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# Watershed Sciences 4930 & 6920

## GEOGRAPHIC INFORMATION SYSTEMS

WEEK ELEVEN –

### GEOPROCESSING & EFFICIENCY

Joe Wheaton



WATS 4930

## THANK YOU TO SOME OF YOU...



[Class Announcements >](#)

### NO CLASS TUESDAY! Go to Spring Runoff Conference

posted Mar 24, 2011 9:05 PM by Joseph Wheaton



I forgot to announce in class today that we will not have class on Tuesday, because I want to encourage you to attend the [Spring Runoff Conference](#). We have an exciting line up of [speakers and presenters](#) this year and [registration is FREE](#) for students. Please register! Tuesday's lab will still meet at the normal time. We will resume lecture on Thursday!

- How many of you got my message?
- How many of you actually went?



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# HOUSEKEEPING

- Late Labs
  - April 8<sup>th</sup> Cutoff...
- Lab SP2
- Poster Session Preferences...
  - Lab..., Another Room, Atrium
  - Invite Outsiders
- Calendar & Guest Speakers



# WHAT'S LEFT

WEEK 11	<a href="#">Efficiency in GIS Analyses</a>	Mar 29 & 31	9. Geoprocessing With Your Projects
WEEK 12	<a href="#">Uncertainty in GIS</a>	Apr 5 & 8	10. Error Analysis With Your Projects
WEEK 13	<a href="#">Research Applications</a>	Apr 12 & 14	Project Poster Session & Peer Reviews
WEEK 14	<a href="#">Research Applications</a>	Apr 19 & 21	Project Workshop
WEEK 15	<a href="#">Synthesis</a>	Apr 26 & 28	No Lab

NOTE: This is an approximate schedule and will almost certainly change. Check the [class calendar](#) for an up to date schedule.

- Sean Maday – Google Earth
- Austin Jenson – Aggie Air
- Emily Holt – USU Ecologist

## TODAY'S PLAN...

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- I. **Geoprocessing**
- II. ModelBuilder
- III. Batch Processing
  - I. A right-click away
  - II. Scripting
- IV. Python Scripting
- V. Efficiency

## WHAT IS GEOPROCESSING?

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An ESRI term...

### Introduction to Topic

From ESRI's Help:

"Geoprocessing is for everyone that uses ArcGIS. Whether you're a beginning user or a pro, geoprocessing will become an essential part of your day-to-day work with ArcGIS.

The fundamental purposes of geoprocessing are to allow you to automate your GIS tasks and perform spatial analysis and modeling. Almost all uses of GIS involve the repetition of work, and this creates the need for methods to automate, document, and share multiple-step procedures known as workflows.

Geoprocessing supports the automation of workflows by providing a rich set of tools and a mechanism to combine a series of tools in a sequence of operations using models and scripts...." - ...[READ MORE](#)

### Why we're Covering it

Geoprocessing is what helps make you efficient in your spatial analyses. Whether its combining multiple tools into one using model builder, batch processing a large quantity of data, writing some simple Python scripts, or leveraging the functionality of the Results window, geoprocessing is what can help you move from a novice GIS user, to a highly proficient power user.

### Learning Outcomes

This topic supports [primary learning outcomes](#) 1, 2, 3 and 4 for the course.

## TYPES OF GEOPROCESSING IN ARCGIS

- Tools ↙
- Models
- Scripts 📄
- Add-Ins
- Plug-Ins



- These differ from some of the Toolbars you've used...

## PLACES TO GET GEOPROCESSING TOOLS

- Toolbox
- ArcGIS Resource... Gallery
- From Specific Places...

## WHERE TO LEARN MORE ABOUT GEOPROCESSING

### Additional Resources

#### Geoprocessing in ArcGIS

- [Geoprocessing ArcGIS Resource Center](#) - This is the main hub of information on Geoprocessing and getting yourself up to speed.
- [The Geoprocessing Forum](#) - Trying to do something with Geoprocessing and having trouble? Try posting a thread or searching this forum.
- [Geoprocessing Help](#) - An overview of Geoprocessing in ArcGIS
- [Using the Results Window](#) - An essential new feature of Geoprocessing in ArcGIS

#### Batch Processing

- [A quick Tour of Batch Processing](#) - ArcGIS 10 Help topic

#### Finding Existing Tools and Scripts

- [Geoprocessing Model and Script Tool Gallery](#) - A hub of tools you can download and install in ArcGIS that other users have made. Very useful!
- See also this week's lab [Tutorial Topic 1](#)

#### Geoprocessing with Model Builder

- [Designing and Building Geoprocessing Tools](#) - This video walks you through the basics of building Geoprocessing Tools using Model Builder in ArcGIS 10.
- [A quick tour of creating tools with Model Builder](#) - ArcGIS 10 Help
- [Tutorial for Building Tools with Model Builder](#) - ArcGIS 10 Help Tutorial

#### Add-Ins

- [Add-Ins for ArcGIS 10](#) - Add-Ins are a new feature in ArcGIS. This video describes them.
- [Add-Ins Blog](#)

#### Plug-Ins

Plug-Ins are typically tool-bars that are installed externally and produced by someone other than ESRI, to work

- Plus,
  - Other Classes
  - ESRI Courses
  - ESRI Tutorials



<http://gis.joewheaton.org/topics/geoprocessing#TOC-Additional-Resources>

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## TODAY'S PLAN...

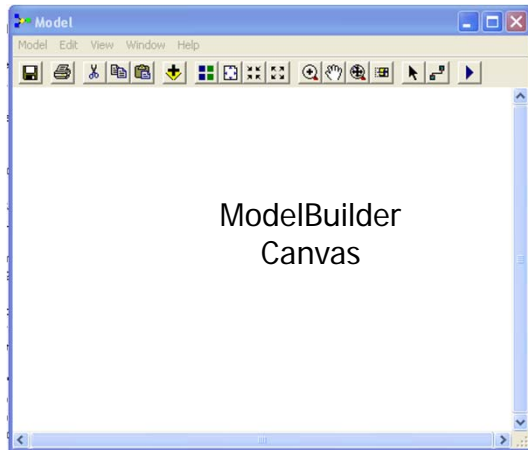
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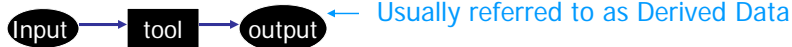
## THE MODELBUILDER INTERFACE

- ModelBuilder window: where you edit, test and run models



## THE MODELBUILDER INTERFACE, CONT.

- Model elements have 3 states
- Not ready to run (parameters aren't defined)



- Ready to run (all elements are colored)



- Already run (elements are colored and shaded)



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## BATCH PROCESSING

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- I got to do this same thing 100 times
- AGHHH
- Brut force or Batch Process
- Write a script that loops through same thing (input varies)
- Use right-click in Arc Toolbox and click 'batch'

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## SCRIPTING

- Sequences of GIS operations that can be stored and shared
  - Native languages: Arc Macro Language, Avenue
  - Software independent languages such as Visual Basic for Applications, Perl, or Python
  - a model can be written and executed as a script
- Scripts can be manipulated visually
  - e.g., through ESRI's ModelBuilder

## PROGRAMMING?

- Lots of languages (syntax is critical to speak)
- Loops (for or do)
- Conditional (if, then, else)

 2.23

### IF Statement

```
IF condition THEN
  action(s);
END IF;
```

```
IF condition THEN
  action(s);
ELSE
  action(s);
END IF;
```

```
IF condition THEN
  action(s);
ELSIF condition THEN
  action(s);
ELSIF condition THEN
  action(s);
[ELSE
  action(s);]
END IF;
```

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# PROGRAMMING - LOOPS

2.27

## Simple Loops

```
LOOP
  EXIT [WHEN <condition>] ;
END LOOP;
```

Initialize counter!

```
SQL> declare
2   counter number := 0;
3   begin
4     LOOP
5       counter := counter + 1;
6       dbms_output.put_line(counter);
7       EXIT WHEN counter = 5;
8     END LOOP;
9   end;
10  /
```

Use the EXIT statement to exit loop

1  
2  
3  
4  
5

PL/SQL procedure successfully completed.

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## BRUTE FORCE...

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- If you do something once or twice, brute force may suffice...
- If you start doing it more than that, make yourself a tool
  - Limits opportunity for sloppy mistakes
  - Makes
  - If good enough, share it with others...

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## THIS WEEK'S LAB

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- Learn how to build a model
- Secondarily, get you might ->
- Do I have to do this lab if it doesn't apply to my project?

