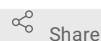


Jun 12, 2021

# Spatio-temporal modelling for future prediction of wetlands

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2 Works for me



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## DISCLAIMER

Use the licensed version of software.

## ABSTRACT

This protocol is intended to help the wetland researchers willing to use remote sensing data. It is designed for conducting past, present and future geospatial modelling. It involves step by step methods for collection of satellite data, processing of data, conducting research, accuracy assessment, future prediction and map composition using Arc GIS, ERDAS Imagine and Terrset software. The expected outcomes will be the Land Use Land Cover maps of past, present and future at spatio-temporal scale in .tif, .img or .png format. Area of each class, rate of change, area transition matrix and the wetland change driving factors will also be obtained. The only limitation is to have prior field knowledge for the wetland for better results.

## ATTACHMENTS

[protocol\\_LULC.docx](#)

## DOI

[dx.doi.org/10.17504/protocols.io.bvryn57w](https://dx.doi.org/10.17504/protocols.io.bvryn57w)

## PROTOCOL CITATION

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MANUSCRIPT CITATION please remember to cite the following publication along with this protocol

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## CREATED

Jun 12, 2021

## LAST MODIFIED

Jun 12, 2021


PROTOCOL INTEGER ID

50712

#### GUIDELINES

1. Visit the wetland prior to starting the research.
2. Collect field photographs and GPS location of different Land Use Land Cover classes.
3. Use half of the GPS as training datasets and half for accuracy assessment.
4. Maintain the uniformity of datasets for future prediction in TerrSet software

#### MATERIALS TEXT

1.  Geocoordinates of study area
2. Data: Landsat (MSS, TM, ETM+ and OLI)
3. Software: Arc GIS, ERDAS Imagine, TerrSet

#### Arc GIS 10.5

Windows 10  
by ESRI

#### ERDAS Imagine 2014

Windows 10  
by ERDAS, Inc.

#### TerrSet 2020

Windows 10  
by Clark Labs

1. Toposheets
2. GPS
3. MS Office

#### Microsoft 2013 and above

Windows 10  
by Microsoft

#### SAFETY WARNINGS

Always keep a backup of all the input datasets and output maps.

#### DISCLAIMER:

Use the licensed version of software.

## BEFORE STARTING

1. Install licensed version software like Arc GIS, ERDAS Imagine and TerrSet.
2. Learn to operate GPS before going to field.

## Study area

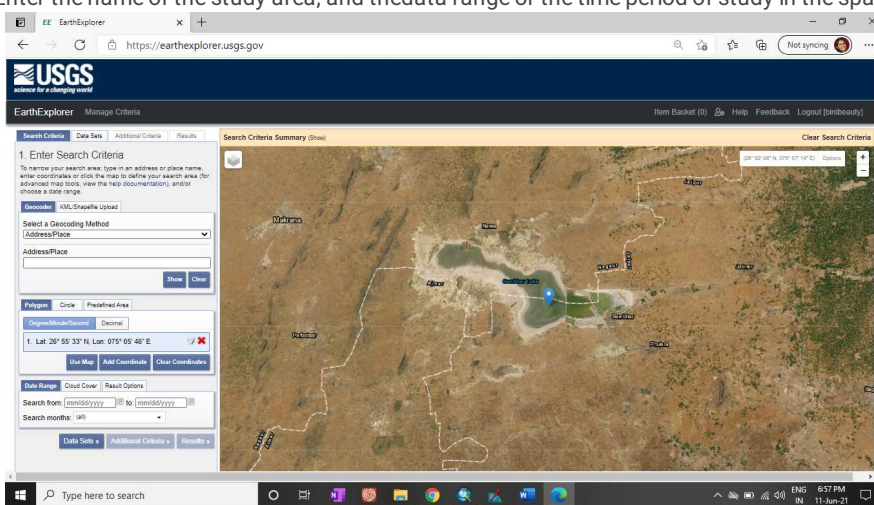
1

1. Decide the wetland to be studied.
2. Collect Toposheet.
3. Georeference and mosaic in Arc GIS.
4. Digitize the official boundary of the wetland.
5. Shape file is ready in .shp format (vector layer).

## Data collection

2

1. Create an account and login to [USGS Earth Explorer](https://earthexplorer.usgs.gov)
2. Enter the name of the study area, and the data range or the time period of study in the space provided.



3.

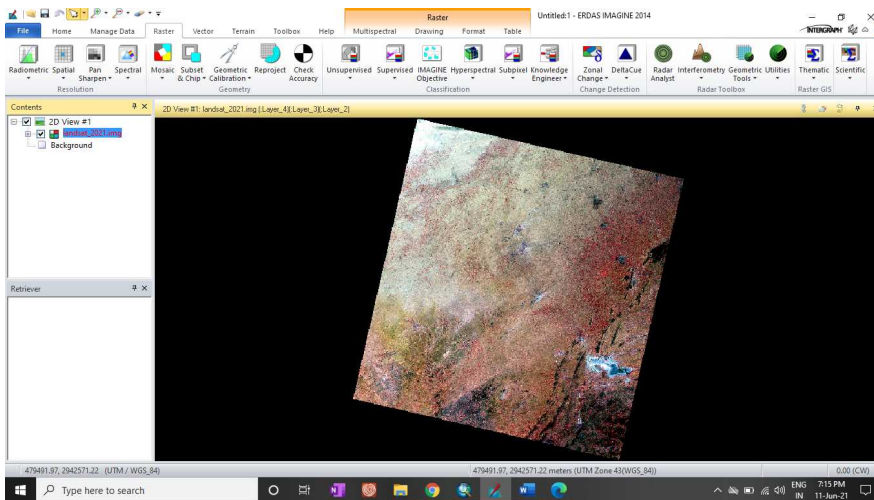
USGS Earth Explorer interface

4. In the second tab named "Dataset", select "Declassified" for the aerial photograph "CORONA" and "Landsat" for satellite images.
  5. Select "**Landsat Collection 2 Level 1**" for collecting Multispectral Scanner (MSS) data and "Landsat Collection 2 Level 2" for Thematic Mapper (TM), Enhanced Thematic Mapper Plus (ETM+) and Operational Land Imager (OLI) datasets.
  6. Then click on the "Result" option given below to visualize the results.
- Download the tiles after checking the metadata

## Data processing

3

1. Unzip the downloaded tiles.
2. "**Layer stack**" the respective band numbers representing Blue, Green, Red and NIR bands.
3. Create True Color Composite (TCC) and False Color Composite (FCC) for visualization and LULC class identification.
4. "**Subset**" the study area using the prepared boundary shapefile.

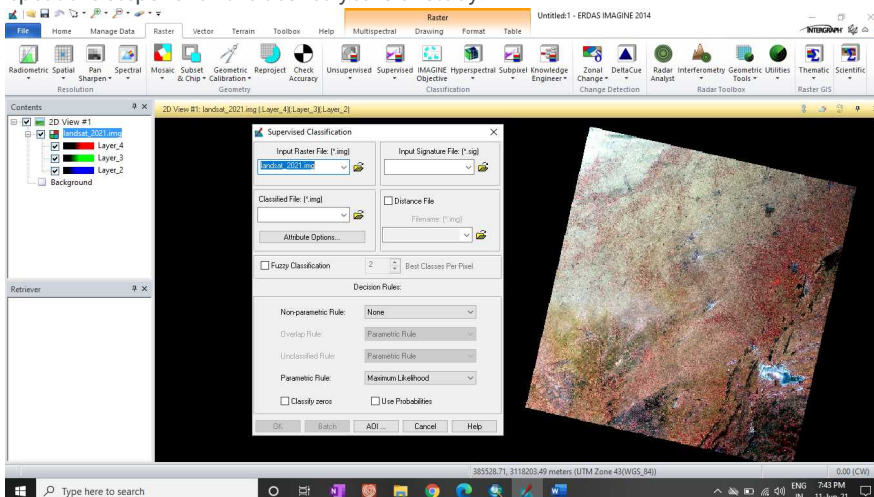


5.

Interface of ERDAS Imagine with FCC of Sambhar Lake

### LULC classification

- 4
  1. Select "**Raster tab**", then "**Supervised menu**" and then "**Signature editor**".
  2. Select minimum 20 to 30 signature for each LULC classes using the training datasets obtained from field.
  3. Save the Signature file.
  4. Select "Supervised Classification".
  5. Import subset image of study area as input file and also import signature file.
  6. Set Parametric rule as "Maximum Likelihood".
  7. Give a name for the output file.
  8. Run the program.
  9. Obtain the classified map and do accuracy assessment.
  10. Calculate the total area of each class.
  11. Repeat the steps for all the desired years of study.



12.

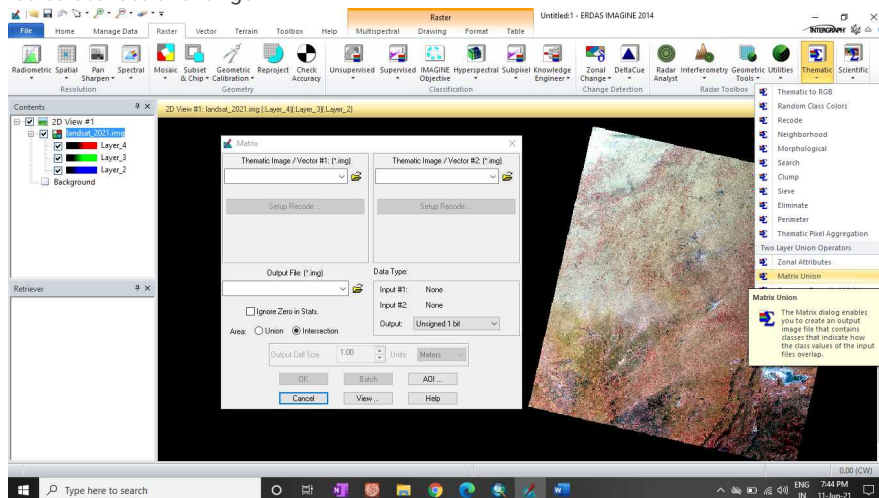
Window for supervised classification.

13.

### Change detection

- 5
  1. Select the "**Raster Tab**".
  2. Select "**Thematic**" menu.

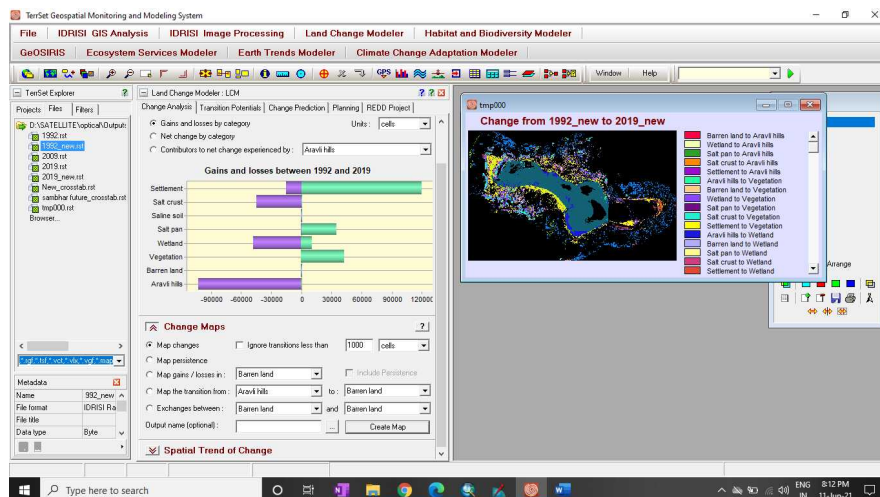
3. Select **"Matrix Union"**.
4. Import two classified images of different years.
5. Give output file name.
6. Select **"Union"** in Area type and **"Unsigned 16 bit"** in data type.
7. Run the program
8. Export transition matrix output file to MS Excel sheet
9. Calculate rate of change



Window for change detection in ERDAS Imagine

#### Future prediction

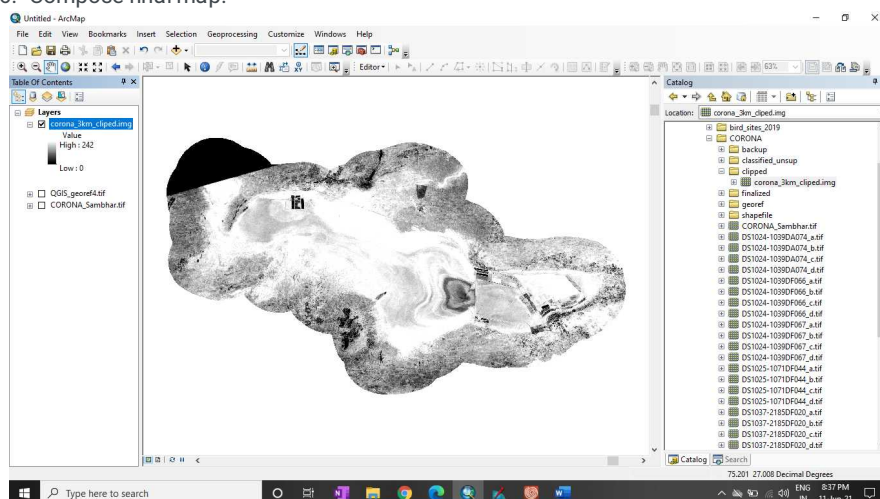
- 6
  1. Open TerrasSet Geospatial Monitoring and Modeling software.
  2. Import two classified maps in .tif format.
  3. Open **"Land Change Modeler"**.
  4. Create new session and name it.
  5. Obtain **"Change maps"**, **"Change analysis"** and **"Spatial trend of change"**.



Future prediction results in TerrSet software

## CORONA Aerial Photograph

- 7
  1. Add downloaded Declassified CORONA photograph.
  2. Georeference it.
  3. To the required form using **"Clip"** option of Raster in Data Management tools.
  4. Digitize and classify using visual interpretation keys.
  5. Calculate area using scale **"Calculate geometry"** in the attribute table.
  6. Compose final map.



Declassified CORONA photograph

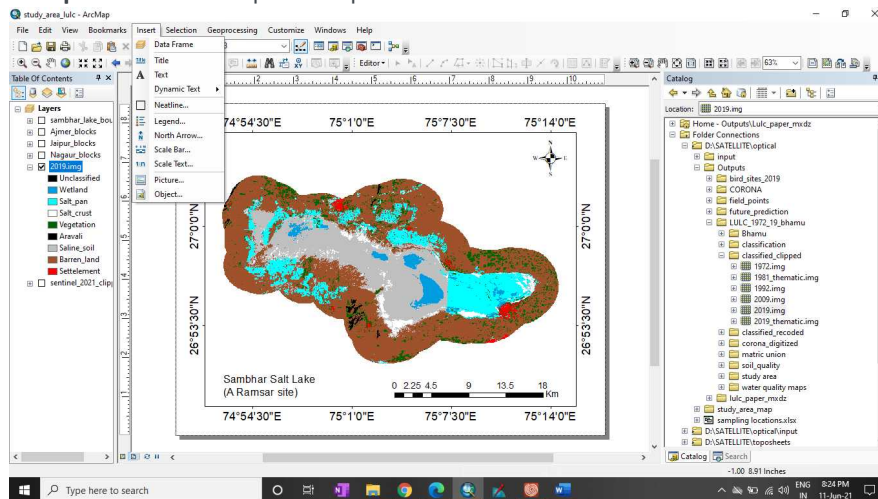
## Map composition

- 8
  1. Add the Maps to Arc GIS.
  2. Switch over to **"Layout View"**.
  3. Go to **"Insert"** menu.



4. Insert Map elements like Legends, North Arrow, Scale bar and text, Grid.

5. “Export” the final composed map in tiff format.



Elements of finally composed map in Arc GIS

## Soil, water and bird study

- 9 1. Soil and water sample were analyzed using the protocols of APHA [1].
2. Bird census were conducted using protocol of [2].

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