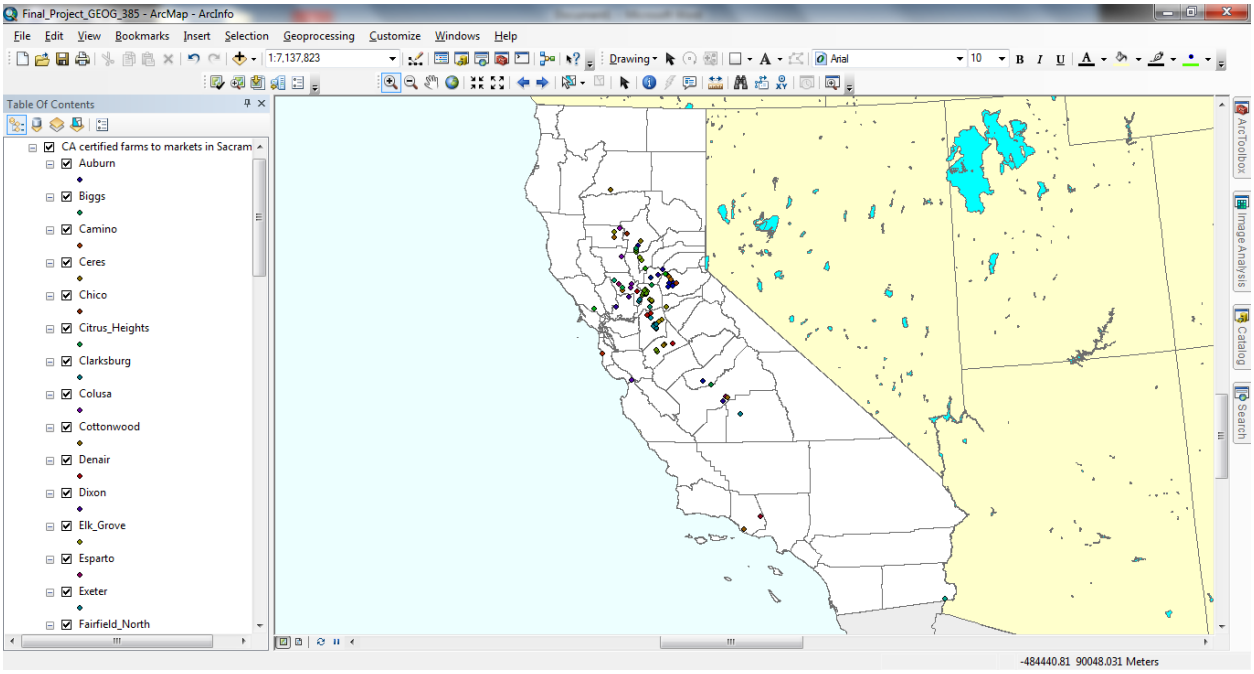
Much insight was gained through the project, and several methods taught in class were applied to publishing my resources and deploying my web application once my original map had been authored. I look forward to using the knowledge gained from both the class and the project in my future work endeavors.

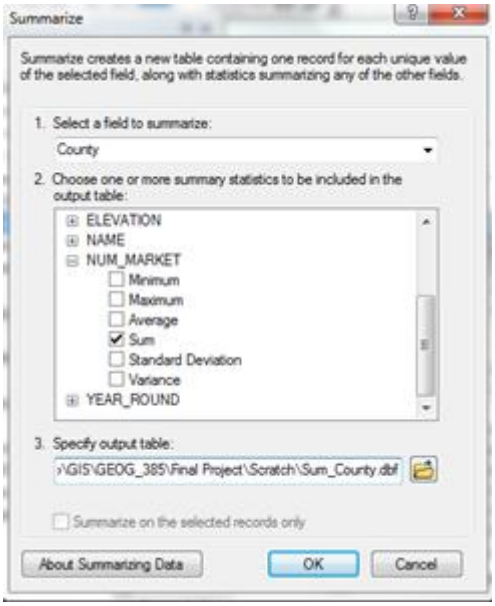
Methodology:

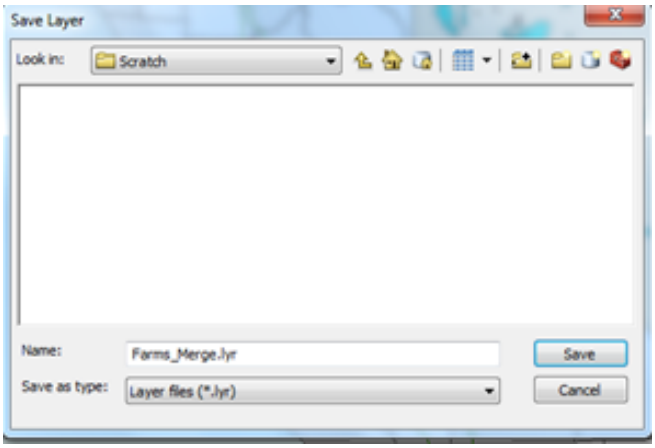
Before any web publishing, deploying, or consuming of services, I first had to acquire datasets to base my project on. Fortunately for me I was already acquiring datasets for another class at American River College (ARC), GEOG 350 (Data Acquisition). By combining the workflows from both classes, I was able to meet half the demands for one class, and complete a project in the other. My research focused on certified Sacramento farmers' markets, where they are located, and (more importantly) where the farms are located. Most analysis happens after you input your raw data into a GIS, with all its bells and whistles. Currently there isn't any spatial data regarding farmers selling at local certified farmers' markets. To acquire my date, I limited my field study to the three largest certified farmers' markets selling year-round in Sacramento County. I learned who is selling, where their farm is located, if they sell year-round at the market, and how else they market their products. From there I turned my field notes into tables, tables into feature classes, and feature classes into spatial knowledge. It is my goal to share my findings with the Certified Farmers' Markets of Sacramento County (an area association organizing most of the county's farmers' markets.

For GEOG 385, I took my completed ArcMap document showing the results of my research from area farmers' markets, and then published it to the web (www). To place spatial information in the public domain is a powerful tool in the hands of many. Applications can be used in the workplace, for research, for navigation, and to share information with the public. Due to bureaucratic hurdles with the college, and issues of legality, the class was constrained to using our desktop computers to function as data server, GIS server, and web server. Whether or not this limited me in my options, I was still able to publish my resources and develop tasks from my services. The following pages will walk the reader through the steps I undertook to publish my GIS resources once I had a finished ArcMap document.

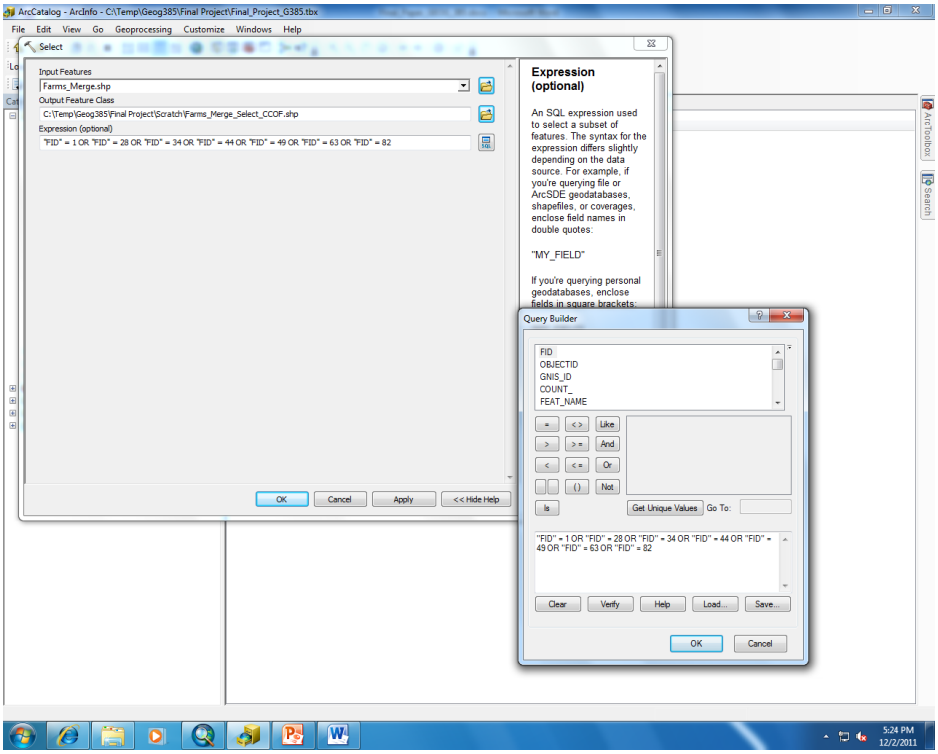
Compiling the data from my research into an ArcMap document:





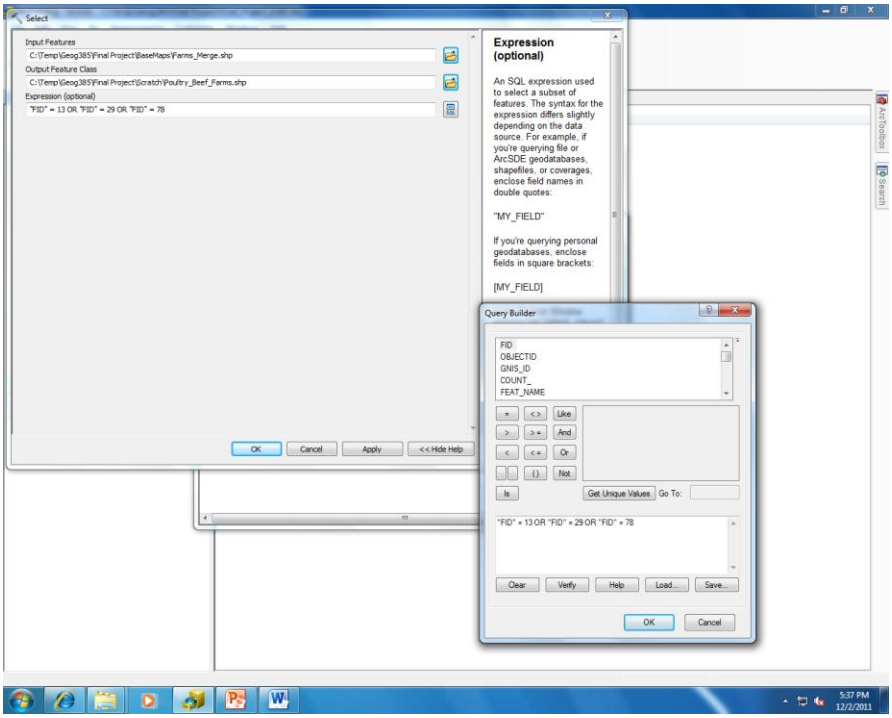


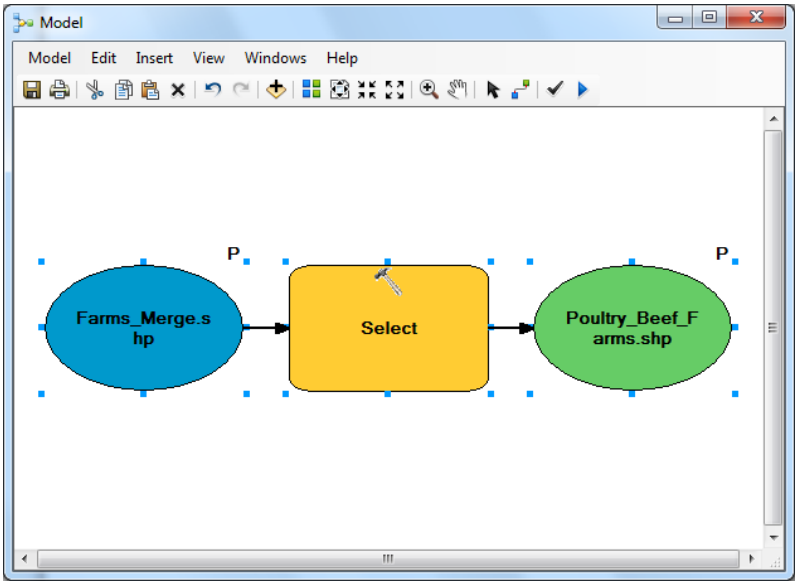
Once I finished authoring my ArcMap document, I opened the Map Service Publishing Toolbar and analyzed the results of my map document. I did not get any errors, but there were warnings for half of the map layers in my table of contents. The warnings indicated certain layers would be drawn at all scale ranges. For the purpose of my intended web application, this was not an issue. I filed this away into memory however, as future map services might not be appropriate to draw at all scale ranges.



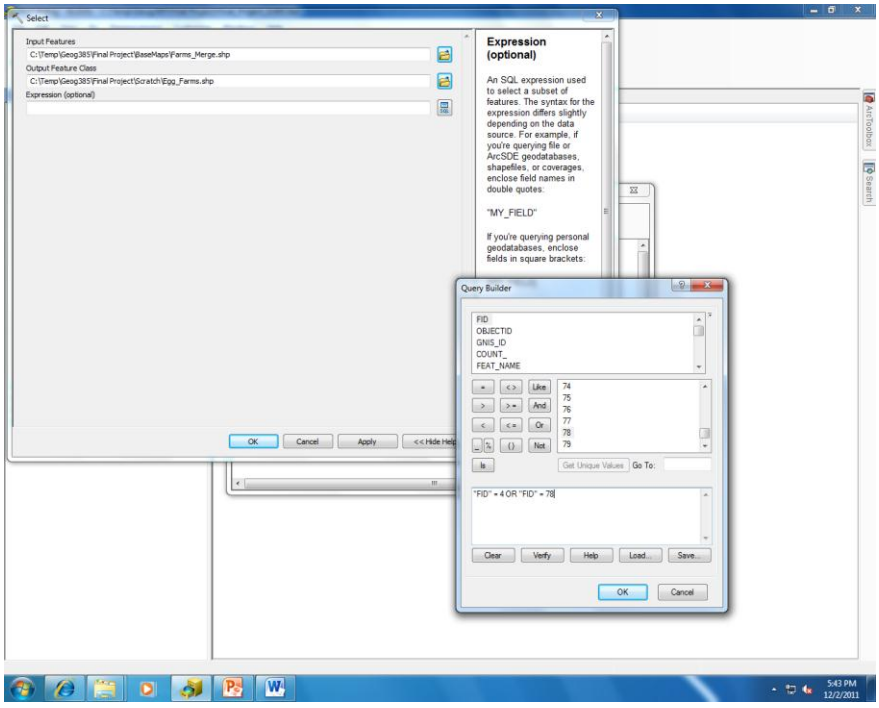
Once I knew my map document was ready to be published, I created different geoprocessing tools using Model Builder, each within their own respective toolbox. For the sake of the project, and keeping with the advice of the instructor, I applied the KISS (Keep It Simple Stupid) method to building my models. Simple geoprocessing operations were assembled in Model Builder as tools, and each of these was saved into its own toolbox. In the following images I am building separate models around the select tool, and the buffer tool.

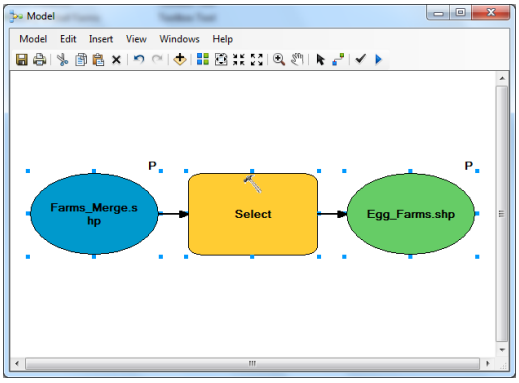
Creating a model with the select tool:

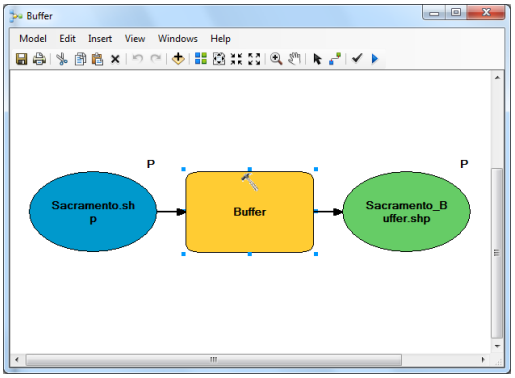




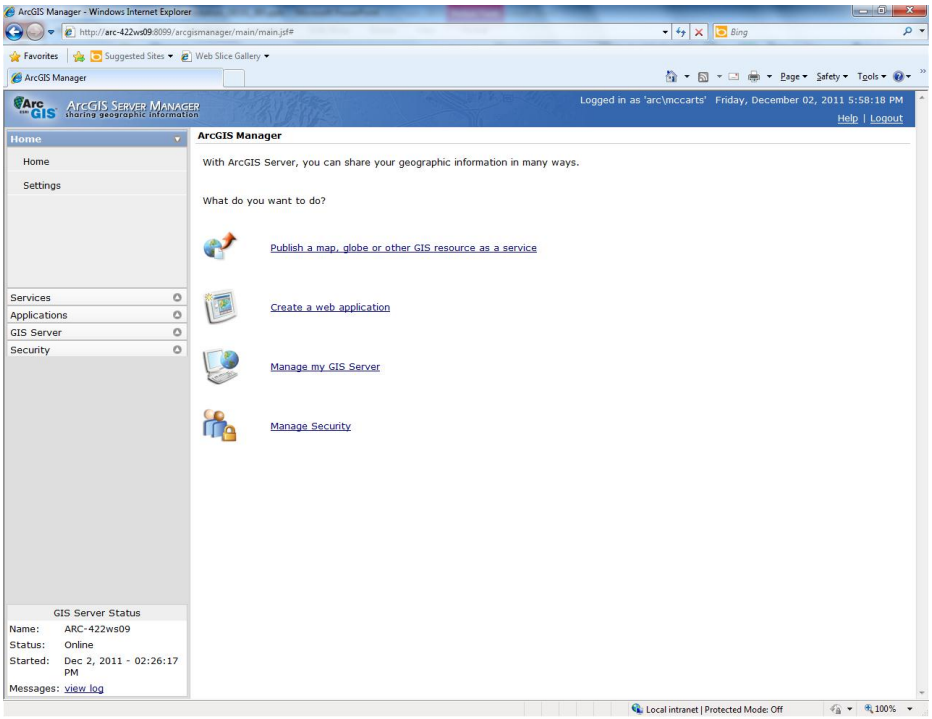
Building two more models with the select tool and the buffer tool:

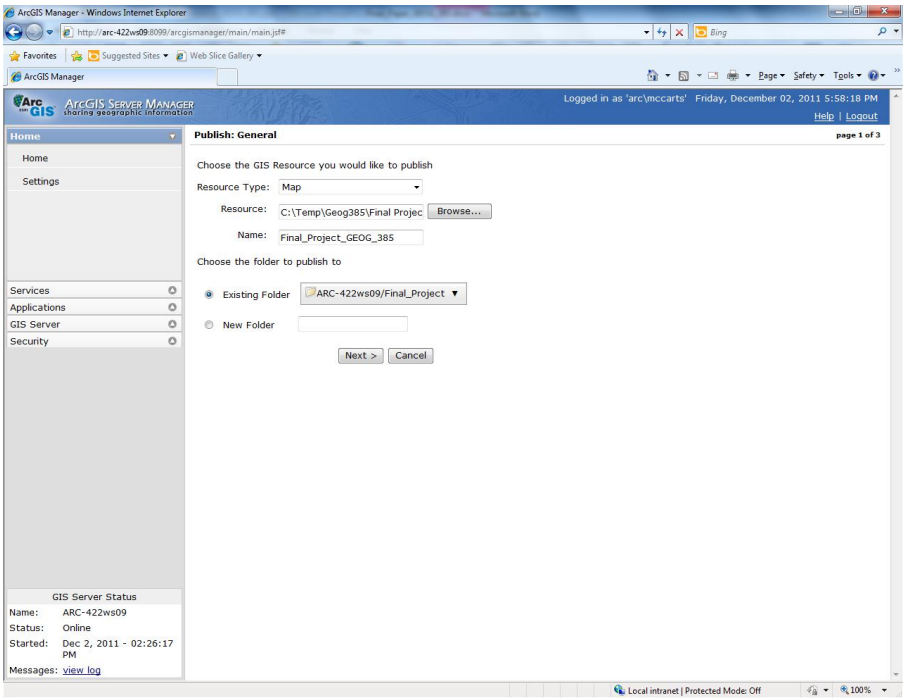


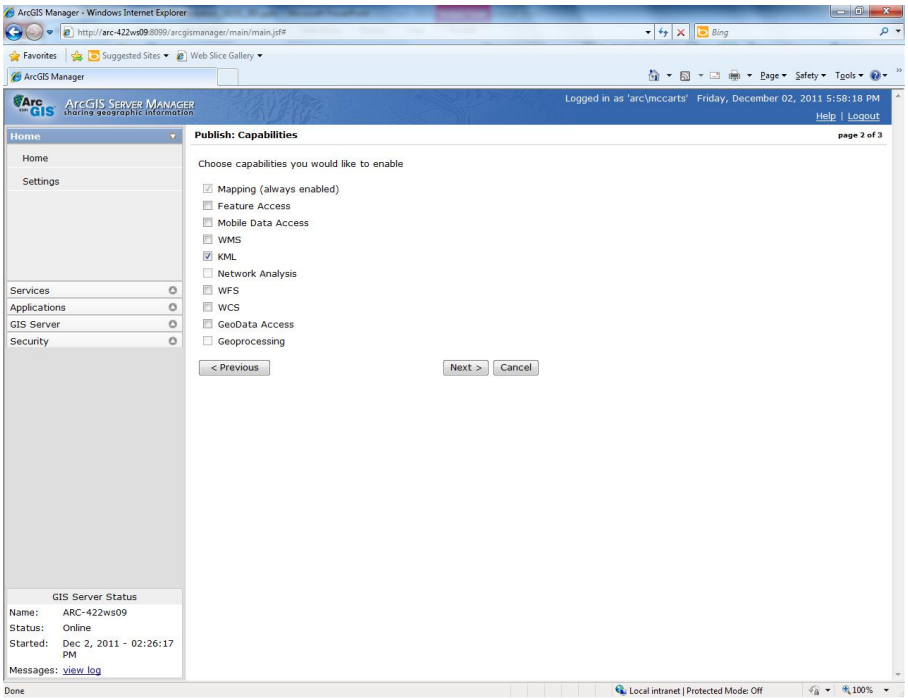


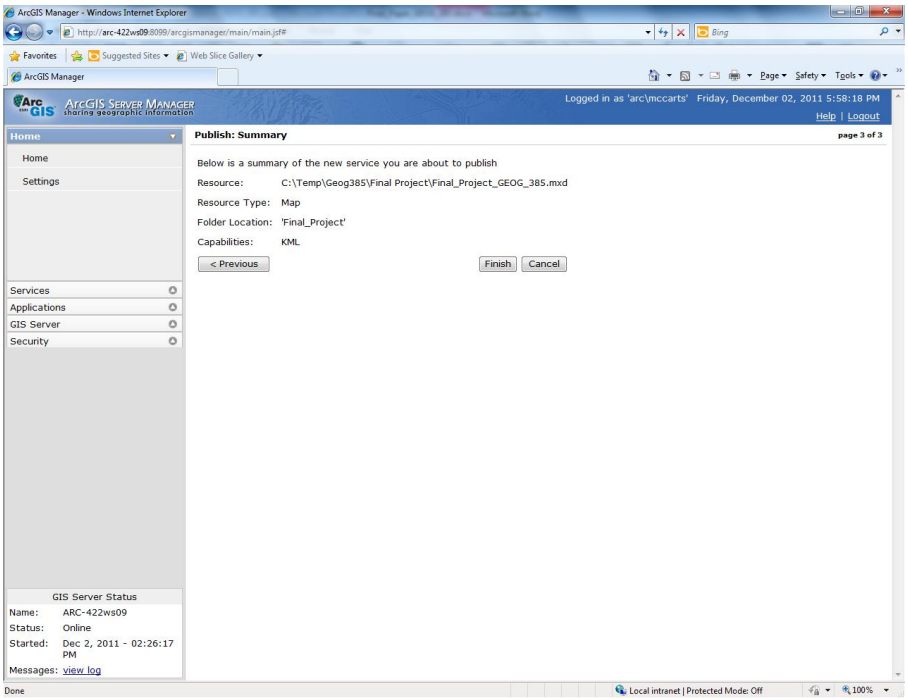


Once my map document and geoprocessing tools were prepared, I published my ArcMap document (.mxd) to the server as a map service (.msd).

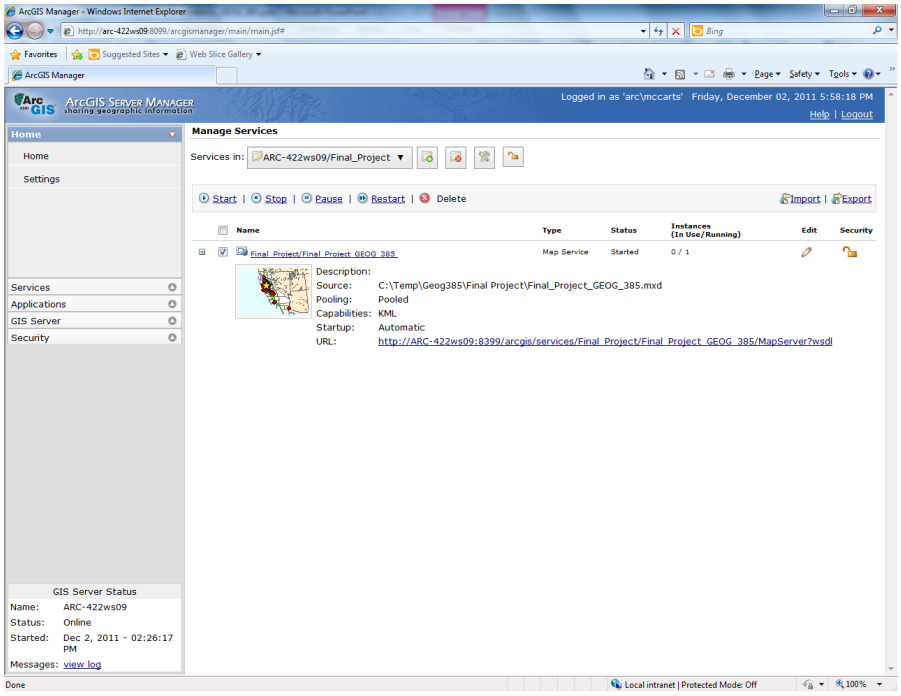


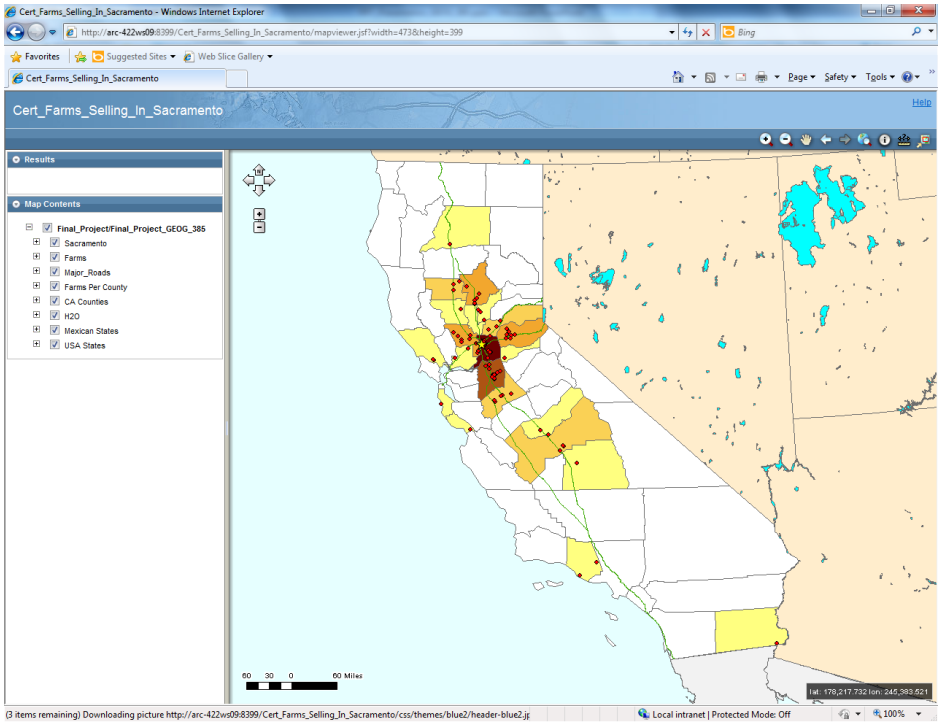



ArcGIS Manager - Windows Internet Explorer
http://arc-422ws09:8099/arcgismanager/main/main.jsf#
Favorites
Suggested Sites
Web Slice Gallery
ArcGIS Manager
ArcGIS Server Manager
sharing geographic information
Logged in as 'arc\mccarts' Friday, December 02, 2011 5:58:18 PM
Help | Logout
Home
Home
Settings
Services
Applications
GIS Server
Security
Publish: Capabilities
page 2 of 3
Choose capabilities you would like to enable
Mapping (always enabled)
Feature Access
Mobile Data Access
WMS
KML
Network Analysis
WFS
WCS
GeoData Access
Geoprocessing
< Previous
Next >
Cancel
GIS Server Status
Name: ARC-422ws09
Status: Online
Started: Dec 2, 2011 - 02:26:17 PM
Messages: view log
Done
Local intranet | Protected Mode: Off
100%

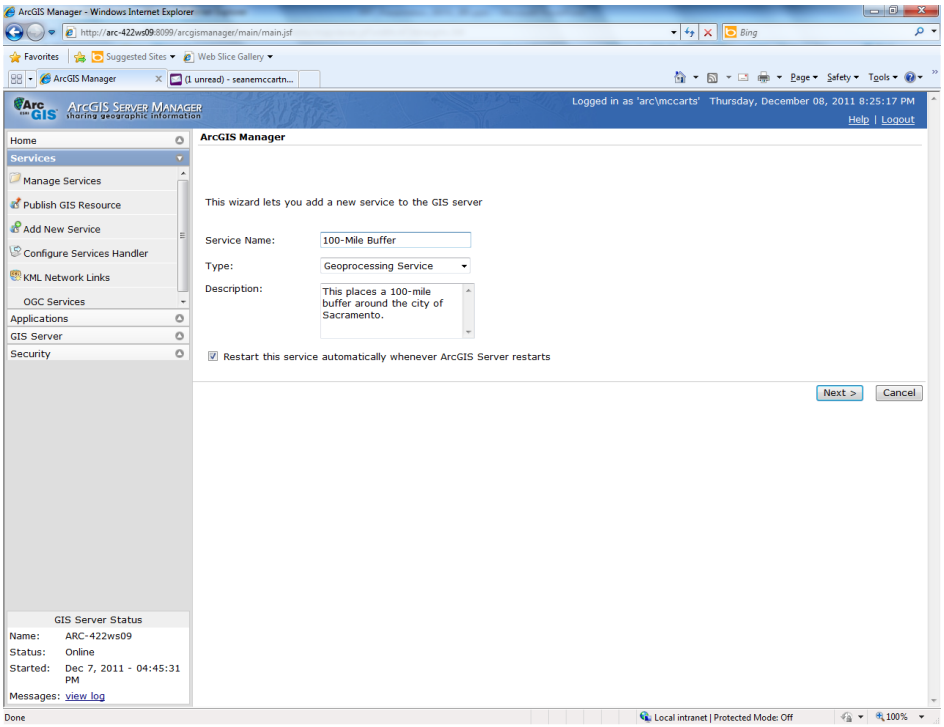

ArcGIS Manager - Windows Internet Explorer
http://arc-422ws09:8099/arcgismanager/main/main.jsf#
Favorites
Suggested Sites
Web Slice Gallery
ArcGIS Manager
ArcGIS Server Manager
sharing geographic information
Logged in as 'arc\mccarts' Friday, December 02, 2011 5:58:18 PM
Help | Logout
Home
Home
Settings
Services
Applications
GIS Server
Security
Publish: Summary
page 3 of 3
Below is a summary of the new service you are about to publish
Resource: C:\Temp\Geog385\Final Project\Final_Project_GEOG_385.mxd
Resource Type: Map
Folder Location: 'Final_Project'
Capabilities: KML
< Previous
Finish
Cancel
GIS Server Status
Name: ARC-422ws09
Status: Online
Started: Dec 2, 2011 - 02:26:17 PM
Messages: view log
Done
Local intranet | Protected Mode: Off
100%

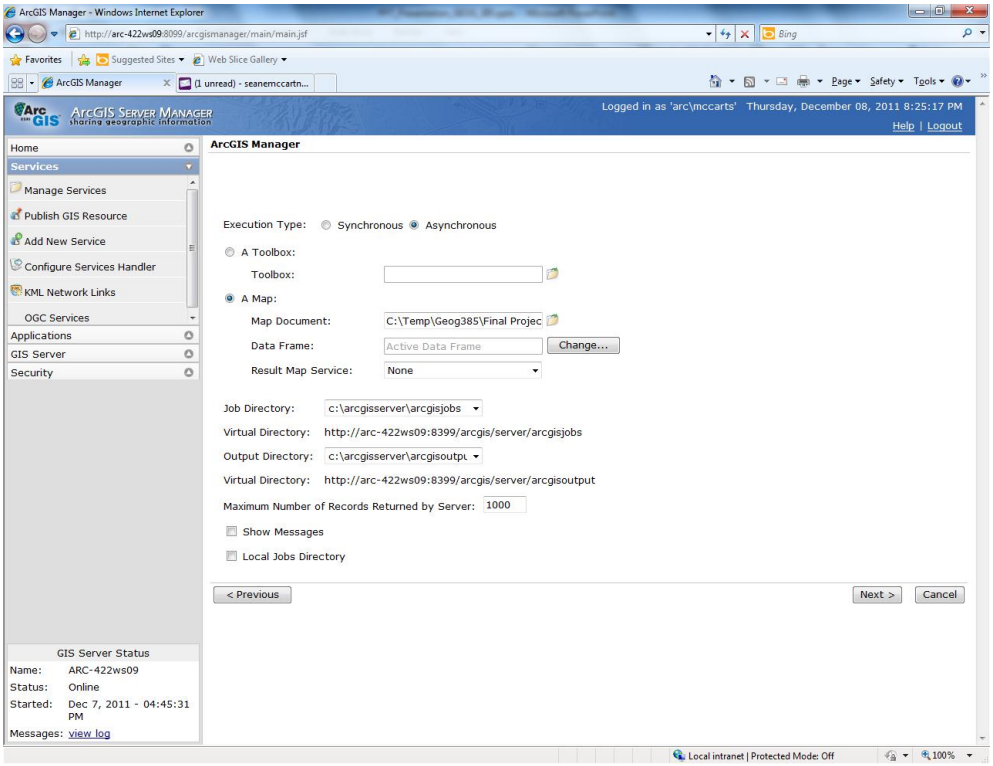
Once I successfully published my map service, I created a web application for the service:

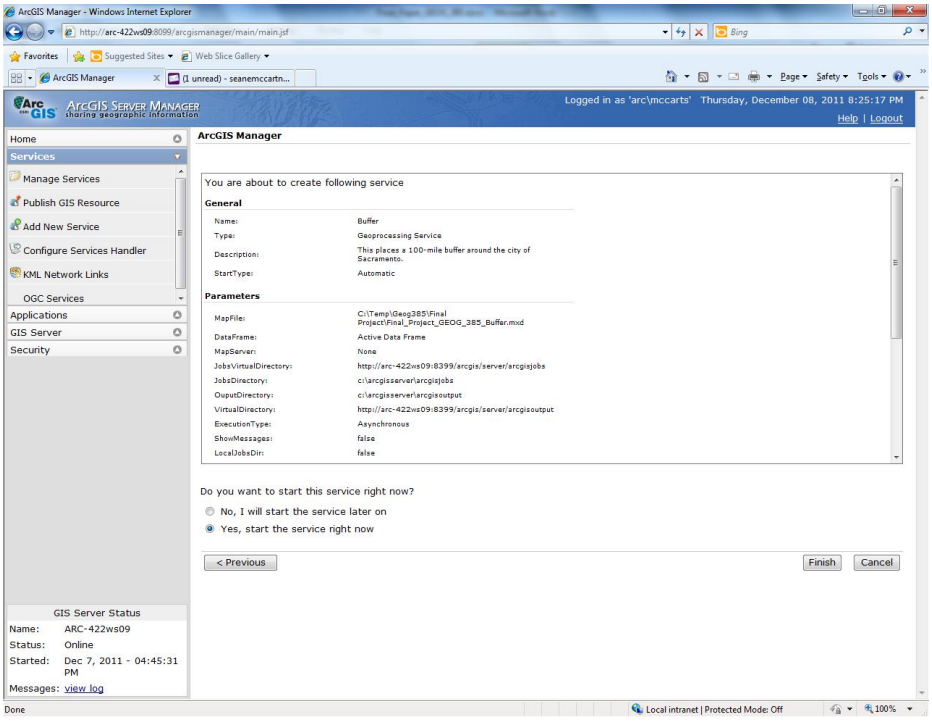




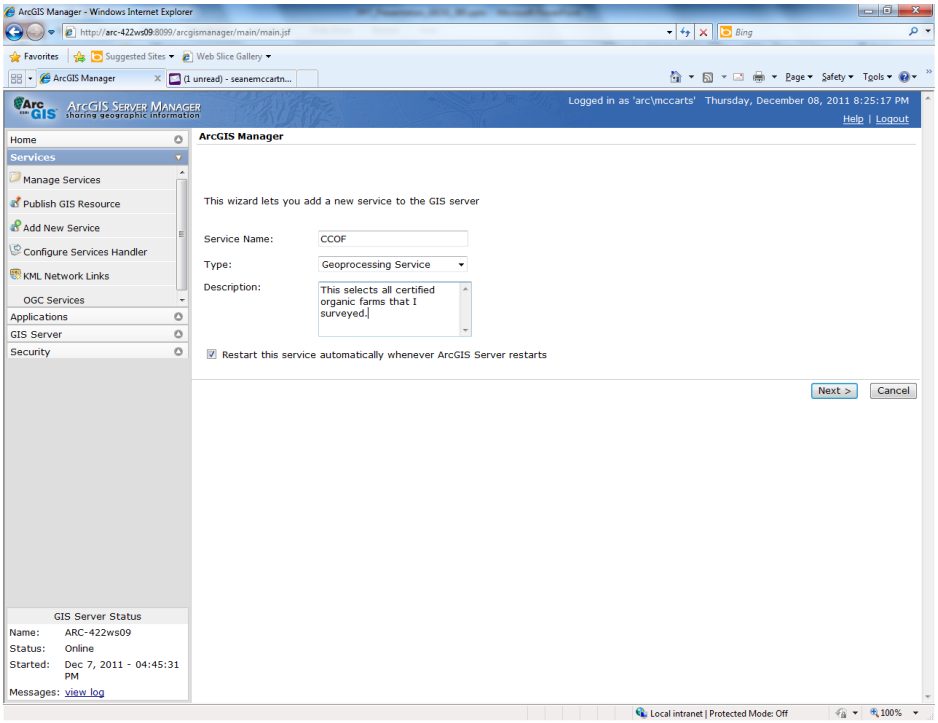
Next I created a copy of my (.mxd) and dragged one geoprocessing tool into the table of contents as a tool layer. From there I published the map as a geoprocessing service:

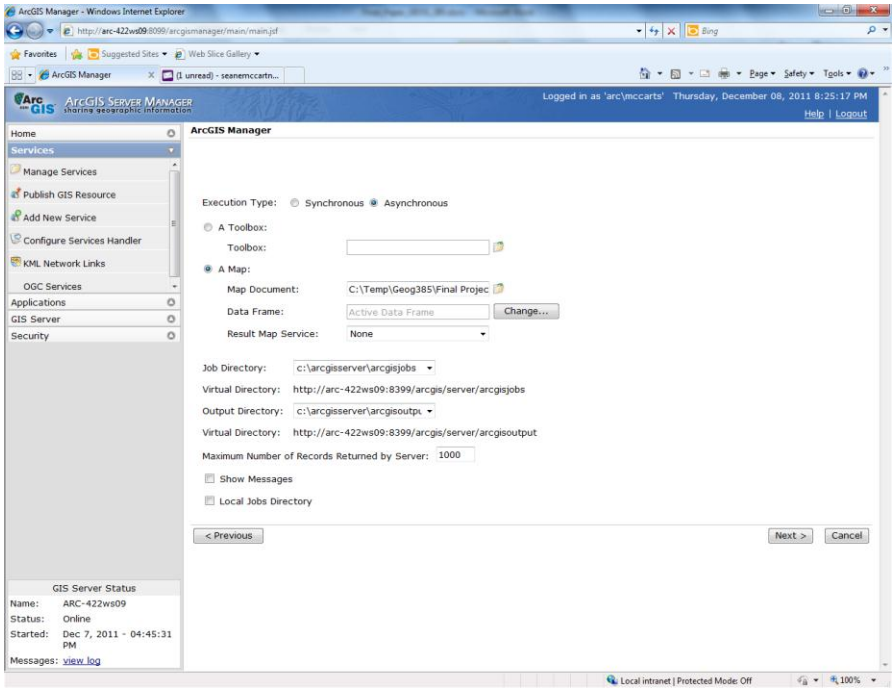


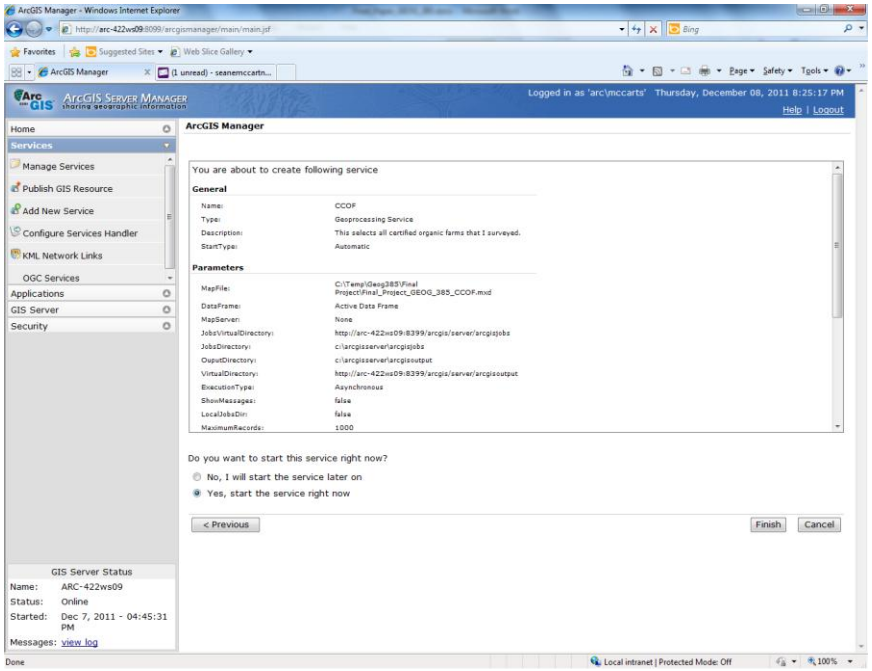




I then repeated these steps creating a new (.mxd) and dragging one tool into the table of contents creating a tool layer. Each new map document was published with one geoprocessing tool as a geoprocessing service:




ArcGIS Manager - Windows Internet Explorer
ArcGIS Server Manager
sharing geographic information
Logged in as 'arc\mccarts' Thursday, December 08, 2011 8:25:17 PM
Help | Logout
Home
Services
Manage Services
Publish GIS Resource
Add New Service
Configure Services Handler
KML Network Links
OGC Services
Applications
GIS Server
Security
ArcGIS Manager
Execution Type: Synchronous Asynchronous
A Toolbox:
Toolbox:
A Map:
Map Document: C:\Temp\Geog385\Final Projec
Data Frame: Active Data Frame
Change...
Result Map Service: None
Job Directory: c:\arcgisserver\arcgisjobs
Virtual Directory: http://arc-422ws09:8399/arcgis/server/arcgisjobs
Output Directory: c:\arcgisserver\arcgisoutpu
Virtual Directory: http://arc-422ws09:8399/arcgis/server/arcgisoutput
Maximum Number of Records Returned by Server: 1000
Show Messages
Local Jobs Directory
< Previous
Next >
Cancel
GIS Server Status
Name: ARC-422ws09
Status: Online
Started: Dec 7, 2011 - 04:45:31 PM
Messages: view log
Local intranet | Protected Mode: Off
100%


ArcGIS Manager - Windows Internet Explorer
ArcGIS Server Manager
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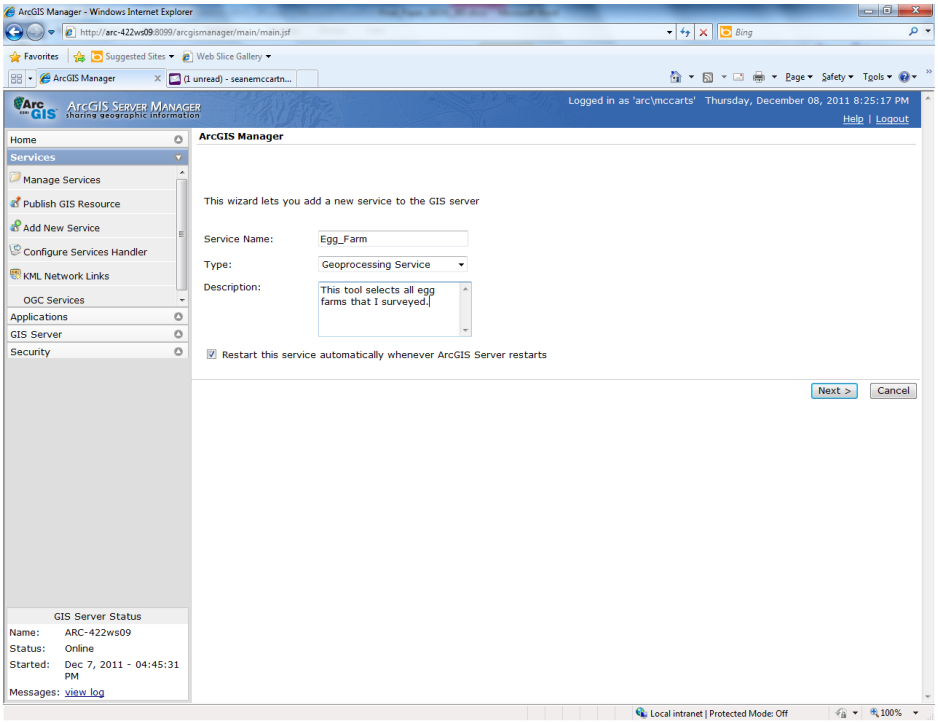
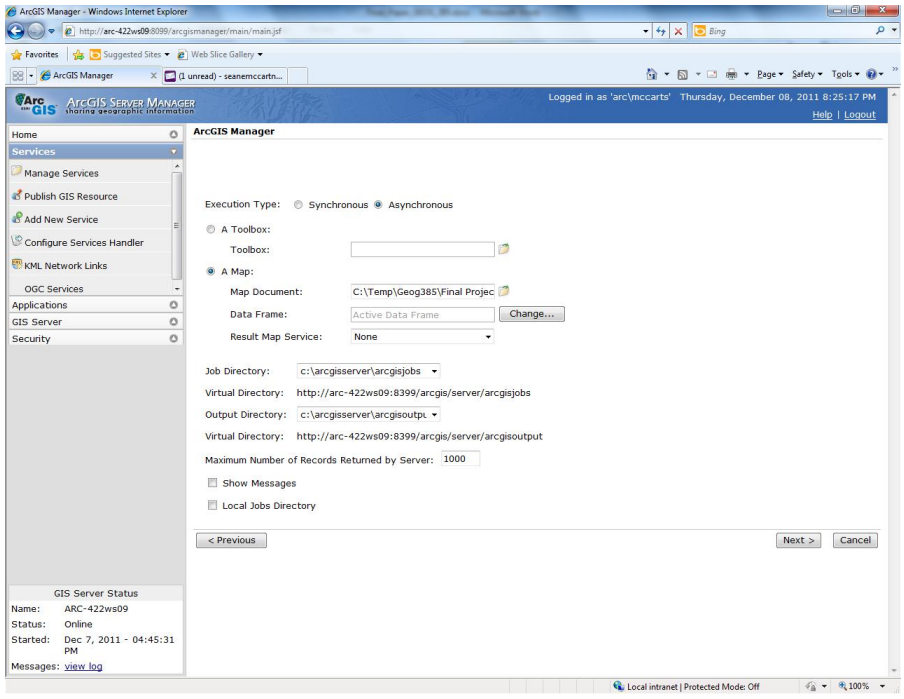
Help | Logout
Home
Services
Manage Services
Publish GIS Resource
Add New Service
Configure Services Handler
KML Network Links
OGC Services
Applications
GIS Server
Security
ArcGIS Manager
You are about to create following service
General
Name: CCOF
Type: Geoprocessing Service
Description: This selects all certified organic farms that I surveyed.
StartType: Automatic
Parameters
MapFile: C:\Temp\Geog385\Final Project\Final_Project_GEOG_385_CCOF.mxd
DataFrame: Active Data Frame
MapServer: None
JobsVirtualDirectory: http://arc-422ws09:8399/arcgis/server/arcgisjobs
JobsDirectory: c:\arcgisserver\arcgisjobs
OuputDirectory: c:\arcgisserver\arcgisoutput
VirtualDirectory: http://arc-422ws09:8399/arcgis/server/arcgisoutput
ExecutionType: Asynchronous
ShowMessages: false
LocalJobsDir: false
MaximumRecords: 1000
Do you want to start this service right now?
No, I will start the service later on
Yes, start the service right now
< Previous
Finish
Cancel
GIS Server Status
Name: ARC-422ws09
Status: Online
Started: Dec 7, 2011 - 04:45:31 PM
Messages: view log
Done
Local intranet | Protected Mode: Off
100%


ArcGIS Manager - Windows Internet Explorer
ArcGIS Server Manager
sharing geographic information
Logged in as 'arc\mccarts' Thursday, December 08, 2011 8:25:17 PM
Help | Logout
Home
Services
Manage Services
Publish GIS Resource
Add New Service
Configure Services Handler
KML Network Links
OGC Services
Applications
GIS Server
Security
ArcGIS Manager
This wizard lets you add a new service to the GIS server
Service Name: Egg_Farm
Type: Geoprocessing Service
Description: This tool selects all egg farms that I surveyed.
Restart this service automatically whenever ArcGIS Server restarts
Next >
Cancel
GIS Server Status
Name: ARC-422ws09
Status: Online
Started: Dec 7, 2011 - 04:45:31 PM
Messages: view log


ArcGIS Manager - Windows Internet Explorer
ArcGIS Server Manager
sharing geographic information
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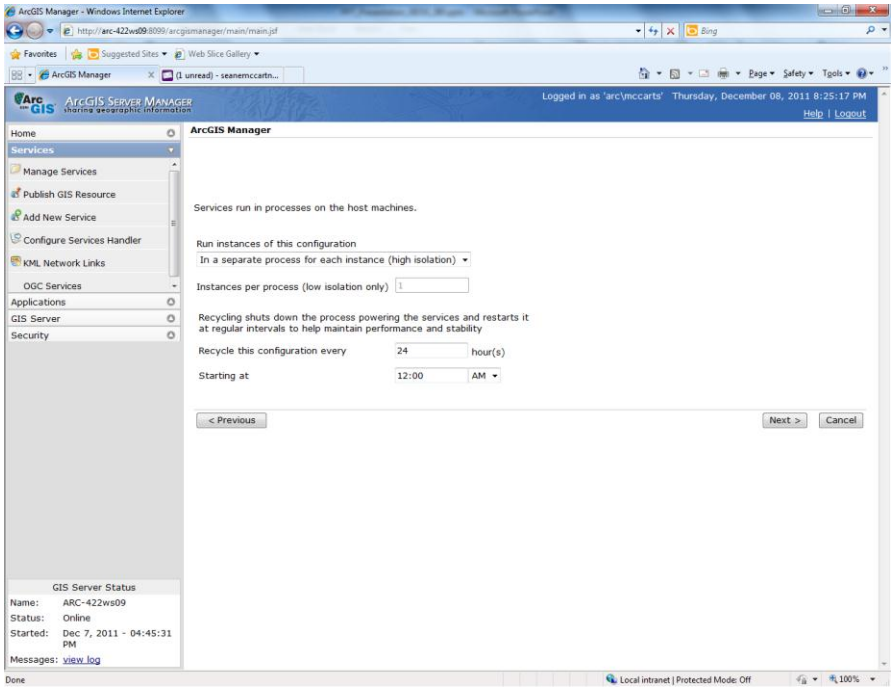
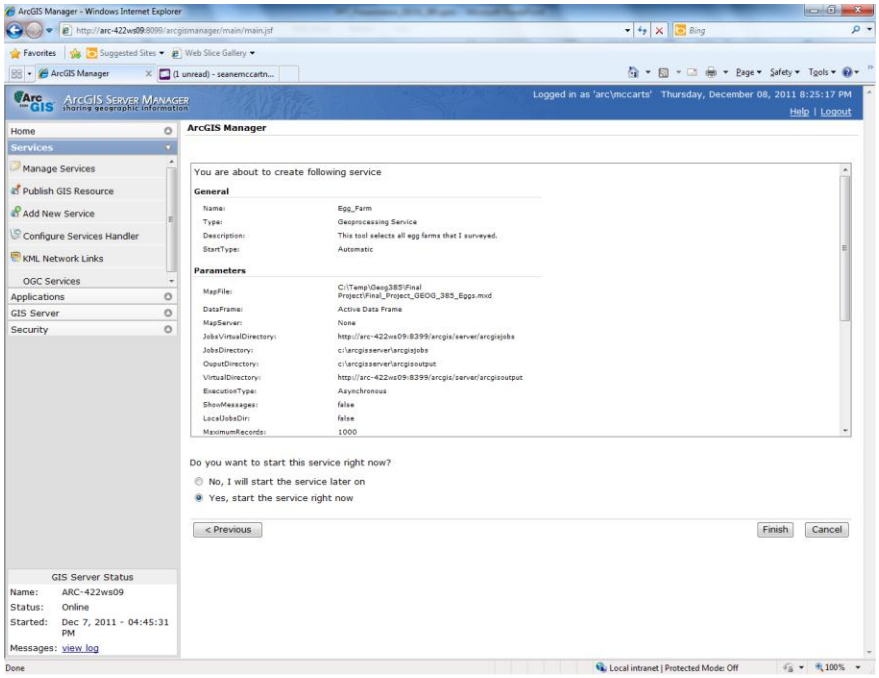
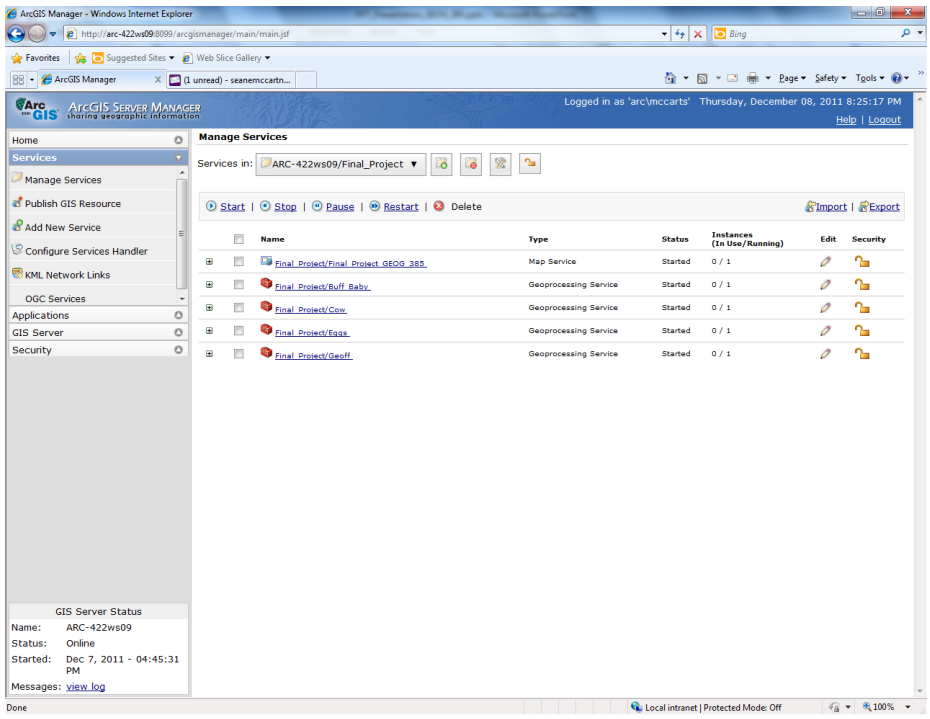
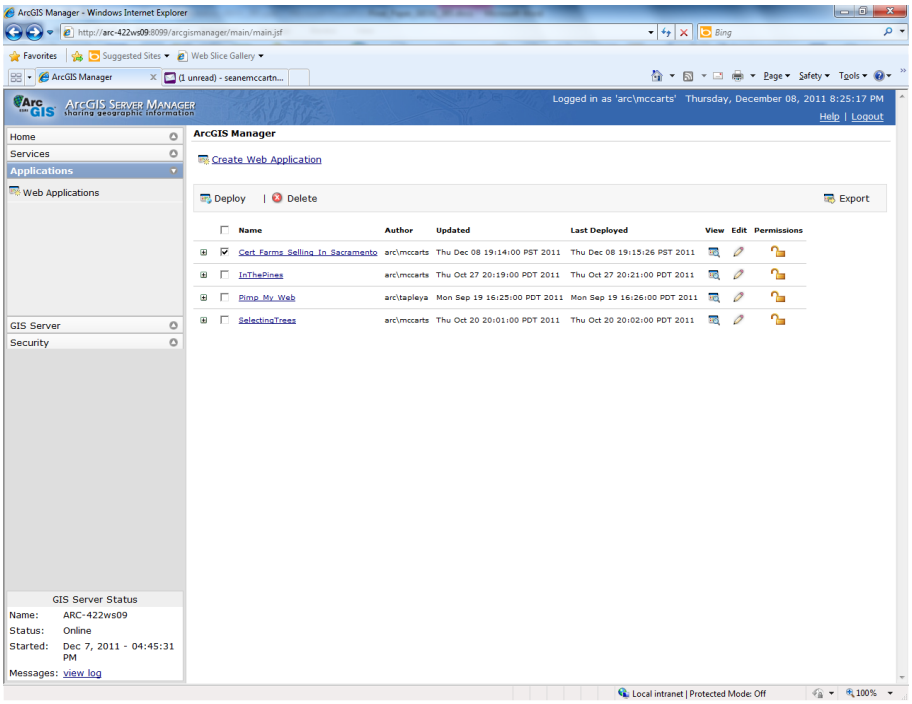
Home
Services
Manage Services
Publish GIS Resource
Add New Service
Configure Services Handler
KML Network Links
OGC Services
Applications
GIS Server
Security
ArcGIS Manager
Execution Type: Synchronous Asynchronous
A Toolbox:
Toolbox:
A Map:
Map Document: C:\Temp\Geog385\Final Projec
Data Frame: Active Data Frame
Change...
Result Map Service: None
Job Directory: c:\arcgisserver\arcgisjobs
Virtual Directory: http://arc-422ws09:8399/arcgis/server/arcgisjobs
Output Directory: c:\arcgisserver\arcgisoutpt
Virtual Directory: http://arc-422ws09:8399/arcgis/server/arcgisoutput
Maximum Number of Records Returned by Server: 1000
Show Messages
Local Jobs Directory
< Previous
Next >
Cancel
GIS Server Status
Name: ARC-422ws09
Status: Online
Started: Dec 7, 2011 - 04:45:31 PM
Messages: view log

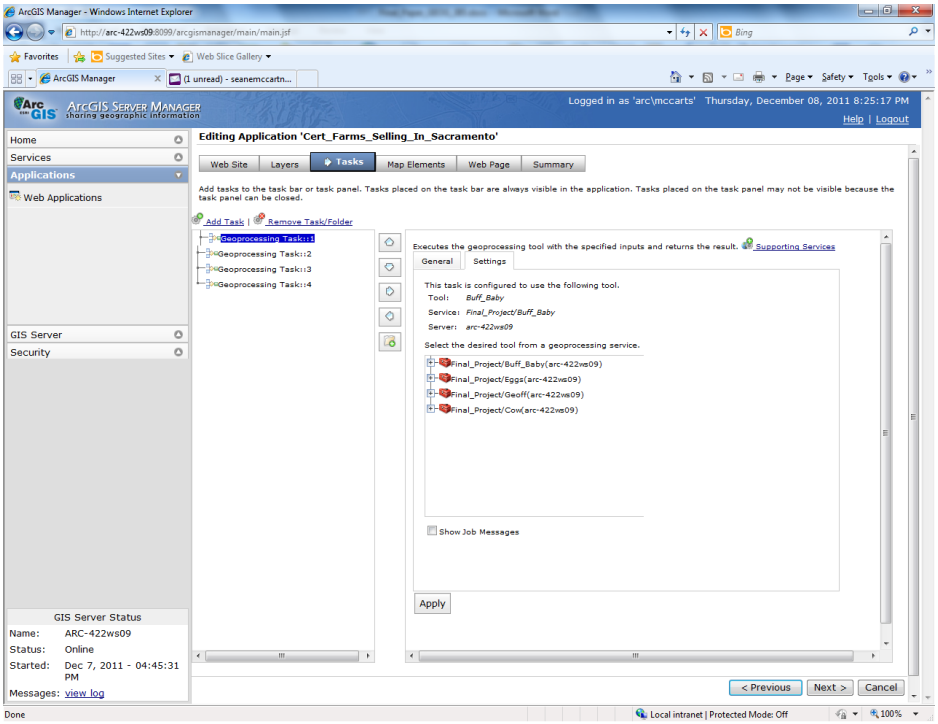

ArcGIS Manager - Windows Internet Explorer
http://arc-422ws09:8099/arcgismanager/main/main.jsf
ArcGIS Server Manager
sharing geographic information
Logged in as 'arc\mccarts' Thursday, December 08, 2011 8:25:17 PM
Help | Logout
Home
Services
Manage Services
Publish GIS Resource
Add New Service
Configure Services Handler
KML Network Links
OGC Services
Applications
GIS Server
Security
ArcGIS Manager
Services run in processes on the host machines.
Run instances of this configuration
In a separate process for each instance (high isolation)
Instances per process (low isolation only)
Recycling shuts down the process powering the services and restarts it at regular intervals to help maintain performance and stability
Recycle this configuration every
24
hour(s)
Starting at
12:00
AM
< Previous
Next >
Cancel
GIS Server Status
Name: ARC-422ws09
Status: Online
Started: Dec 7, 2011 - 04:45:31 PM
Messages: view log
Done
Local intranet | Protected Mode: Off
100%


ArcGIS Manager - Windows Internet Explorer
ArcGIS Server Manager
sharing geographic information
Logged in as 'arc\mccarts' Thursday, December 08, 2011 8:25:17 PM
Help | Logout
Home
Services
Manage Services
Publish GIS Resource
Add New Service
Configure Services Handler
KML Network Links
OGC Services
Applications
GIS Server
Security
ArcGIS Manager
You are about to create following service
General
Name: Egg_Farm
Type: Geoprocessing Service
Description: This tool selects all egg farms that I surveyed.
StartType: Automatic
Parameters
MapFile: C:\Temp\Geog385\Final Project\Final_Project_GEOG_385_Eggs.mxd
DataFrame: Active Data Frame
MapServer: None
JobsVirtualDirectory: http://arc-422ws09:8399/arcgis/server/arcgisjobs
JobsDirectory: c:\arcgisserver\arcgisjobs
OuputDirectory: c:\arcgisserver\arcgisoutput
VirtualDirectory: http://arc-422ws09:8399/arcgis/server/arcgisoutput
ExecutionType: Asynchronous
ShowMessages: false
LocalJobsDir: false
MaximumRecords: 1000
Do you want to start this service right now?
No, I will start the service later on
Yes, start the service right now
< Previous
Finish
Cancel
GIS Server Status
Name: ARC-422ws09
Status: Online
Started: Dec 7, 2011 - 04:45:31 PM
Messages: view log
Done
Local intranet | Protected Mode: Off
100%

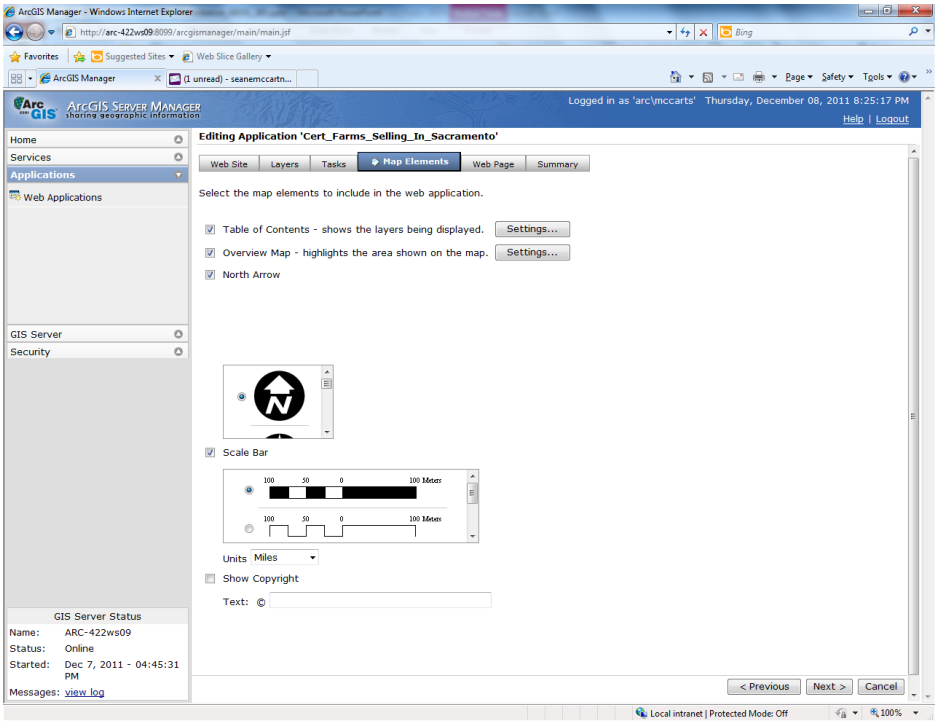
I then created tasks for my web application from my geoprocessing services:



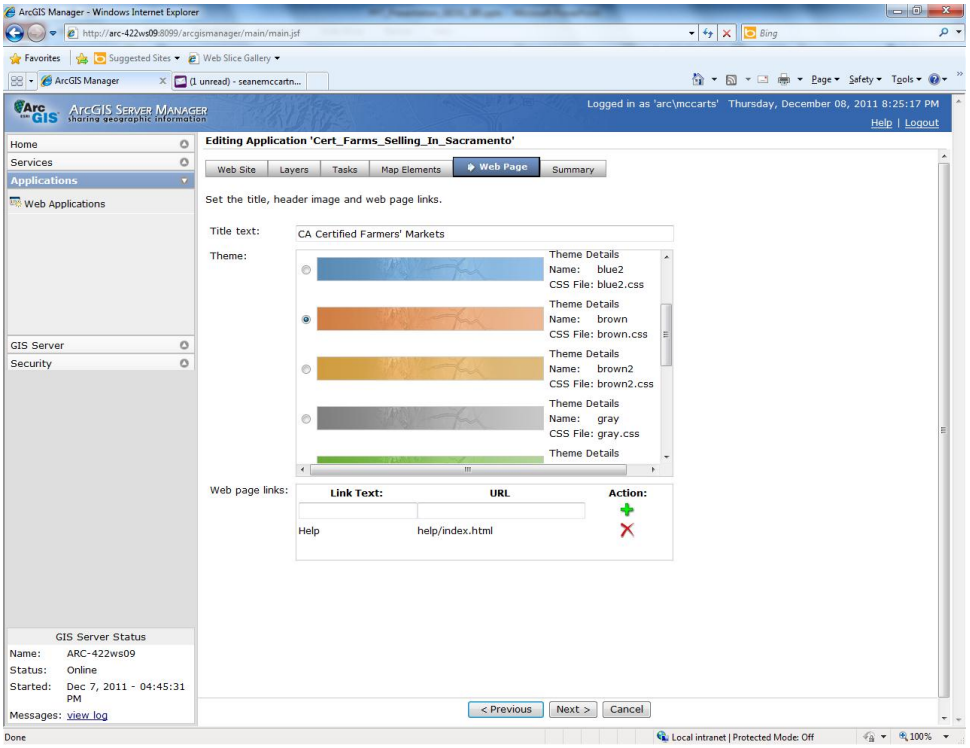




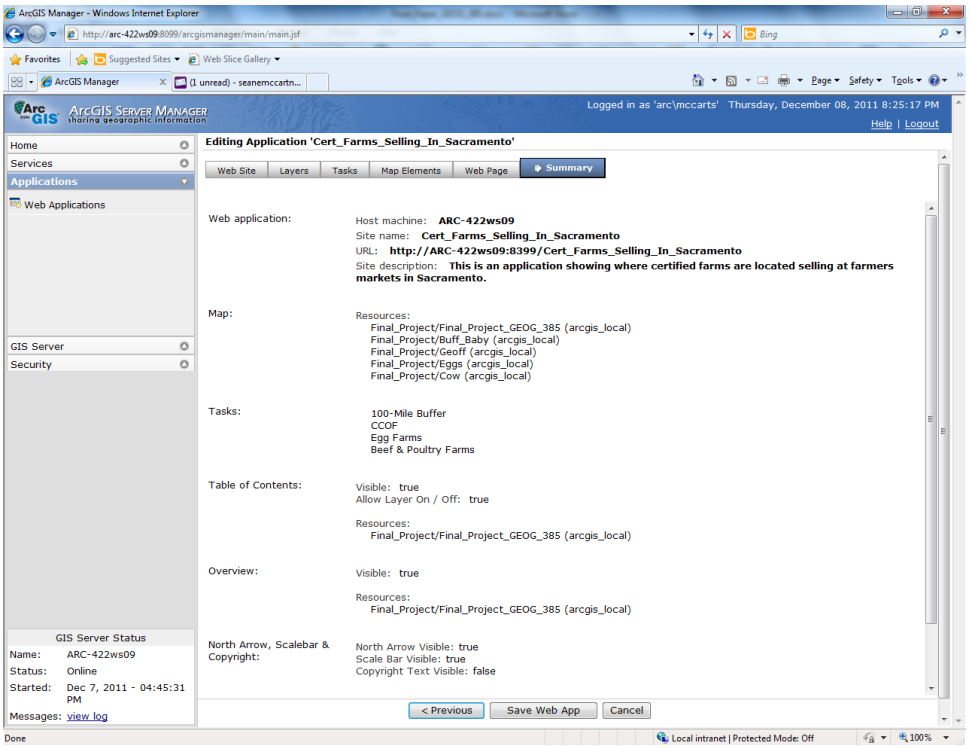
Adding map elements to my web application after creating my tasks:



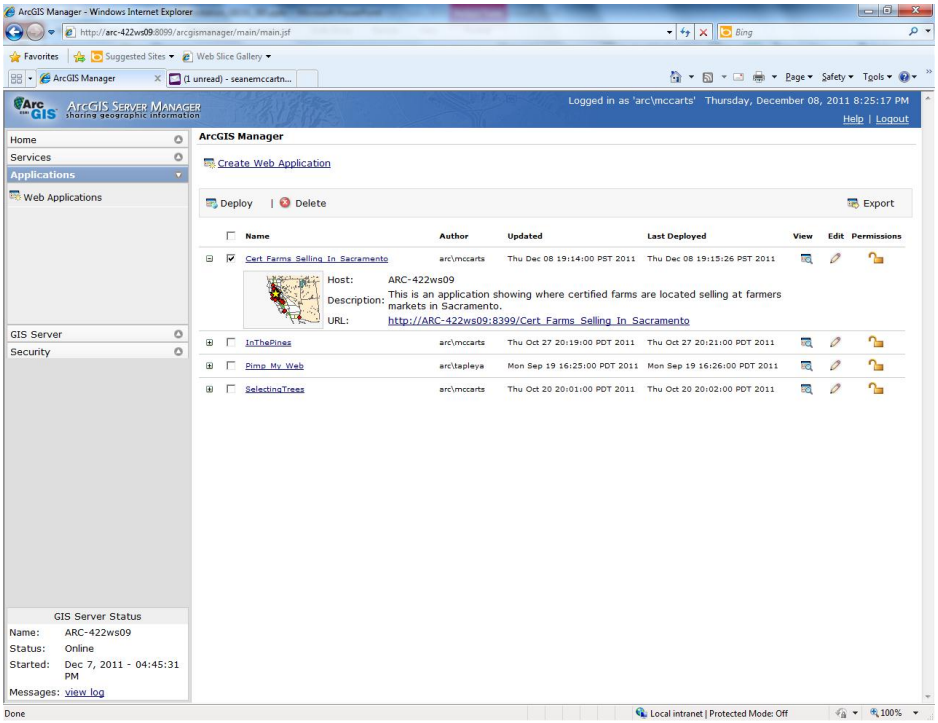
Choosing a theme for my web application from those provided:



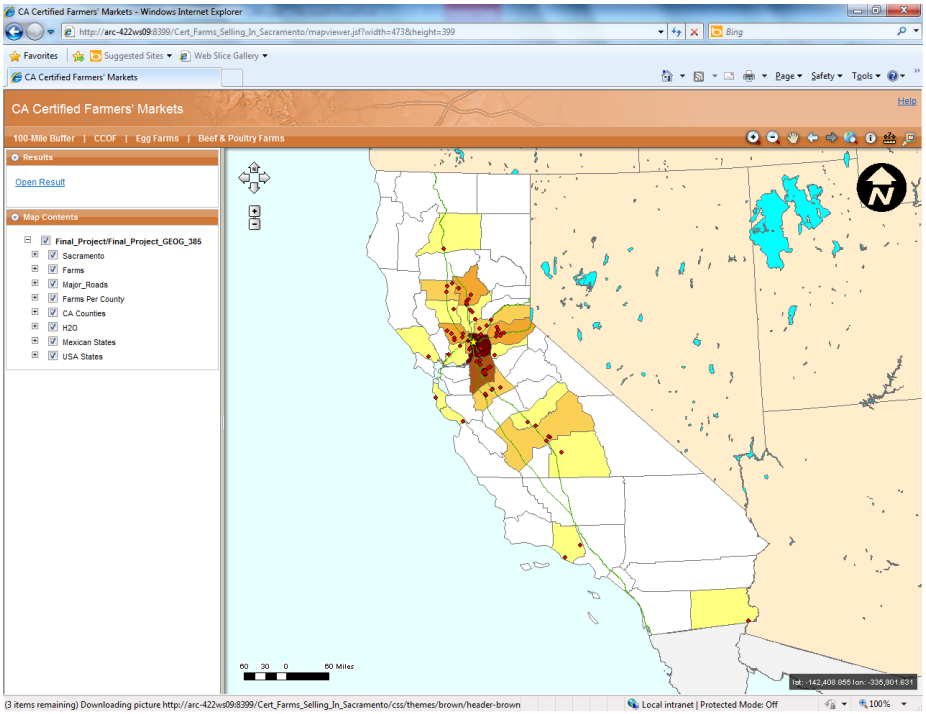
Double-checking the summary of my web application before deploying it to the web:



Deploying my web application:



Voila! A fully functioning web application, complete with four separate geoprocessing tools:



Analysis:

Though I made it seem in my methodology that my workflow was fluid, I experienced many trials and tribulations throughout. Each step in the process was wrought with troubles, troubleshooting, and much frustration. First off, I had a terrible time attempting to publish my geoprocessing tools through ArcCatalog.

Working in ArcCatalog, I created one toolbox containing four separate tools. Each model ran perfectly well in ArcMap, but once I tried to publish the toolbox as a geoprocessing service through ArcCatalog, I ran into problem after problem. I kept getting the same results—invalid parameters from my models. Repeated troubleshooting produced no desirable outcome, so I took Geoff's advice to publish one tool per toolbox, then publishing them individually as a tool layer, all within an ArcMap document. For publishing I used ArcGIS Server Manager, which has much more functionality than publishing through ArcCatalog. After testing the models in ArcMap to make sure they were valid, I followed the prompts in ArcGIS Server Manager to publish all four of my geoprocessing services.

The lesson here was one that Prof. Jennings always stresses: develop small and deploy large. By trying to bundle all my geoprocessing services into one toolbox, it made troubleshooting a headache. By spreading out my workflow into separate files, it also made access to the data easier for the servers to retrieve. The entire process was frustrating, but not difficult. It still does not make sense why my models worked perfectly fine as tool layers but not together in the same toolbox. As much as I prefer ArcGIS Server Manager over ArcCatalog when publishing web services, I know it won't be long until ArcGIS Server Manager is phased-out. When this is the case, I hope ESRI will improve the functionality and ease of publishing GIS resources through ArcCatalog.

Conclusions:

As much frustration as I experienced trying to get my project deployed, I learned a lot about web publishing, and how to troubleshoot an otherwise simple process when things go awry. ArcGIS Server Manager is a very good interface for managing and deploying web applications, and the ability to get the tools in the hands of intended users is an incredibly powerful tool in itself. The democratization of information is what defines our generation, and the ideas, methods and applications behind GEOG 385 will be highly sought after in the future. It is only a matter of time before anyone can upload spatial data onto their phones and use it for an intended purpose. As technology goes more and more mobile, the ability to create the applications for a targeted user will be sought after.

The concepts and procedures learned in class will only be as good as the developer. It takes repetition to perfect anything, and after the frustrations experienced trying to publish simple buffer tools, I know I have a long way to go before I am proficient with the software. The ideas behind the processes are not difficult, implementing them are. Versed in the Python programming language should help streamline much of the workflow, and more time interacting with the software should also help in developing good habits. I was happy with my results, and it was satisfying to be able to interact with a fully functional web application that I created. As the mantra goes—develop small and deploy large. I hope in the coming months I will be able to apply the lessons learned this semester to my work at the Department of Conservation—Office of Mine Reclamation.