The Value of Automation: Geoprocessing with .NET and ArcObjects

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Objectives

- Demonstrate the value of Microsoft .NET and ESRI ArcObjects for geoprocessing tasks
- Provide helpful suggestions with respect to key considerations

Species Locations with Counties

Task: Produce a list of species locations/counties

Why Use .NET?

- Versatility

- Ability to interact with other programs

- Ability to incorporate sophisticated procedures

- Ability to manage memory

- Controllability

Key Considerations

- Simplify tasks

- Establish a control mechanism

- Store process messages

- Manage memory

- Develop in a step-wise manner

- Incorporate safety mechanisms

Task Simplification

- Divide the total task into a set of subtasks
  - Same task, data subsets
  - Different (sequential) tasks
- Run each subtask separately and check the results

Task Simplification - Example

- 70,000 species locations

  Subdivide into 350 state/taxon datasets (maximum number of locations in a set ~4500)

- Run overlay operation

- Run output read operation

Control Mechanism

- Process reads parameter values and process control values from a table in a SQL Server database

- Writes back to table to indicate progress

- Can check progress remotely

- If process needs to be restarted, don't have to start from beginning

SQL Server Control Table

Set ID	State	Taxon	Location Count	Process Count	Completion Status	Start Time	Update Time	End Time
1	AK	Ferns and Allies	5	5	1	4/21/2008 23:35	4/21/2008 23:35	4/21/2008 23:35
2	AL	Amphibians	139	139	1	4/21/2008 23:37	4/21/2008 23:52	4/21/2008 23:52
3	AL	Birds	151	60	0	4/21/2008 23:52	4/22/2008 0:10	NULL
4	AL	Crustaceans	4	0	0	NULL	NULL	NULL
5	AL	Dicots	254	0	0	NULL	NULL	NULL

Text Output Log for Process Messages

1 103433_AL_000082

Executing: MakeFeatureLayer C:\GP\Species_Locations.gdb\AL_Birds Species_Location "Comb_ID = '103433_AL_000082'" # #

Start Time: Mon Apr 21 23:53:22 2008

Executed (MakeFeatureLayer) successfully.

End Time: Mon Apr 21 23:53:24 2008 (Elapsed Time: 2.00 seconds)

Executing: Identity Species_Location "C:\GP\NA_Admin.gdb\countyp020_Albers" C:\GP\Overlay_Output\AL_Birds_Id.gdb\AL_Birds_Id ALL # NO_RELATIONSHIPS

Start Time: Mon Apr 21 23:53:24 2008

Reading Features...

Cracking Features...

Assembling Features...

Executed (Identity) successfully.

End Time: Mon Apr 21 23:53:28 2008 (Elapsed Time: 4.00 seconds)

Memory Management

- Clear resources

Use ReleaseComObject method or set object to null

```
public static void ClearResources(object o)
{
    //http://support.microsoft.com/default.aspx?scid=kb;en-us;317109
    try
    {
        System.Runtime.InteropServices.Marshal.ReleaseComObject(o);
    }
    catch {}
    finally
    {
        o = null;
    }
}
```

- Run separate executable(s)

# Species/County Overlay Processing

- Control application
  - loops over 354 state/taxon feature classes,
  - launches executable for each feature class
- Separate geoprocessor application
  - loops over species locations in feature class
  - overlays each location with U.S. counties
  - stores results in output feature class
- Separate process used to read output and compile species/county list
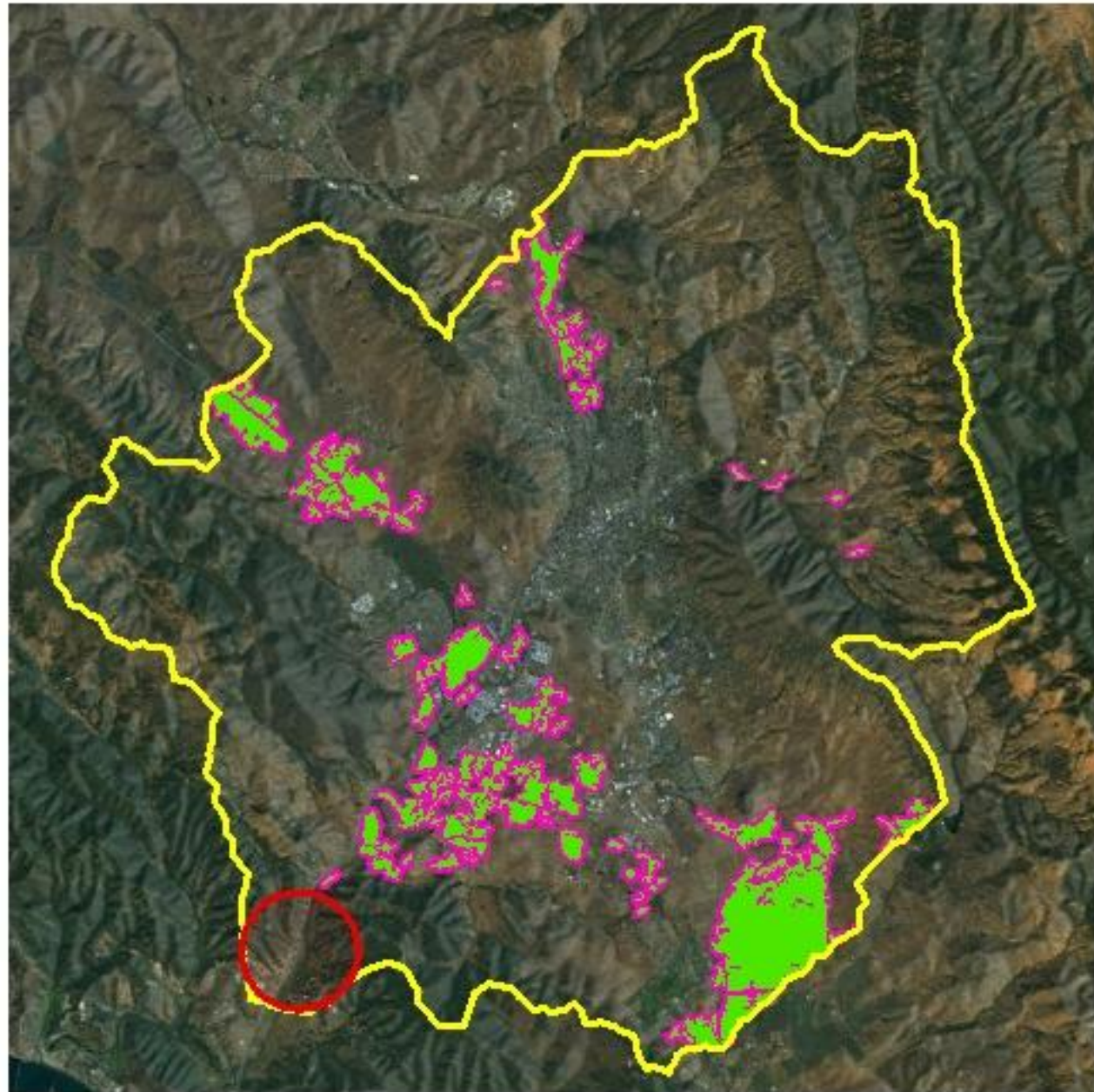
Code Review

- Overlay control

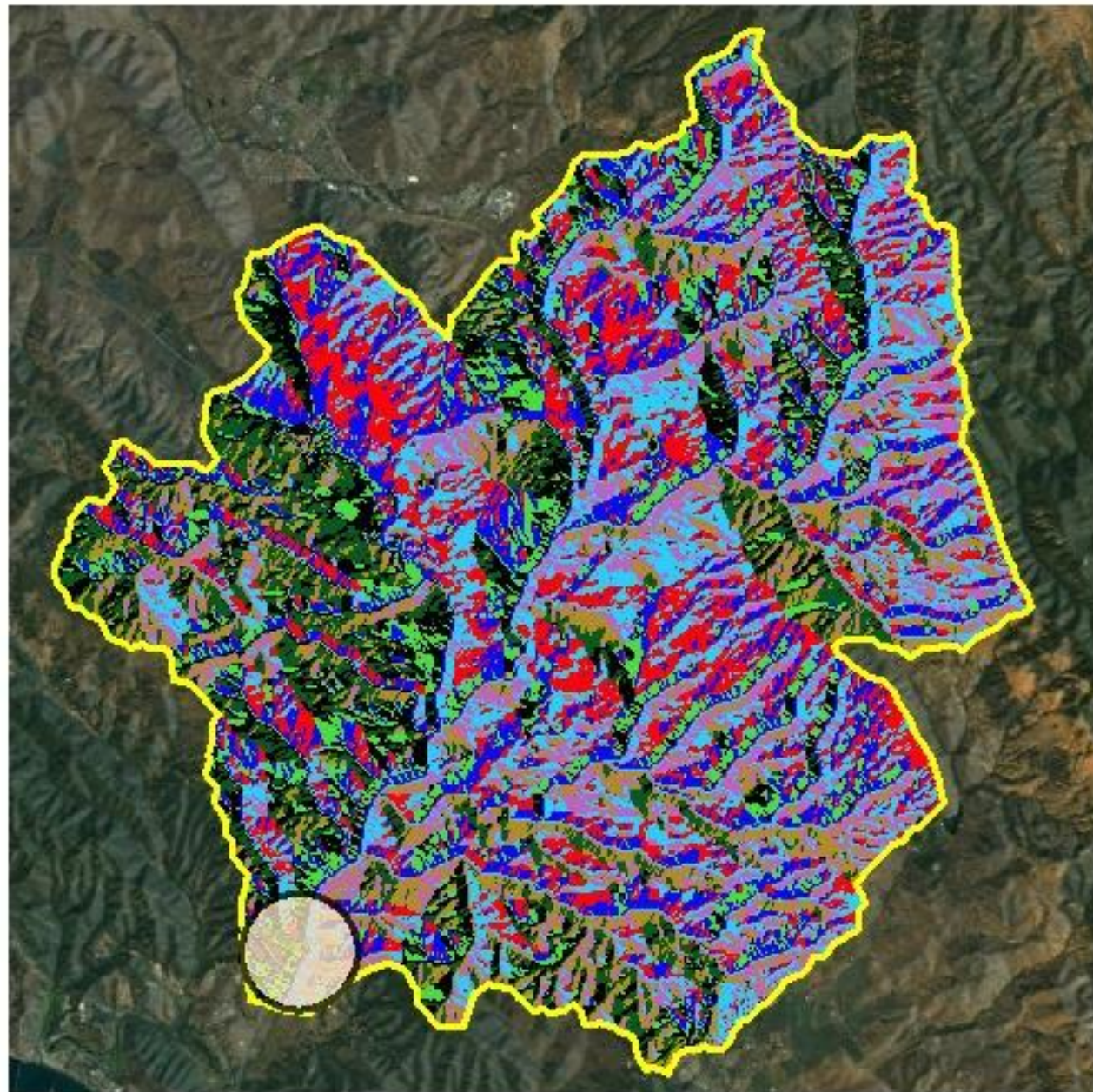- Overlay processor

Flow Accumulation Modeling
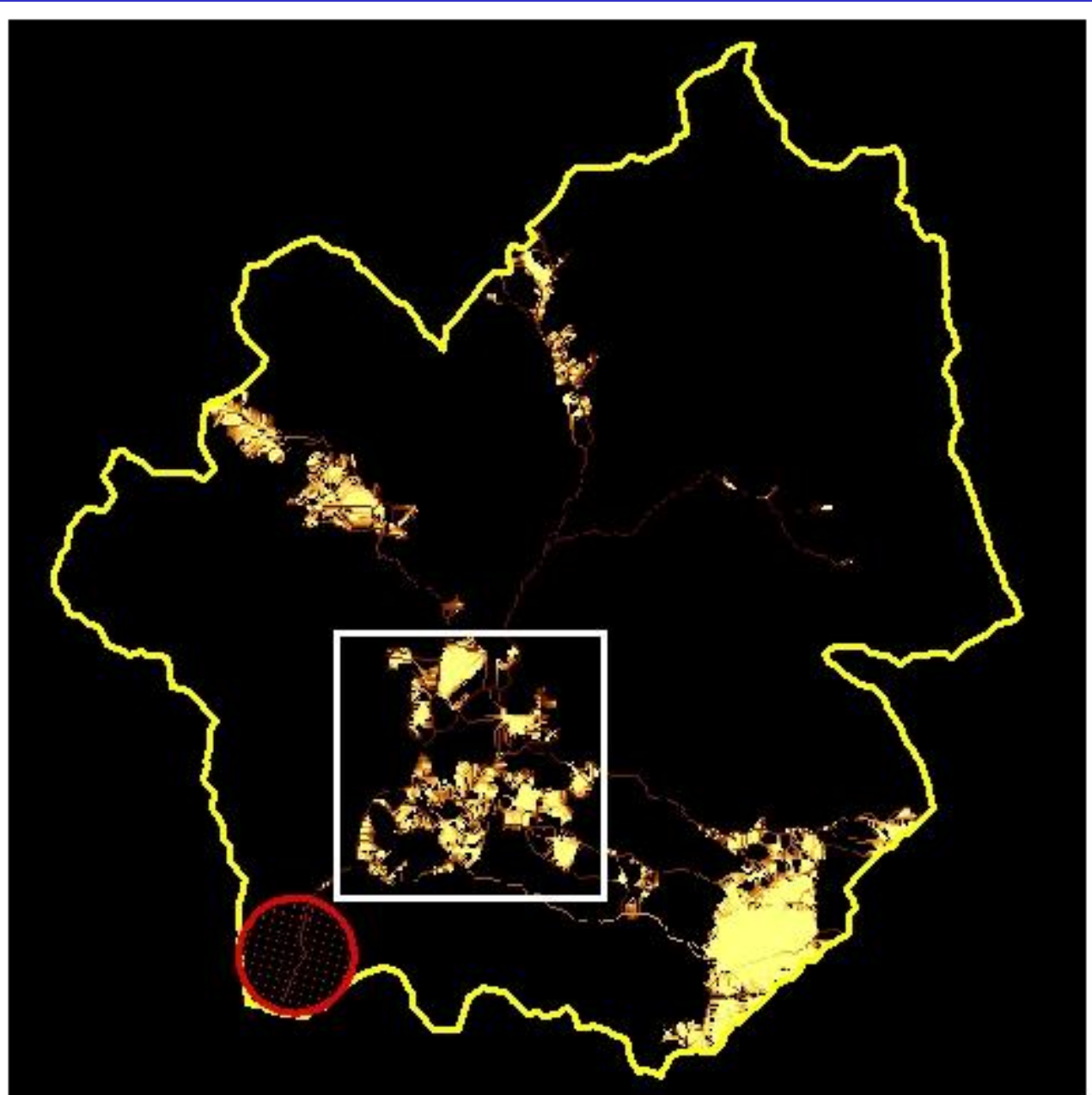
Use Area (NLCD Class 82)
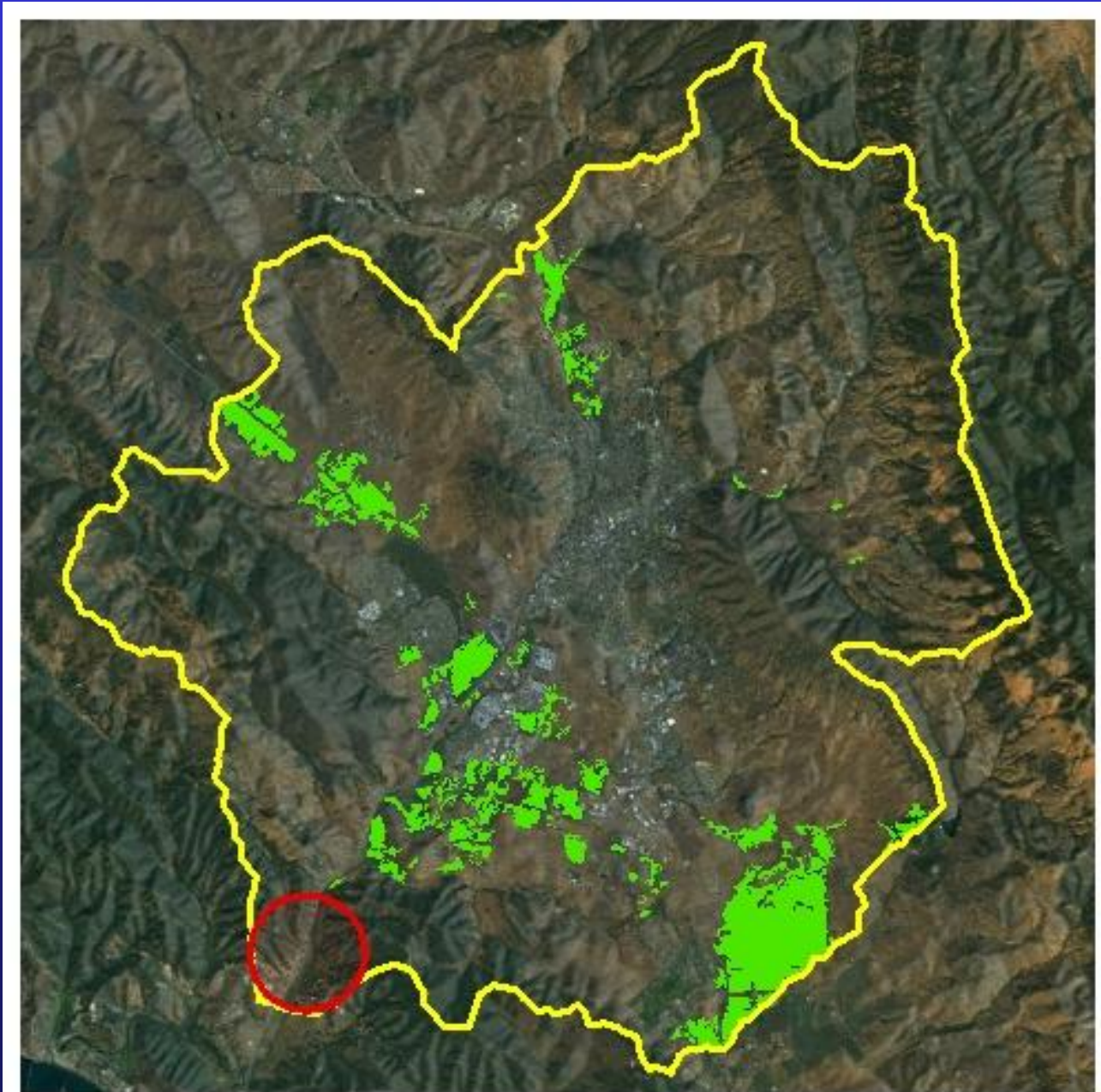
Use Area Plus Drift Area
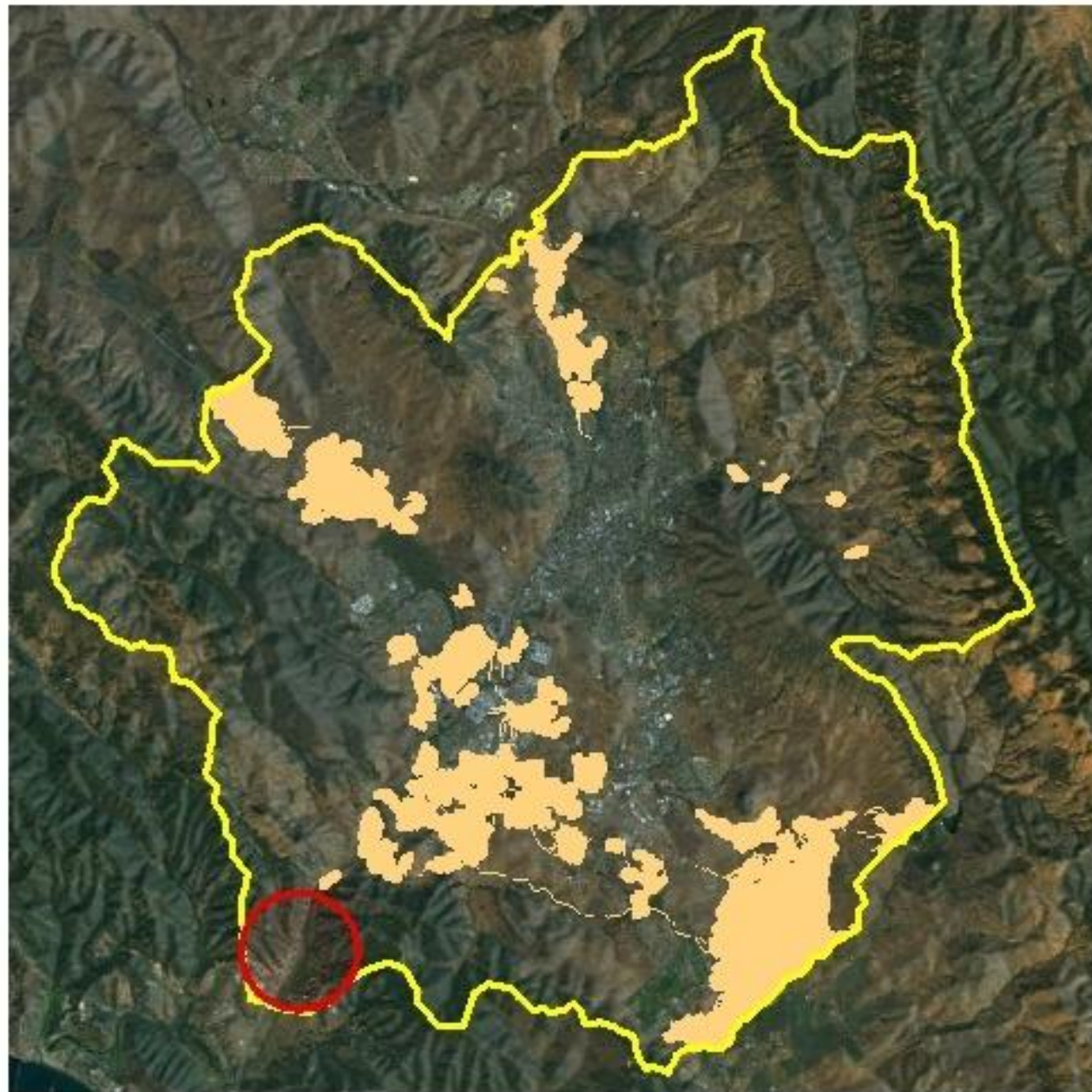
Flow Direction Data

Exposure Factor Distribution

Exposure Factor Distribution

Action Area (10% Threshold)

Conclusion

- Once you figure out some key considerations, .NET/ArcObjects provides an extremely versatile platform for potentially very sophisticated geoprocessing

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