



Change Detection Using Resource Photography

Remote Sensing For Ranger Districts Using Image Analysis For ArcGIS



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Assumptions of Resource Photography for Change Detection:

1. You have at least two dates of scanned resource photography,
2. All photos have been terrain corrected, and
3. All photos cover your focus area (Figure 1).

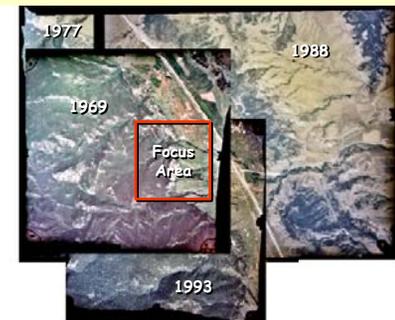


Figure 1. In this example, there are four dates of photography (1969, 1977, 1988 and 1993) that all cover the focus area.

Objective

- To demonstrate the value of resource photography for change detection.

Required Data

- At least two resource photographs of the same area taken at different dates

Introduction and Overview of Procedure Steps

Resource photography is one of our oldest remotely sensed data products—several forests have photography dating back to the 1930s and 40s. As a result, resource photography may be the only source to assess and document land cover changes over time. The focus of this document is to demonstrate the value of resource photography for change detection. The major topics include:

1. Display Photographs
2. Identify Land Cover Changes
3. Create Shapefiles
4. Digitize Land Cover Changes
5. Other Considerations

I. Display Photographs

1. Open **ArcMap** from the **Start** menu (**Start** | **Programs** | **ArcGIS** | **ArcMap**).
2. Select the **Add Data** button from **ArcMap's Standard** toolbar.
3. Navigate to and select your **Resource Photographs** that you wish to display (for now, assume you are using only **two** photographs).
4. Select **Add** to load your **Resource Photographs** into **ArcMap's Table of Contents**. Both photos should be displayed in the **Data View**.

II. Identify Land Cover Changes

1. Zoom, Pan, and Toggle your **Resource Photographs** in **ArcMap** to:
 - Locate your focus area (Figure 1), and
 - Identify land cover changes between the two photographs (Figure 2). That is, identify features in the most recent photo that are not present in the older photo.



Figure 2. Land cover changes between 1969 and 1977. Note the new roads and buildings in this example.



Why must I create shapefiles for this change detection procedure? Shapefiles will store and document digitized land cover changes.

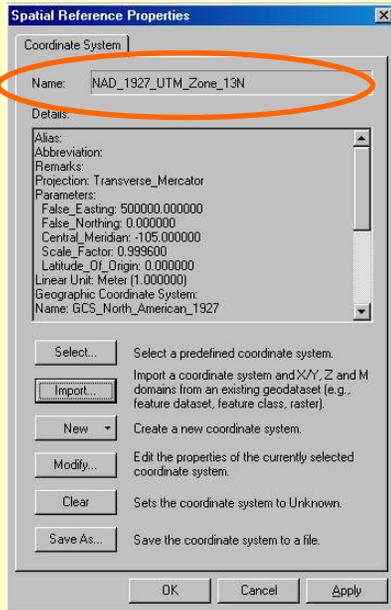


Figure 3. The *Spatial Reference Properties* dialog after the shapefile has been set to a projection and coordinate system. Check the **Name** option to verify the projection and coordinate sys-

III. Create Shapefiles

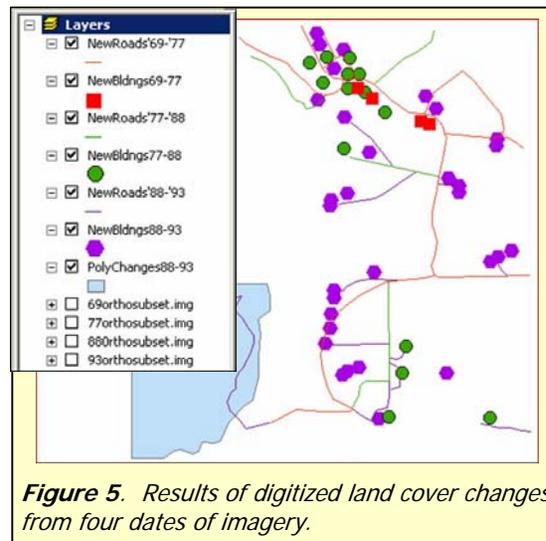
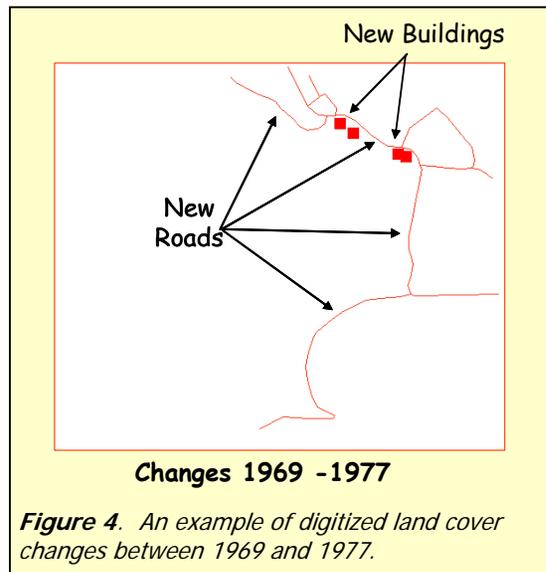
1. Launch **ArcCatalog** from the **Start** menu (**Start | Programs | ArcGIS | ArcCatalog**).
2. Navigate to the directory where your **Resource Photographs** are located in the **Catalog Tree**.
3. Select **File | New | Shapefile** from **ArcCatalog's** main menu. Set the following parameters in the **Create New Shapefile** dialog:
 - **Name:** *NewBuildings*
 - **Feature Type:** *Point*
 - Select the **Edit** button to open the **Spatial Reference Properties** dialog.
 - Select the **Import** button from the **Spatial Reference Properties** dialog
 - Navigate to and select one of your **Resource Photographs**
 - Select **Add**
 - Check to ensure that the **Projection and Coordinate System** of your new shapefile is the same as your **Resource Photographs** (Figure 3)
 - Select **Apply** and **OK** to close the **Spatial Reference Properties** dialog
 - Select **OK** in the **Create New Shapefile** dialog. You should be able to see the **NewBuildings** shapefile in the **Contents** tab of **ArcCatalog**
4. Select **File | New | Shapefile** from **ArcCatalog's** main menu. Set the following parameters in the **Create New Shapefile** dialog:
 - **Name:** *NewRoads*
 - **Feature Type:** *Polyline*
 - Select the **Edit** button to open the **Spatial Reference Properties** dialog
 - Select the **Import** button from the **Spatial Reference Properties** dialog
 - Navigate to and select one of your **Resource Photographs**
 - Select **Add**
 - Check to ensure that the **Projection and Coordinate System** of your new shapefile is the same as your **Resource Photographs** (Figure 3)
 - Select **Apply** and **OK** to close the **Spatial Reference Properties** dialog
 - Select **OK** in the **Create New Shapefile** dialog. You should be able to see the **NewRoads** shapefile in the **Contents** tab of **ArcCatalog**
 - Close **ArcCatalog**

IV. Digitize Land Cover Changes

1. Make your **ArcMap** session visible.
2. Select **View | Toolbars** from **ArcMap's** main menu and check **Editor** (the **Editor** toolbar will ap-



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- pear).
3. Select the **Add Data** button from **ArcMap's Standard** toolbar.
4. Navigate to and select **NewBuildings** and **NewRoads**. Select **Add** to load the files into the **Table of Contents**.
5. Toggle off all data layers in the **Table of Contents** except for your **Resource Photographs**.
6. Zoom, pan, and toggle your **Resource Photographs** in the **Data View** and locate buildings and roads that are present in your **most recent photo**, but are not present in your **oldest photo**.
7. Select **Editor | Start Editing** from the **Editor** toolbar. Set the following parameters on the **Editor** toolbar:
 - **Task:** *Create New Feature*
 - **Target:** *NewBuildings*
 - Select the **Sketch Tool** (looks like a pencil)
8. Digitize new buildings (as points) by single left-clicking on them. Continue until all new buildings have been digitized.
9. Select **Editor | Stop Editing** from the **Editor** toolbar once you have digitized all new buildings. Select **Yes** to save the edits.
10. Select **Editor | Start Editing** from the **Editor** toolbar. Set the following parameters on the **Editor** toolbar:
 - **Task:** *Create New Feature*
 - **Target:** *NewRoads*
 - Select the **Sketch Tool**
11. Digitize roads (as polylines) by single left-clicking at the beginning of a road to start, follow the road with your cursor while intermittently single left-clicking, and double-click when you get to the end of a road to finish. Continue until all new roads have been digitized.
12. Select **Editor | Stop Editing** from the **Editor** toolbar once you have digitized all the new roads. Select **Yes** to save the edits.
13. Examine your land cover changes (Figure 4). *What conclusions can you draw from your digitized changes?*

V. Other Considerations

1. **Use more than two dates of photography** (Figure 5). You may be able to identify trends and/or narrow a time when certain landscape changes did occur. Note: You would be required to create new shapefiles when digitizing changes between each time period.
2. **Create a polygon shapefile.** Polygon shapefiles allow you to document large-scale changes such as land use conversions (e.g., forest converted to agriculture).



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To Summarize:

- Change detection using resource photography is a valid method for assessing land cover changes over time.
- In some instances, resource photos may be the only data source available for a change detection procedure.
- Several techniques can be applied to perform a change detection using resource photography—the method described using ArcMap represents a very capable approach.