iGETT Cohort 1, June 2008

Curriculum Support Document – Outline of Content

OsoBayLCCC_Nelson_CS_June2008

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- Title: "Oso Bay Land Cover Change Classification"

Introduction

The use of GIS to detect land change in Nueces County, Corpus Christi, Texas and in particular a region of interest ROI around Oso Bay.

Overview

The campus of Texas A & M University of Corpus Christi has had tremendous growth in student population, faculty and support staff. The Island University as it is called has been experiencing a tremendous amount building construction on Ward Island (I.E. classrooms, offices, administration, physical education facilities and student housing). The region around Oso Bay, where ward Island sits has experienced the growth of new construction and the expansion of existing structures. These new developments have occurred on Ennis Joslin, Alameda, and Ocean drive, which are three main roads that survive TA&MUCC and the Corpus Christ Naval Air Station. These encompass areas directly north, west and south of the campus as they wind around Oso Bay. The university administration and the city government are in discussions concerning the expansion of the campus across Oso Bay to areas along Ennis Joslin, Oso Golf course and city parks little league and soccer fields. The area around Oso bay is also home to Guth Sutter Wet lands Park and birds' sanctuary. Please see attached link for Corpus Christi Caller Times articles about the campus areas recent growth and planned expansions. "TXAMUCC_60yearsgrowth". **http://www.caller.com/news/2008/feb/03/am-cc-celebrates-60-years/**, **http://www.caller.com/news/2008/jan/29/celebrating-60-years-of-texas-am-cc/**

Purpose

The purpose of this lesson is to demonstrate the use of satellite remote sensing images and orthographic photos to identify areas of land change and to reclassify land use and

coverage. This should enable the student to analyze land cover change; to help them grasp the extent, significance, and consequences of land cover change; and to introduce them to the perspective of space-based observations. The project study should help students to determine what possible types of land coverage existed in proposed area and what changes have occurred. This lesson will introduce the applications and operations of ENVI 4.4, ENVI Zoom and ArcMap 9.3.

Description of the Learning Unit

This Sequence of Learning Units integrates; newly developed lessons and exercises with lesson plans, exercises, tutorials, power points, and videos created by other authors' as noted. Some previously created material was edited to apply to the needs of this Learning Unit. The original documents will be available in the LU's Supporting_Documents.

Learning Objectives

1) Apply Remote Sensing (RS) and ArcGIS data and software to create land cover classification maps.
2) Demonstrate the use of ENVI 4.4 and ENVI-Zoom when applying the applications necessary to determine land cover types.
3) Be able to identify Land Cover Types and Land Cover Use through observation.
4) Make maps of land cover at a regional or ROI scale.
5) Qualify land cover changes over time.
6) Quantify land cover changes over time.
7) Be able to identify and select the necessary data elements and analysis components applied to Landsat image data to perform land cover type classification.
8) Understand the basic principles that influence Land change over time – Multi Temporal Analysis.
9) Explain the forces that affect land change over a 6 month period, 1 year or decade.
10) Demonstrate the ability to find, select and download Landsat image data using GloVis
11) Predict land cover or land use change and direction of geographic that change.
12) Demonstrate the ability to find, select and down load SDDS data layers.
13) Realize that land cover and land use in geographic areas as in our ROI is changing in significant ways, and that this has implications for management of the natural resources we depend on.
14) Begin to appreciate the value of planning in urban growth to protect natural resources or neighborhoods. (campus, parks-wetland, golf course, base ball 7 soccer field)
15) Demonstrate the ability to work independently.
16) Demonstrate a team concept, by building and working together with in a team structure.
17) Demonstrate the ability to manage information and time management.

18) Demonstrate the ability to share knowledge and skill sets with team members other teams and teacher.

Student Outcomes:

1) Experience the practical value of remote sensing at an introductory level.
2) Learn to interpret, assess, and predict changes in the nature and spatial extent of land use and land cover at the different landscape (regional or ROI) scale, using land remote sensing images.
3) Begin to appreciate the extent of urban development and the impact on natural resources as land cover changes.
4) Perceive a regional and area of interest (landscape scale) context for local change.
5) Develop skills of visual analysis of remote sensing images.
6) Perform hands on classification of Land Cover and Land use types using simple transparencies, grids and paper satellite images.
7) Use data derived from Remote Sensing and GIS to assist in identifying land classifications.
8) Distinguish between pervious and impervious land cover features.
9) Contrast the PCA change analysis for 1992, 2002, 2004 and 2005)
10) Use data derived from Remote Sensing and GIS to assist in analyzing land cover change on a multi temporal basis. (1992-2002, 2004).
11) Through visualization techniques applied to data identify land change and factors that affect it.
12) Compare SDDS NLCD classification types with student's derived image data.
13) Forecast land cover change for the next ten years if all the factors studied remain the same.
14) Demonstrate the critical thinking skills required to combine numerous sources of image data with field observations and analysis to identify land cover classification and land cover change.
15) To develop and demonstrate the social and team building skills to become a productive and positive team member.
16) Maintain an up to date classroom project notebook.
17) Exercise Time management in classroom and home work activities.
18) Prepare and present a report on the analysis.

Geographical Location

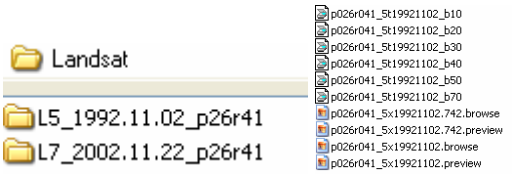
1) Landsat data Path-26/ Row-41
2) Nueces County and Corpus Christi.
3) Region of Interest (ROI) Oso Bay & TAMUCC

Preliminary list of software and hardware

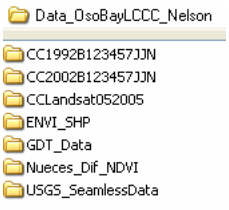
1) GIS software – ArcGIS & ArcCatelog
2) Remote Sensing software – ENVI-4.4, ENVI-Zoom, MultiSpec.

3) Microsoft Office – Power Point, Text Editor, Word. Data Base Explore
4) Internet Browsers – Internet Explorer, Fire Fox,
5) Trimble GPS & software, TerraSync, ArcPad

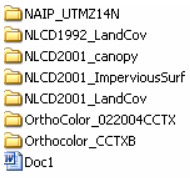
Preliminary list data sets



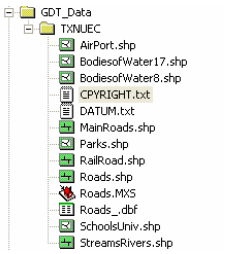
1) Landsat_L5_1992.11.02_p26r41
2) Landsat_L7_2002.11.22_p26r41



3) Data_OsoBayLCCC_Nelson
    a) \CC1992B123457JJN
    b) \CC2002B123457JJN
    c) \CCLandsat052005



    d) USGSSeamlessData\WGS84_USALBERTEAC



    e) Shapefiles: GDT_Data

Links & References

Look in LU supporting documents folder for articles and power points.

1) Field Photos: OsoBayLCCC_Nelson_Photos_June2008
2) “Multisensor Fire Oberservations”, NASA DVD
3) “A Tour of the CRYOSPHERE”, NASA DVD
4) Quantifying Changes in the Land Over Time” NASA Education Team
5) “Getting to know Your Satellite Imagery and Globe study Guide”, Globe 2003
6) Phoenix video

7) iGETT-Cohort-1, Tutorial exercises: ENVI and GloVis applications for Nueces County Landsat scene, author Laura Rocchio NASA 2008.
8) iGETT-Cohort-1, Tutorial exercises: ENVI applications using Landsat image data for Nueces County and Corpus Christi, author Ann Johnson ESRI 2008, screen shots J.J. Nelson. (2008).
9) iGETT-NASA: "How People use Remote Sensing" Jeanie Allen
10) Websites:
    a) http://seamless.usgs.gov
    b) http://glovis.usgs.gov
    c) http://geographynetwork.com
    d) http://www.caller.com/news/2008/feb/03/am-cc-celebrates-60-years/
    e) http://www.dhba.com/globe.html
    f) http://cobweb.ecn.purdue.edu/~biehl/MultiSpec/
    g) http://www.epa.gov/mric/nlcd.html
    h) http://change.gsfc.nasa.gov/create.html
    i) http://earthobservatory.nasa.gov/library/Landcover/
    j) http://earthobservatory.nasa.gov/library/LandSurface/
    k) http://landsat.gsfc.nasa.gov/
    l) http://landsat.usgs.gov/
    m) http://landcover.usgs.gov/urban/info/factsht.pdf

11) OsoBayLLC_Nelson_PPT

Entrance skills and competencies for LU.
Grades 10-12

1) Basic computer skills, MS applications.
2) Intermediate ArcGIS.
3) Beginner ENVI
4) Beginner to basic principles of Remote Sensing (RS)
5) Intermediate communication skills
6) Intermediate collaboration skills
7) Beginning time management skills
8) Beginning presentation and report skills
9) Supervision ranges from guided – moderate – independent practice.
10)

Skill level of LU.

1) Beginning Remote Sensing user.
2) Intermediate ArcGIS user
3) Grades 10-12

Learning Units Timeline

3-4 weeks, 15-20 hours of classroom, 6 hours homework (dependent on grade level and skills sets levels.

Sequence of Lessons, Activities, Exercises & Timelines at a Glance Parts 1-16

- **Student outside preparation as homework:** Students should be ready to participate in class room discussion Q & A. The teacher will make material and links available to each student. (6 hours HW)

- **Part-1**. Homework, Student will preview Remote Sensing Videos: Available on the web site links, CD-ROM or DVD. Students will preview Hand out (HO) Articles & Power Points: Home work. Students should be ready to participate in class room discussion Q & A.The teacher will instruct the students to make a 3 ring notebook for notes, handouts, power points, grids, maps, images, and definitions. Preview and complete MultiSpec Tutorials on line. Download program and data.

- **Part-2**. Lecture & Guided Presentation: **"Getting to Know Your Satellite Imagery". Use Globe2003 Maps. (30 minutes)**

- **Part-3: Qualitative Assessment; Hands on Guided Practice and Independent Practice Classroom Activity:** The student will begin by following the same steps in the **"Getting to Your Satellite Imagery".** But using local Landsat scene data for Nueces County and Corpus Christi (P-26/R-41). **(45-60 minutes).**

- **Part-4.** ENVI Tutorial: Quick Start to ENVI, "ENVI_Quick_Start [1]". Guided practice and independent practice. (45-60 minutes).

- **Part-5** ENVI Tutorial: Working with ENVI Zoom. Guided practice and independent practice. (30-45 minutes).

- **Part-6. "Quantifying Changes in Land Cover Over Time".** The teacher will monitor and guide the students to perform Identification, **Qualitative Assessment, Quantitative Assessment**, Data Analysis and to forecast land cover classification and change for Nueces County, Corpus Christi 1992 and 2002 remote sensing data from Landsat-7, P-26/R-41. (75 minutes)

- **Part-7: iGETT-Cohort-1, Tutorial exercises: ENVI and GloVis applications for Nueces County Landsat scene, author Laura Rocchio NASA 2008.** (45-60 minutes)

- **Part-8**. iGETT-Cohort-1, Tutorial exercises: ENVI applications using Landsat image data for Nueces County and Corpus Christi, author Ann Johnson ESRI 2008, screen shots J.J. Nelson. (2008). **(45-60 minutes)**

- **Part-9.** Using ENVI 4.4 Applications to select 1992 Nueces County and Corpus Christi remote sensing scenes for the purpose of building **composite images, data cubes, images, crop regions of interest (ROI**), print a QuickMap, perform **Unsupervised Classifications** and **Post Classifications**, and convert layers to shape files. (90 minutes)

- **Part-10**. The teacher will instruct the class to use ENVI 4.4 applications to select 2002 Nueces County and Corpus Christi remote sensing scenes for the purpose of building composite images, data cubes, images, crop regions of interest (ROI), print a QuickMap, perform Unsupervised classifications and post classifications, and convert layers to shape files. (45-60 minutes)

- **Part-11**. The teacher will instruct the class to use ENVI 4.4 applications to select 2005 Nueces County and Corpus Christi remote sensing scenes for the purpose of building composite images, data cubes, images, crop regions of interest (ROI), print a QuickMap, perform Unsupervised classifications and post classifications, and convert layers to shape files. Same as Parts 9-10. (30 minutes)

- **Part-12**. Finding, selecting, and Downloading Seamless Data from the USGS Seamless Data Distribution System (SDDS). (http://seamless.usgs.gov) In search of recent Orthoimagery (aerial photos) and National Land Coverage Data Layers (NLCD**).** (60+ minutes)

- **Part-13:** Perform the Mosaicking of Raster application. It will be necessary to mosaic the Orthoimagery: Corpus Christi Feb 2004. (45+ minutes depending on process)

- **Part-14**.Perform ENVI ZOOM applications and Analysis of Oso Bay ROI. Review the ENVI-ZOOM tutorials in Part-5. The object of this lesson is to perform further image processing and utilize additional spectral tools to better analyze the digital imagery that was processed in ENVI 4.4. (30-45 minutes)

- **Part-15.** Perform ArcMap Applications. The teacher will instruct the students to perform applications to interpret land cover classifications and land cover change. The student will reclassify and rename land cover using National land Coverage Dataset Schemes. (90-120 minutes)

- **Part-16.** Plan a field trip to the Oso Bay ROI to make a field study of the work the students performed. Take photos, notes, and collect GPS field points if possible to add to map project.

The End

Key Words

Qualitative, Quantitative, RGB, Layer Stacking, Land Cover, Remote Sensing, Data Cube, ISODATA, Image, Raster, Vector, Land Use, true-color, false-color, NDVI, Grayscale, Anomaly Detection, ROI, RBG, Landsat, Path, Row, Pervious, Impervious. PCA.

Brief Description of Evaluation and Assessment

1) Student Note book. (rubric)
2) Work sheets and grids
3) Glossary – terminology
4) Logged lab hours
5) Quiz and tests.
6) Participation; Class room discussions – Q & A.
7) Teacher monitored progress
8) Instructor graded reports (rubric)
9) Instructor graded Maps (rubric)

List of disciplines or existing courses where Learning Unit may be included

10) Physical & Human Geography
11) Urban Development
12) Earth Science & Biology
13) Agriculture
14) Government

Contact information for questions related to the Learning Unit.

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