How To Use Timesync For Interpretations Of Change

TimeSync is a Landsat satellite image time series visualization and data collection tool. It is used to record and describe events and periods in the history of land cover and use as represented by Landsat satellite image pixels. This guide walks through the basic procedure for interpreting a plot. Information about the TimeSync user interface and functionality is available as tool tips activated from the Help button dropdown. When tool tips are active you can hover over most program elements to produce a description of the element and any functionality it has. This document should be used in conjunction with the default "Response Design" available through the Help button. Although a given project may use a different response design, the same basic overview represented in the default version is relevant to your understanding of how to use TimeSync. Some of the detail below is relevant only to the default response design, but the mechanics for all designs are the same.

The basic steps of TimeSync interpretation are as follows:

1. Load a project

2. Load a plot from the project plot list

3. Visually assess the spectral image series points and image chips for change events

4. Set change events as vertices

5. Fill out the vertex and segment interpretation forms.

1. Load a project

At the top of the user interface is a dropdown menu titled "Project" that contains projects that are registered to you. Select the project you want to work on by a single left click. This action will load the list of plots associated with the selected project in the "Plots" component of the interface. Plots that have been completed (all segments and vertices have been described in the interpretation forms) will be delineated with a check mark. A Google Earth kml or kmz file should accompany your project to aid in plot interpretations described below.

2. Load a plot from the project plot list

Select a plot from the "Plots" list with a single left click. This action will load all data associated with the plot. This includes the spectral trajectory time series points, target date image chips, and forms for segmented time series. Plots that have not been interpreted before will have one default line segment with two default vertices, one at the beginning of the time series and one at the end. For each vertex and segment, empty interpretation form inputs will populate the "Interpretation Forms" section. Plots that have been previously interpreted will be loaded with all saved vertices, segments, and form inputs.

3. Visually assess the spectral image series points and image chips for change events

Familiarize yourself with the plot. Look at image chips and try to determine what land cover and use are being represented. Use the zoom functionality to scale out, putting the plot into context with the

surrounding landscape (zoom slider at the top of the interface or hold the shift key and mouse scroll while hovering over an image chip). Once you have a notion about what the land cover and use are you can better imagine what kinds of changes are possible for the plot. Look at the spectral point time series and image chips and notice if there are drastic changes, subtle changes, erratic changes, cyclic changes, and how much inter-annual variability there is. Think about how these spectral changes relate to the land cover and use you identified for the plot. Activate the "Show All" button to show intra-annual points which will help you determine how much intra-annual variability there is for the plot and if the date that was selected to represent the year is indeed representative. If you find that the default annual point is not a good date (cloud, shadow, ephemeral deviation) you can change the default annual point by opening the intra-annual chip window and selecting a new default date. To open the intra-annual chip window, hover over a chip in the main interface and a "new window" icon will appear, left click to open. To match a suspect point to a chip, hover over the point and it will highlight both it and the corresponding chip with a bold, green border. Hovering over either an image chip or an annual point has the same highlighting effect. This feature is helpful for identifying which annual chip to open the intra-annual chip window from, based on a point hover in the spectral time series plot. The full set of images for the year will appear in the new window. Hovering over each intra-annual chip in the new window while the "Show All" button is active will highlight the corresponding point in the spectral time series plot with an increased point size and a bold, blue outline. This feature is helpful for determining which image chip is the best date to represent the year. Left click the desired chip to set the image date as the default for the particular year. Your selection is saved to the server as the default image date.

4. Set change events as vertices

Once you have gotten a sense for the plot and made any changes to the default image chip data representing the annual time series, you must segment the spectral history so that discrete events and periods can be described. Segmentation is achieved by setting line vertices. To set a vertex you can either double left click on an annual point in the spectral time series plot or on an image chip. The goal is to make a line that matches the profile of the spectral time series using as few segments as possible to describe the durable, impactful changes or stability of the plot's spectral history. If you would like to remove a vertex, simply double click on either the annual point or the image chip defining the vertex. You should avoid setting vertices for changes that represent ephemeral or phenological phenomena. You must consider the goal of the data collection and the summary you wish to produce after all plots are interpreted, as well as the precision of the Landsat data. Too many vertices can introduce noise into the dominant signal/history of the plot, or are not meaningful in the context of the sensor's design.

5. Fill out the vertex and segment interpretation forms.

After you fully segmented the spectral history of the plot you must fill in the interpretation forms. In the Interpretation Forms section of the interface there are tabs for vertices, segments, and plot comments. Under the segments tab, left click in an empty "Change Process" form input slot to activate a dropdown menu of options to label the change process for the selected segment. The segment being labeled will be identified by its start and end vertices highlighted with a bold, green border around representative points and image chips. The dropdown menu will hide after the cursor leaves the menu or the Interpretation Forms section. Fill out the vertices in the same way. At each vertex you will describe the

primary land use and land cover for each vertex. You also have the option of specifying a secondary land use, though this is not a required field. Comments about the plot can be added in the comments input section by activating the “Comments” tab. Please see the default “Response Design” document under the Help button dropdown for details regarding the definition and options for “change process”, “land use”, and “land cover”. To reduce repetitive form entry time and clicking, you can right click on form input slots to select various copying methods. All segment, vertex, and comment information is saved automatically upon switching to a different plot or project, and when closing the program.