NOAA CoastWatch & PacIOOS: ArcGIS Demo to Access and Use Data for Ocean and Coastal Applications

PacIOOS | https://pacioos.org

2024 Pacific Islands GIS & Remote Sensing User Conference

26 November, 2024

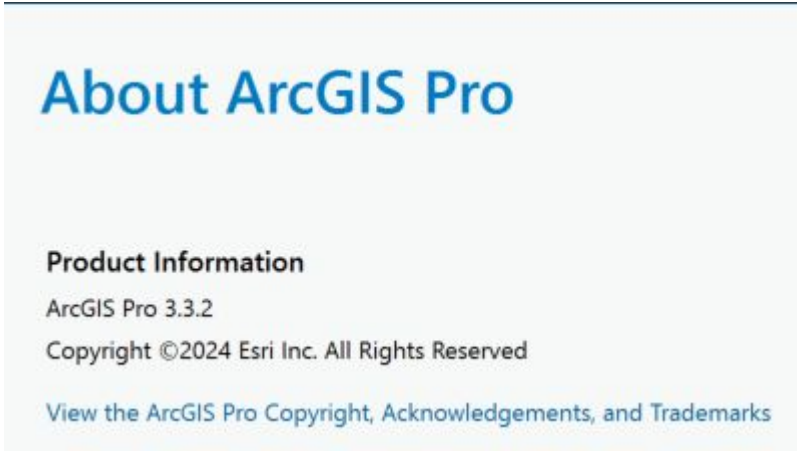
Tutorials available at:
https://bit.ly/pgrsc-demos

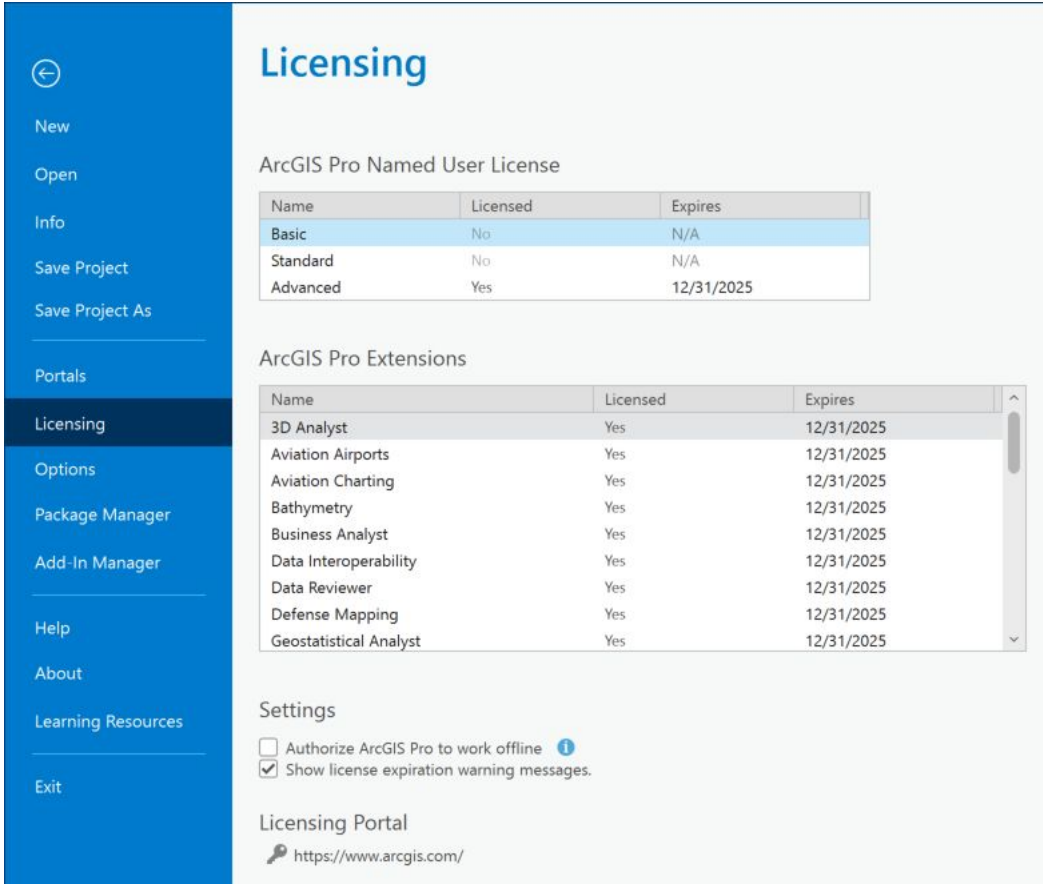
PacIOOS
PACIFIC ISLANDS OCEAN OBSERVING SYSTEM

NOAA OceanWatch & PacIOOS

Tutorial: ArcGIS Online Pro

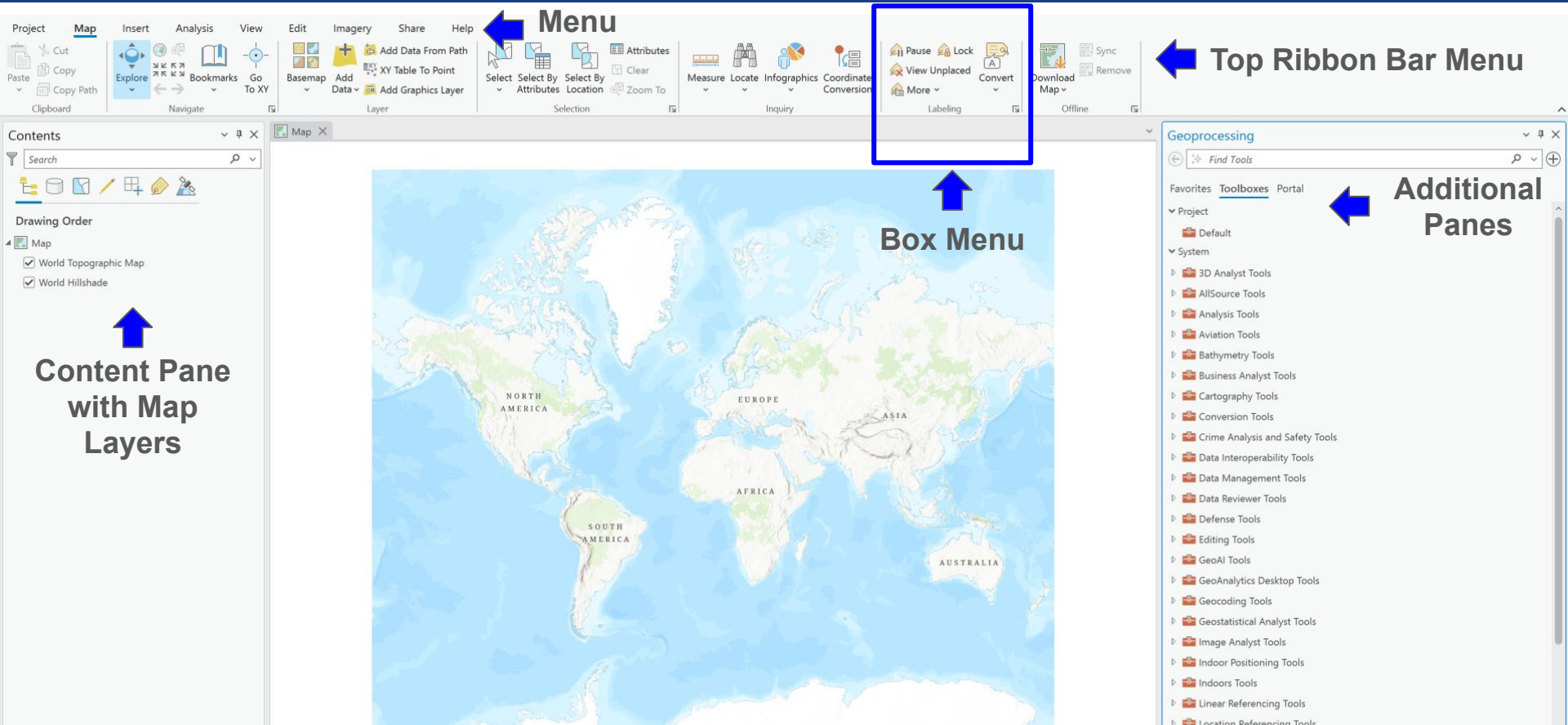
ArcMap 10.8.1 was the final release of ArcMap and all future development is in ArcGIS Pro. ArcMap 10.8.1 will continue to be supported until 2026 via the normal Esri support cycle. It is encouraged that you use ArcGIS Pro.





NOAA OceanWatch & PacIOOS

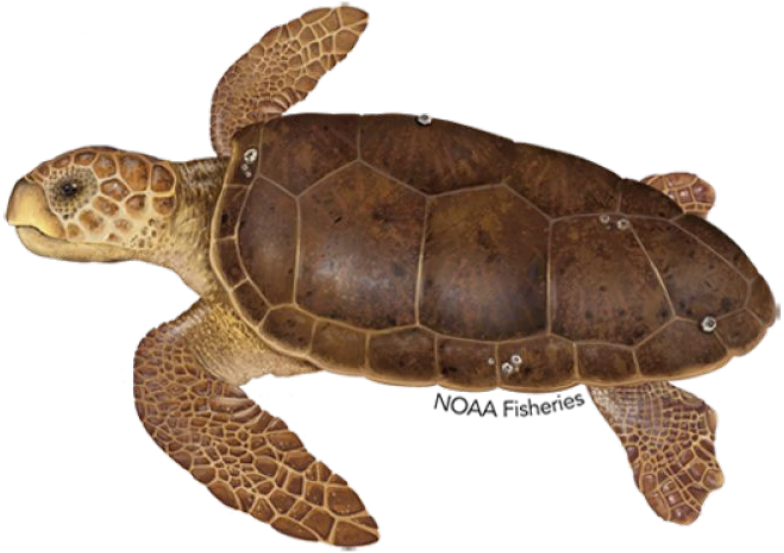
Tutorial: Navigating ArcGIS Online Pro



Tutorial: Tracking Turtles

- **Scenario:** A juvenile loggerhead sea turtle (ARGOS ID 25317) provided positional data over a period of three years

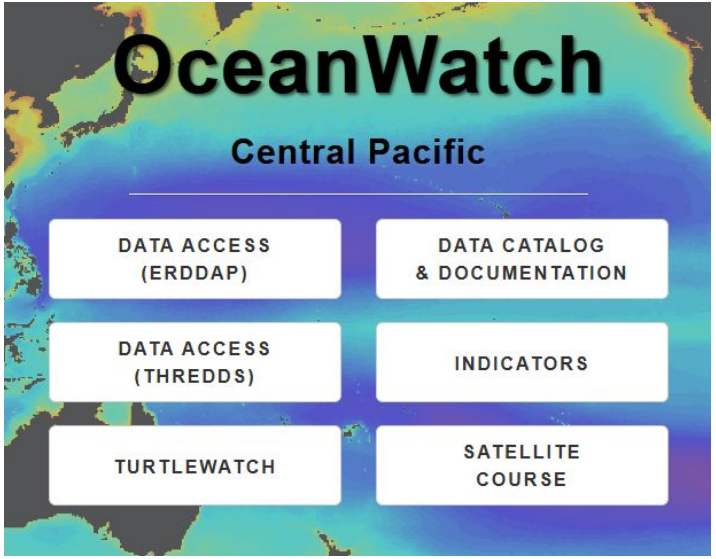
- **Research Question**: Does this sea turtles' behavior correspond to oceanographic surface parameters such as sea surface temperature? Does the turtle remain within the TurtleWatch Area (17.5° to 18.5°C)?



NOAA OceanWatch & PacIOOS

Tutorial: Download Data

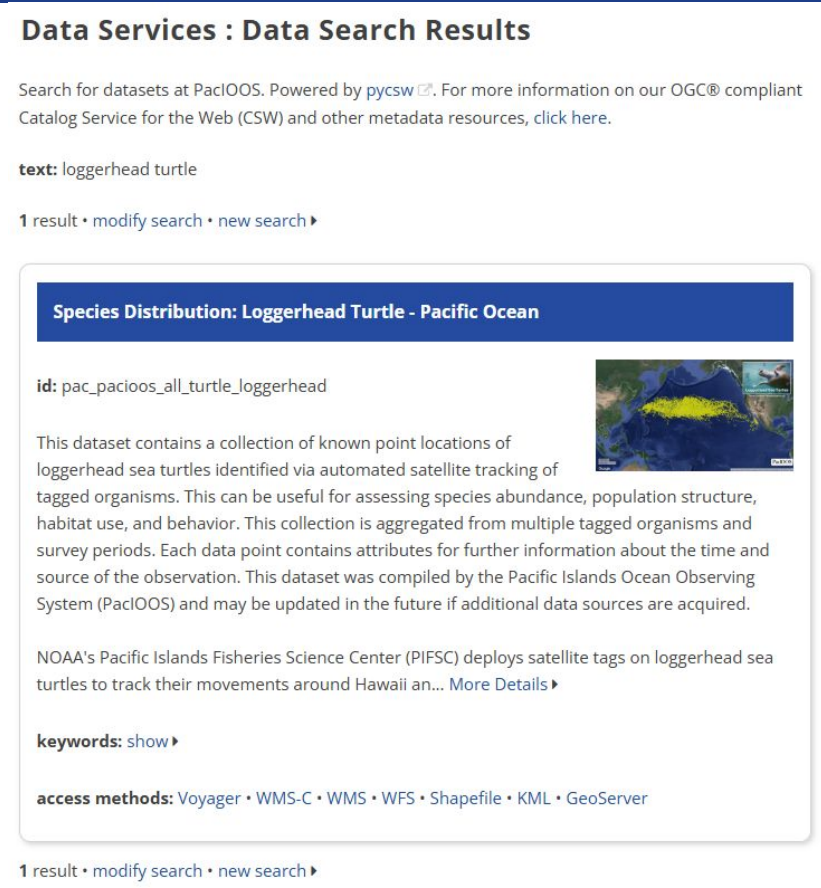
- Get oceanographic surface parameter data
  - Look through OceanWatch's Data Catalog to find SST data
  - Find the "Geopolar blended" dataset and click on the "daily" ERDDAP link
  - Click on the "Data Access Form" at the top and select data from 2005-05-01 to 2008-05-01 for 18.025 to 45.423 latitude and 175.025 to 208.025 longitude
  - Check only the "analysed_sst" box under Grid Variables
  - Under File Type, select ".nc", then click "Submit" to download



This is a large dataset and will take 3-5 min to download (1.7 GB)

Tutorial: Download Data

- Get loggerhead sea turtle track data
  - Use PacIOOS Data Search and search for “Loggerhead Turtle”
  - Click the “Shapefile” link to download the data (.shp)
  - Loggerhead turtle distribution available from 1997 to 2010



Data Services : Data Search Results

Search for datasets at PacIOOS. Powered by pycsw. For more information on our OGC® compliant Catalog Service for the Web (CSW) and other metadata resources, click here.

text: loggerhead turtle

1 result • modify search • new search

Species Distribution: Loggerhead Turtle - Pacific Ocean

id: pac_pacioos_all_turtle_loggerhead

This dataset contains a collection of known point locations of loggerhead sea turtles identified via automated satellite tracking of tagged organisms. This can be useful for assessing species abundance, population structure, habitat use, and behavior. This collection is aggregated from multiple tagged organisms and survey periods. Each data point contains attributes for further information about the time and source of the observation. This dataset was compiled by the Pacific Islands Ocean Observing System (PacIOOS) and may be updated in the future if additional data sources are acquired.

NOAA's Pacific Islands Fisheries Science Center (PIFSC) deploys satellite tags on loggerhead sea turtles to track their movements around Hawaii an... More Details

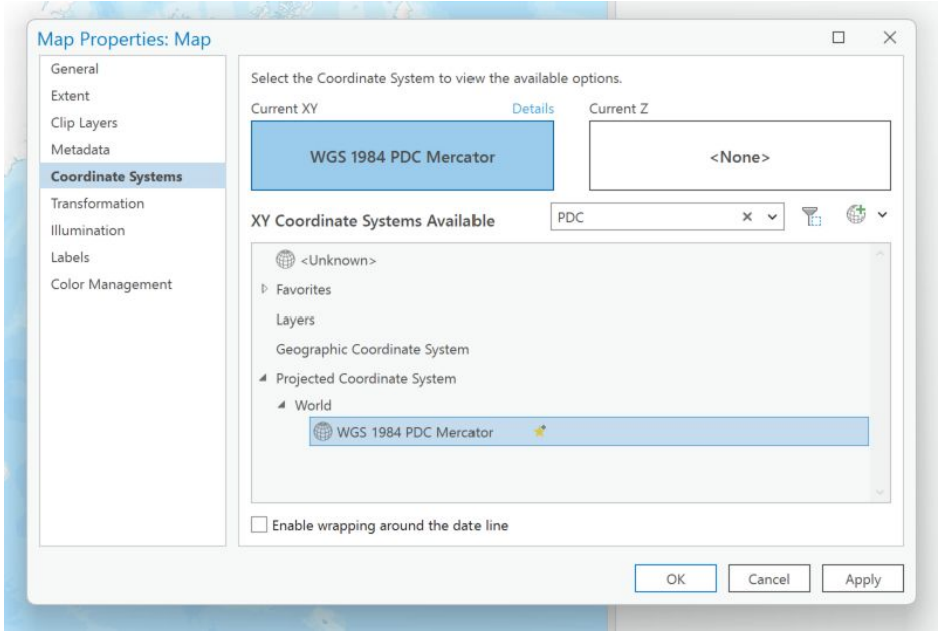
keywords: show

access methods: Voyager • WMS-C • WMS • WFS • Shapefile • KML • GeoServer

1 result • modify search • new search

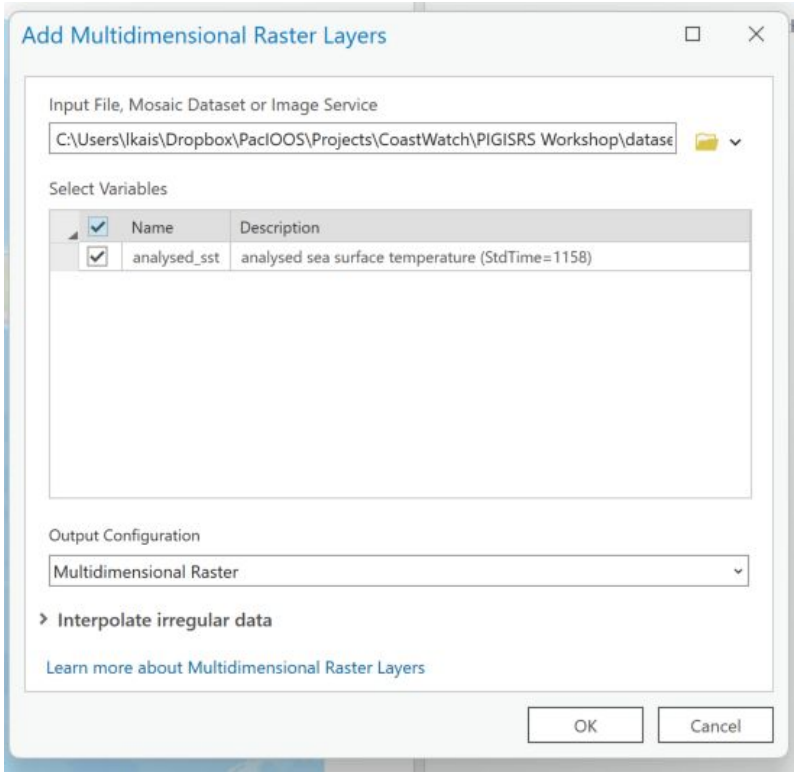
Tutorial: Create Map

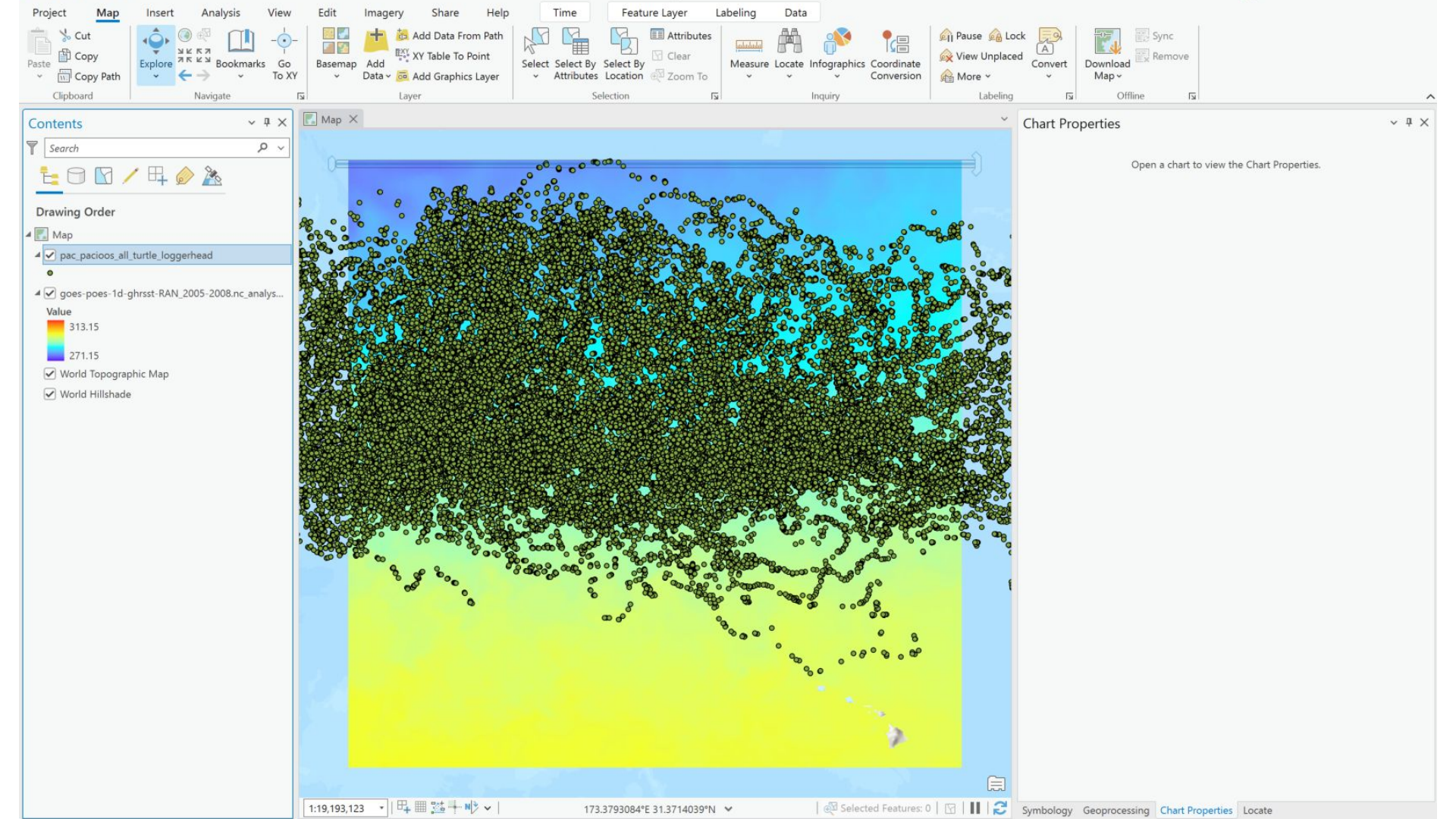
1. Open ArcGIS and start with a blank map
   a. Start without a template and then under Insert in the top ribbon menu bar, click “New Map”
2. Change the new map to be Pacific-centric
   a. Double-click on “Map” in the Content panel to open the Map Properties
   b. Click on “Coordinate Systems” in the left-hand menu
   c. Either search “PDC” in the XY Coordinate Systems Available, or manually navigate by clicking “Projected Coordinate System”, then “World”, and scroll down and select “WGS 1984 PDC Mercator”
   d. Click “OK” to close the Map Properties



Tutorial: Add Data

1. Add satellite data (.nc file)
   a. Under Map, use the dropdown menu under Add Data in the top ribbon menu bar and click “Multidimensional Raster Layer”
   b. Navigate to the .nc file path by clicking on the folder icon to fill the Input File, Mosaic Dataset or Image Service box
   c. Check the box to Select Variables for “analysed_sst”, then click “OK”
2. Add point data (.shp file)
   a. Click “Add Data”, navigate to the .shp file, then double-click to add to the map




Project
Map
Insert
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View
Edit
Imagery
Share
Help
Time
Feature Layer
Labeling
Data
Paste
Cut
Copy
Copy Path
Clipboard
Explore
Bookmarks
Go To XY
Navigate
Basemap
Add Data
Add Data From Path
XY Table To Point
Add Graphics Layer
Layer
Select
Select By Attributes
Select By Location
Attributes
Clear
Zoom To
Selection
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Locate
Infographics
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View Unplaced
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World Topographic Map
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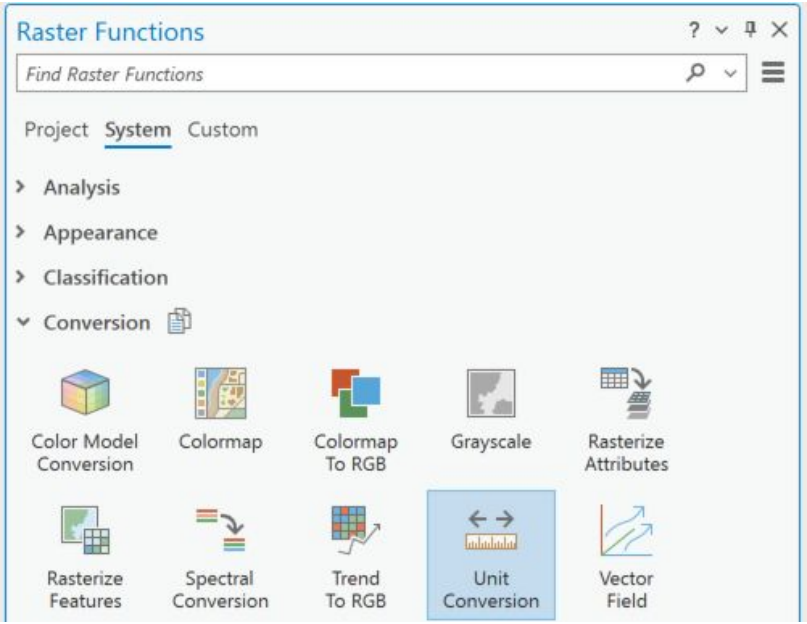
Map
Chart Properties
Open a chart to view the Chart Properties.
1:19,193,123
173.3793084°E 31.3714039°N
Selected Features: 0
Symbology
Geoprocessing
Chart Properties
Locate

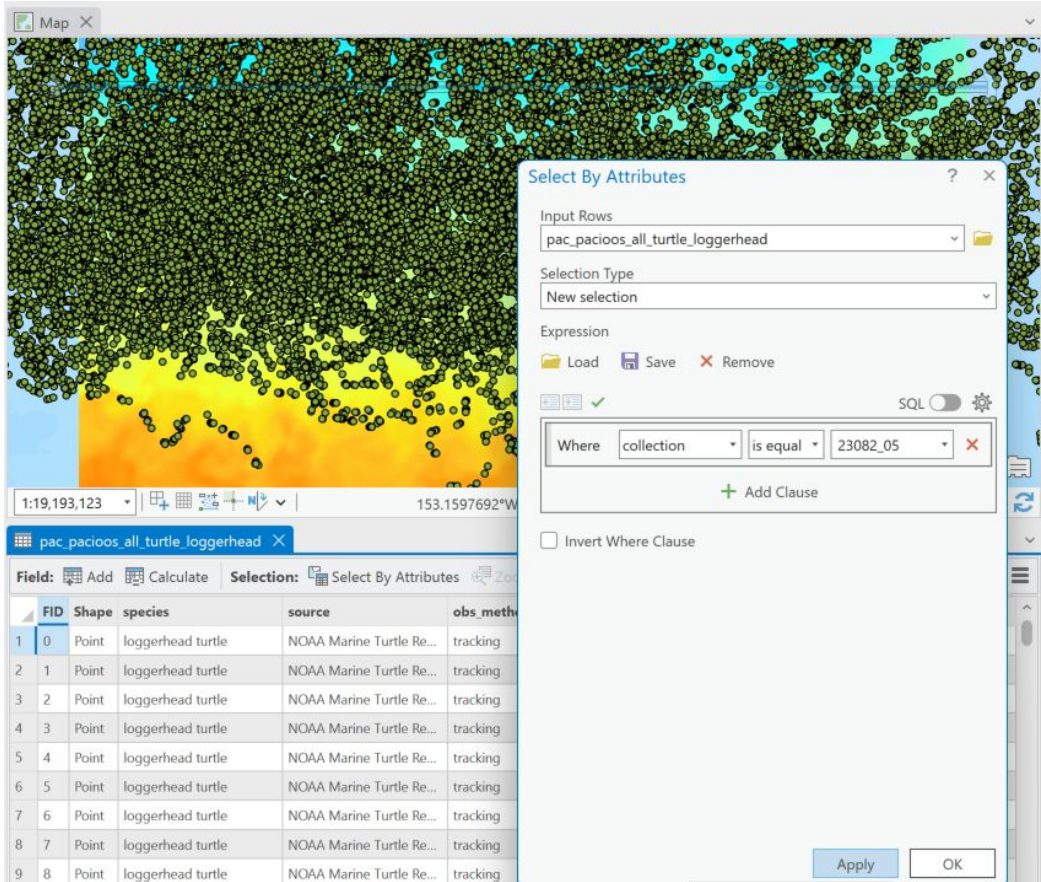
Tutorial: Data Processing

1. Convert SST from Kelvin to Celsius
   a. In the top ribbon menu bar, click “Analysis” and then click “Raster Functions”
   b. In the Raster Functions menu under Conversion, click on “Unit Conversion”
   c. Select the SST layer as the Raster, Kelvin as the From Unit, Celsius as the To Unit, then click “Create new layer”
   d. Rename the new layer in the Contents panel “OceanWatch SST (Celsius)
   e. Turn off the original “goes-poes” SST .nc file



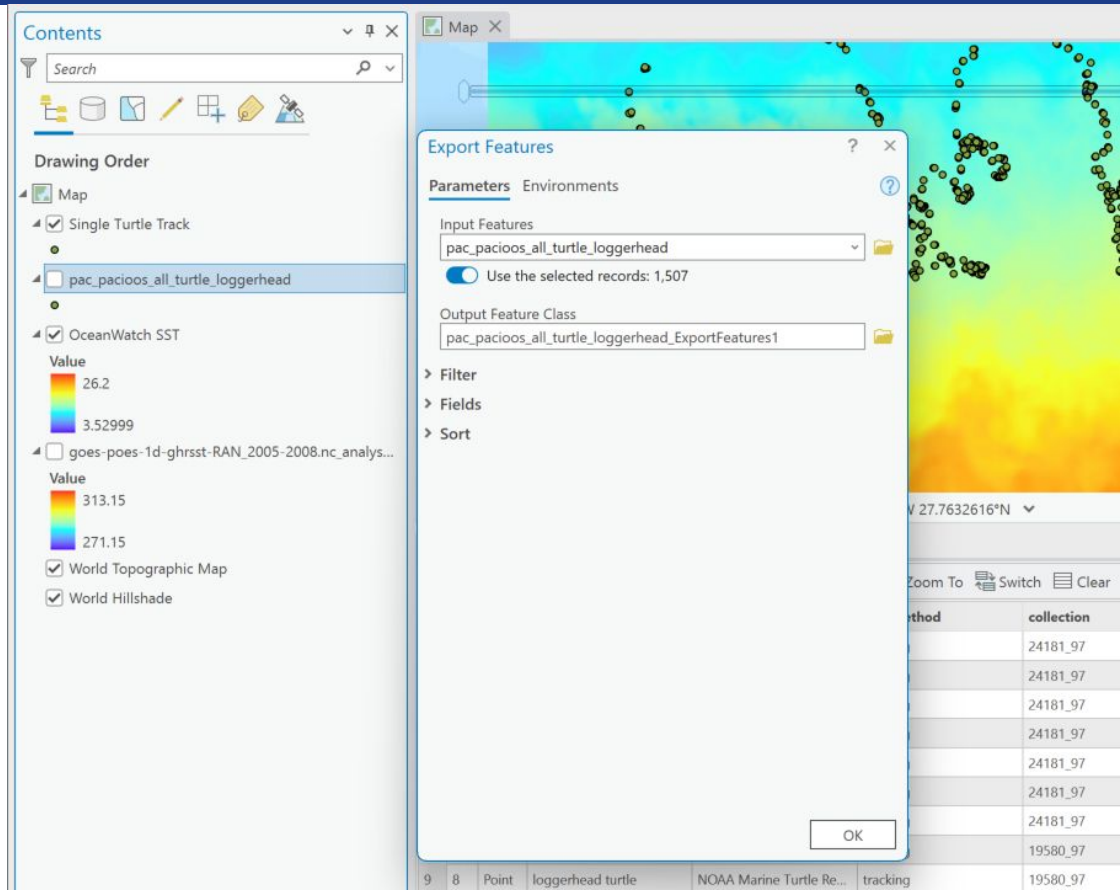
Tutorial: Data Processing

1. Select a single loggerhead turtle of interest within SST dataset
   a. Right-click on the loggerhead data layer and click “Attribute Table” to view data
   b. Click “Select By Attributes” at the top of the table
   c. Under Expression, from the Select a field dropdown menu, choose “collection”, leave the default expression “is equal to”, then type “23082_05”, and click “OK”



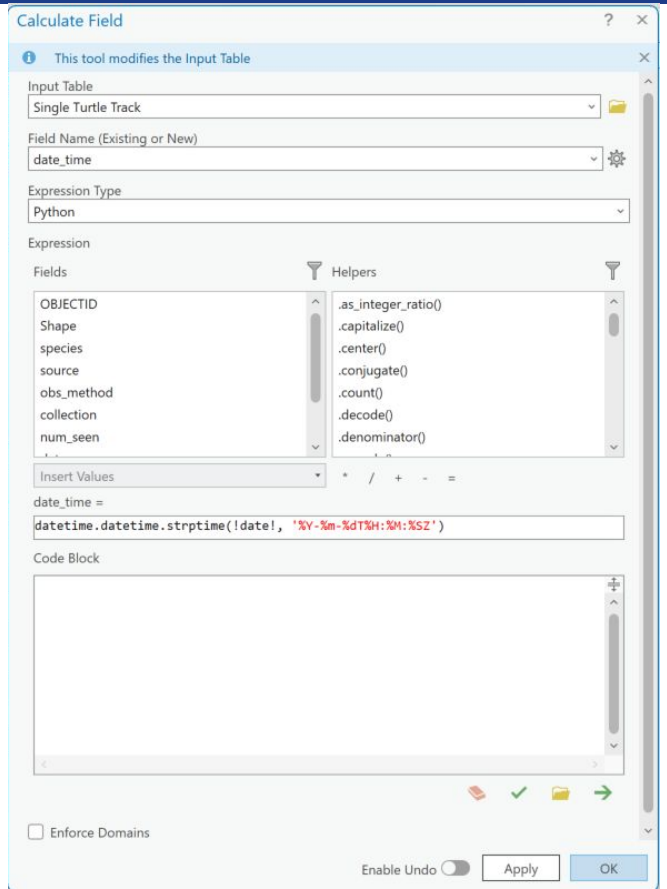
Tutorial: Data Processing

1. Select a single loggerhead turtle of interest within SST dataset (con't.)
   d. Right-click on the loggerhead data layer in the Contents panel, navigate to Data in the menu, and click "Export Features"
   e. Leave the auto-populated defaults and click "OK"
   f. Rename the new layer in the Contents panel "Single Turtle Track"
   g. Turn off the original "all_turtle_loggerhead" .shp layer and close the tables



Tutorial: Data Processing

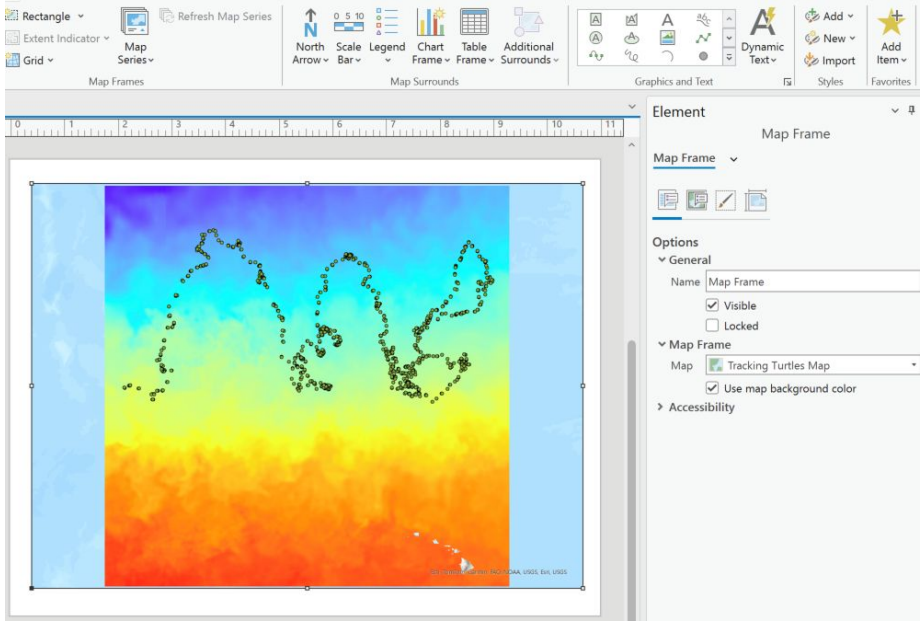
1. Format the single loggerhead turtle date and time in a new column field
   a. Right-click on the Single Turtle Track layer and click “Attribute Table” to view data
   b. Click “Add Field” at the top of the table
   c. Enter “date_time” in the Field Name and Alias boxes, then change the Data Type to “Date” and then right-click the row and click “Save”
   d. In the Attribute Table, right-click on the new field and select “Calculate Field”
   e. In the box under “date_time = ”, use the built in function “datetime.datetime.strptime(!date!, '%Y-%m-%dT%H:%M:%SZ')”
   f. Click “OK” and the new field should be populated with a formatted date



NOAA OceanWatch & PacIOOS

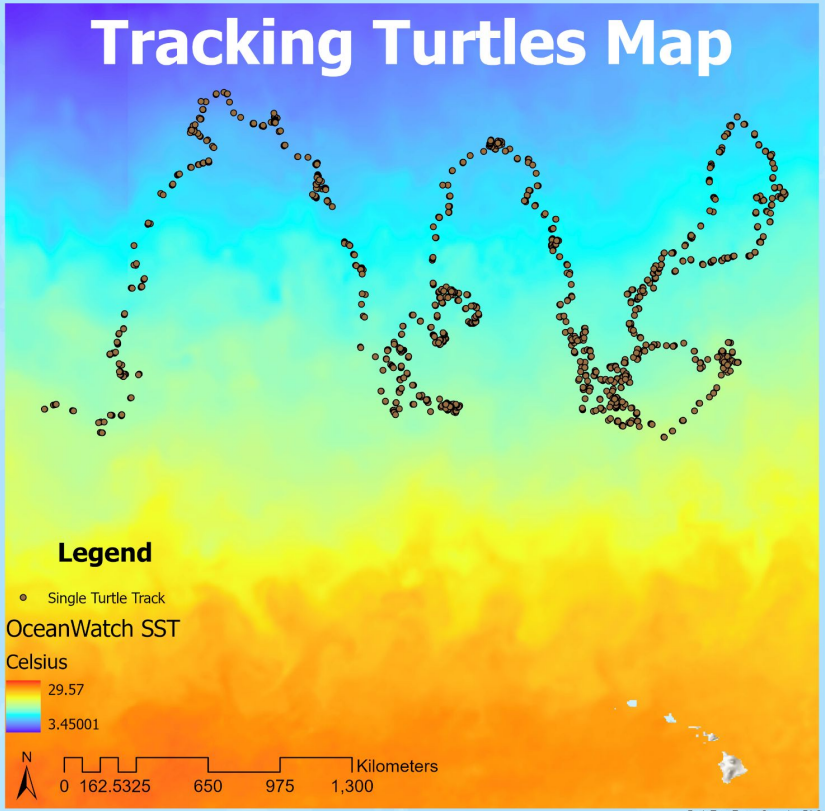
Tutorial: Overview Map Output

1. Under Insert, click “New Layout” in the top ribbon menu bar and select the Landscape Letter 8.5” x 11”
2. Then from the drop-down menu under Map Frame, click on the Tracking Turtles Map
3. Add cartographic elements to visually tailor the map
    a. Move the map and stretch the map extent in the layout window
    b. Insert a title, north arrow, scale bar, legend, and other desired features
    c. Change the layer names, color symbology, and point symbol if desired
4. Under Share, click “Export Layout” in the top ribbon menu bar and export map image



NOAA OceanWatch & PacIOOS

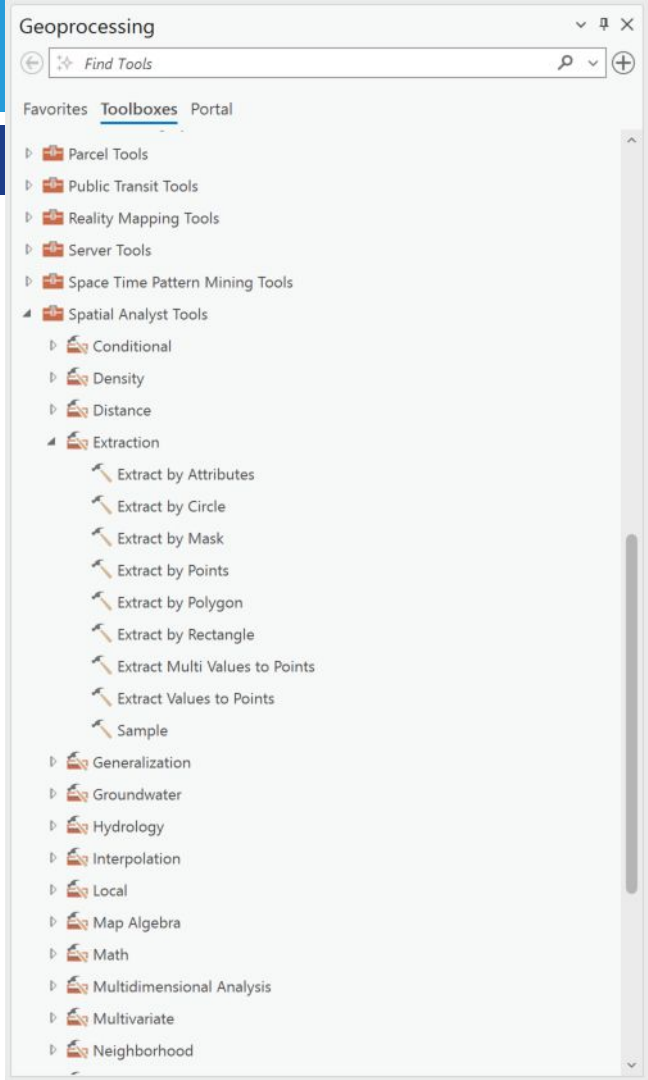
Tutorial: Overview Map Output



NOAA OceanWatch & PacIOOS

Tutorial: Data Processing

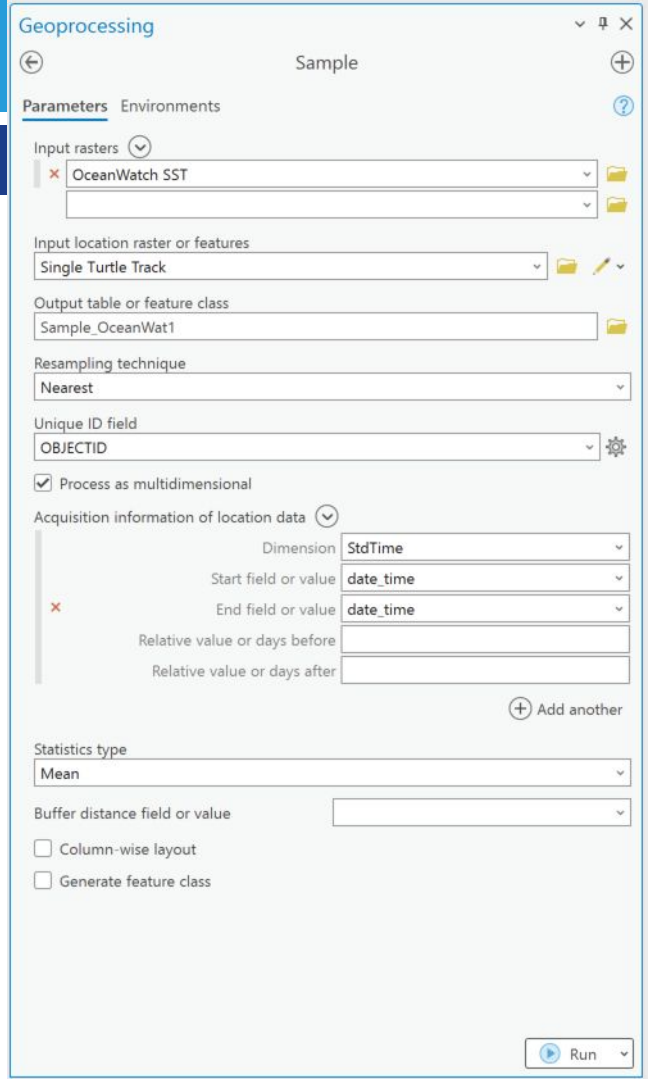
1. Spatial-temporal sampling of single turtle track and SST in Celsius
   a. Under Analysis, click “Tools” in the top ribbon menu bar to open the Geoprocessing pane, then click on “Toolboxes” in that window
   b. Scroll down to Spatial Analyst Tools, then click “Extraction”, and then click “Sample”



NOAA OceanWatch & PacIOOS

Tutorial: Data Processing

1. Spatial-temporal sampling of single turtle track and SST in Celsius (con't.)
   c. Use the SST layer as your Input rasters and the single turtle track layer as your Input location raster or features
   d. Check the "Process as multidimensional" box, then set the Dimension to StdTime from your SST layer, and both the Start and End field or value as your date_time column from the single turtle track layer
   e. Click "Run"



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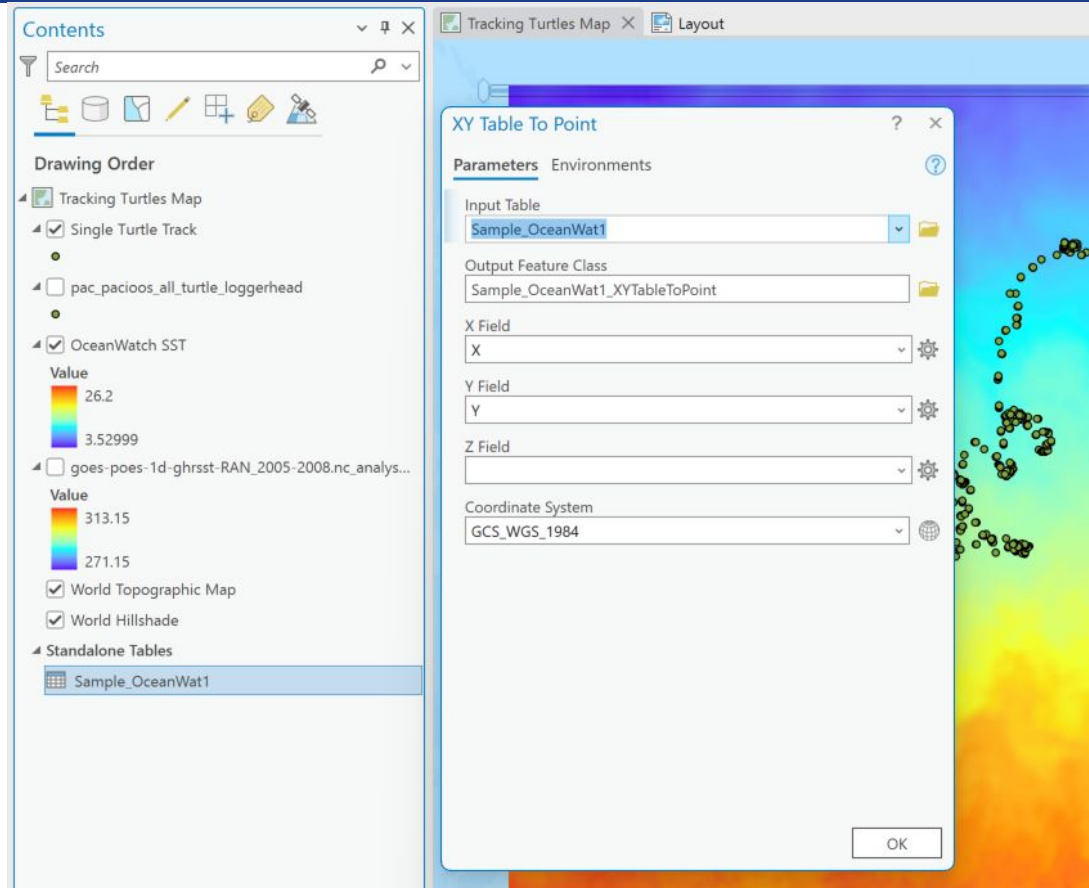
Tutorial: Data Processing

1. Add spatial-temporal sampling points to map
   a. Right-click the sampling output under Standalone Tables in the Content pane
   b. Navigate to Create Points From Table, click “XY Table To Point” leave the default settings, then click “OK”
   c. Rename the newly added points layer to “Turtle Track by SST”



Tutorial: Data Processing

1. Add spatial-temporal sampling points to map (con't.)
   d. Making sure the layer or point is highlighted in the Contents panel, click on the Feature Layer tab in the top ribbon menu bar, then click "Symbology"
   e. Click on the green box icon labeled Vary symbology by attribute
   f. Under Color, select analysed_sst as the Field and choose your Color scheme and check the "Show legend" box
   g. Change the point symbol shape and size if desired under Primary symbology
   h. Turn off the original single turtle track layer and the SST layer
   i. Under Map in the top ribbon bar, use the dropdown menu to change the Basemap and select "National Geographic Style Map"

NOAA OceanWatch & PacIOOS

Tutorial: Parameter Map Output

1. Under Insert, click “New Layout” in the top ribbon menu bar and select the Landscape Letter 8.5” x 11”
2. Then from the drop-down menu under Map Frame, click on the Tracking Turtles Map
3. Visually tailor the map
   a. Move the map and stretch the map extent in the layout window
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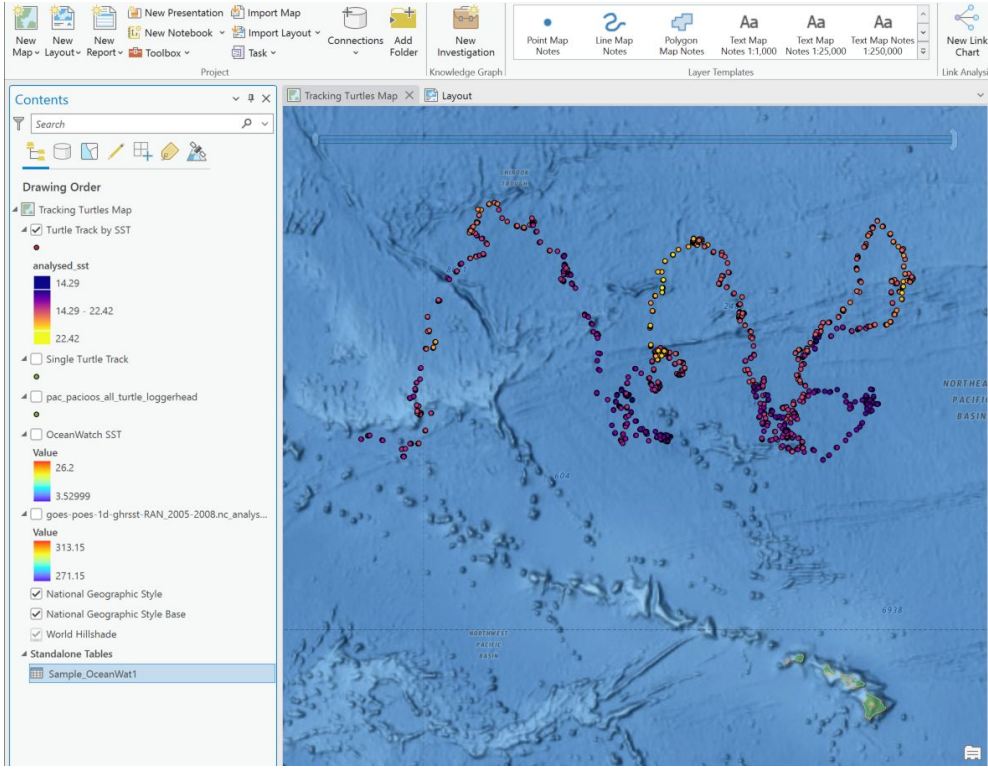
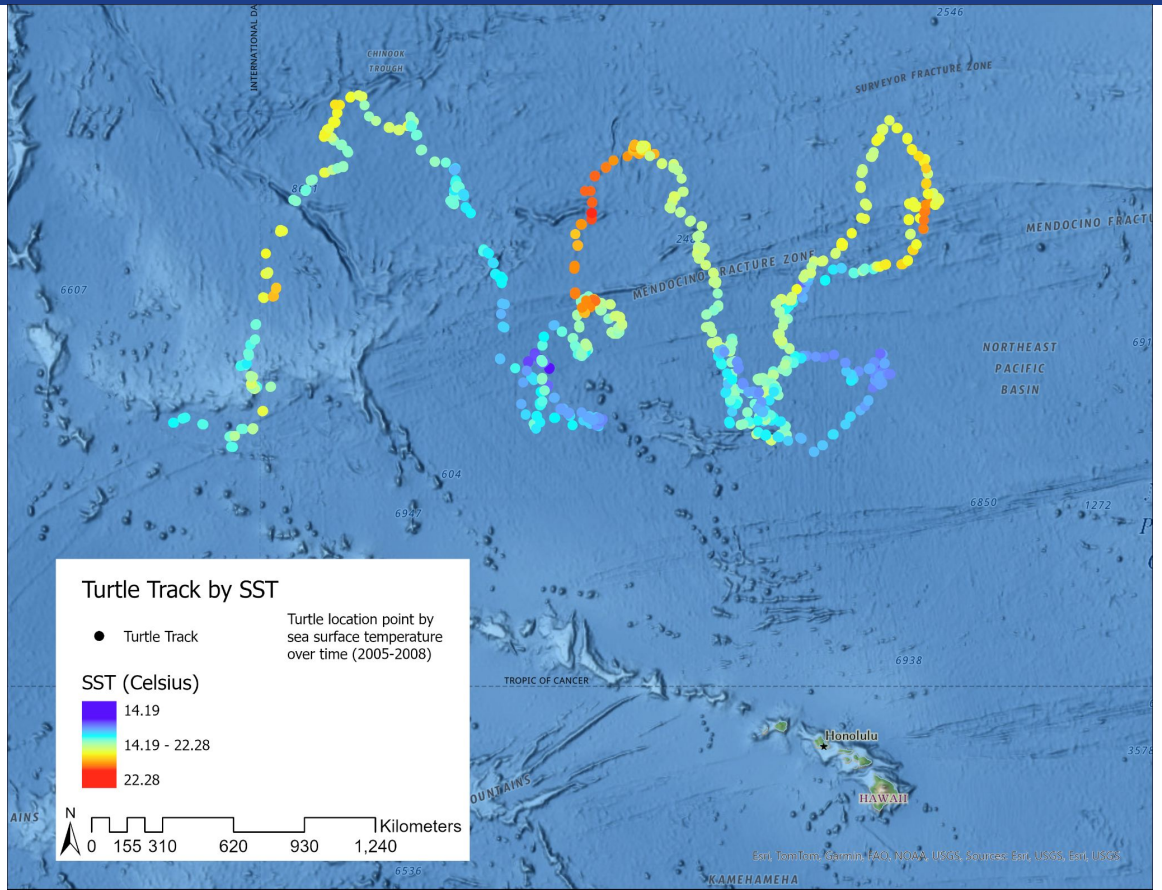


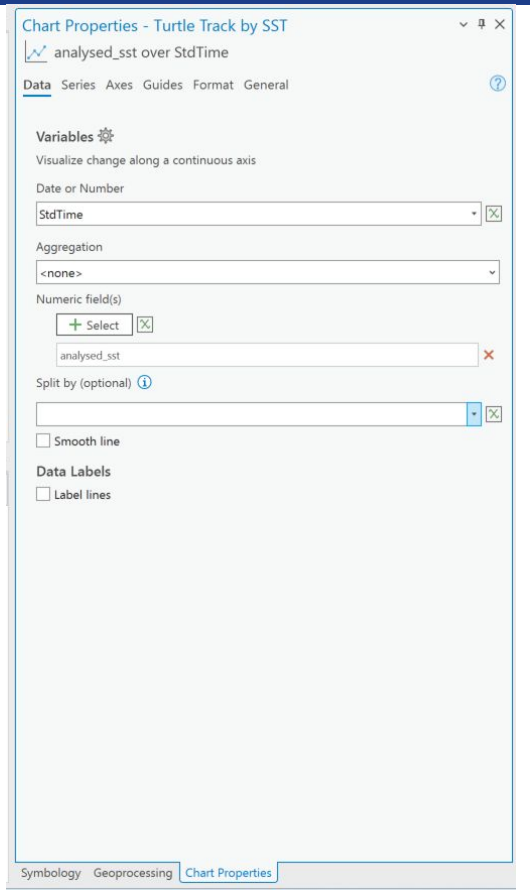
NOAA OceanWatch & PacIOOS

Tutorial: Parameter Map Output

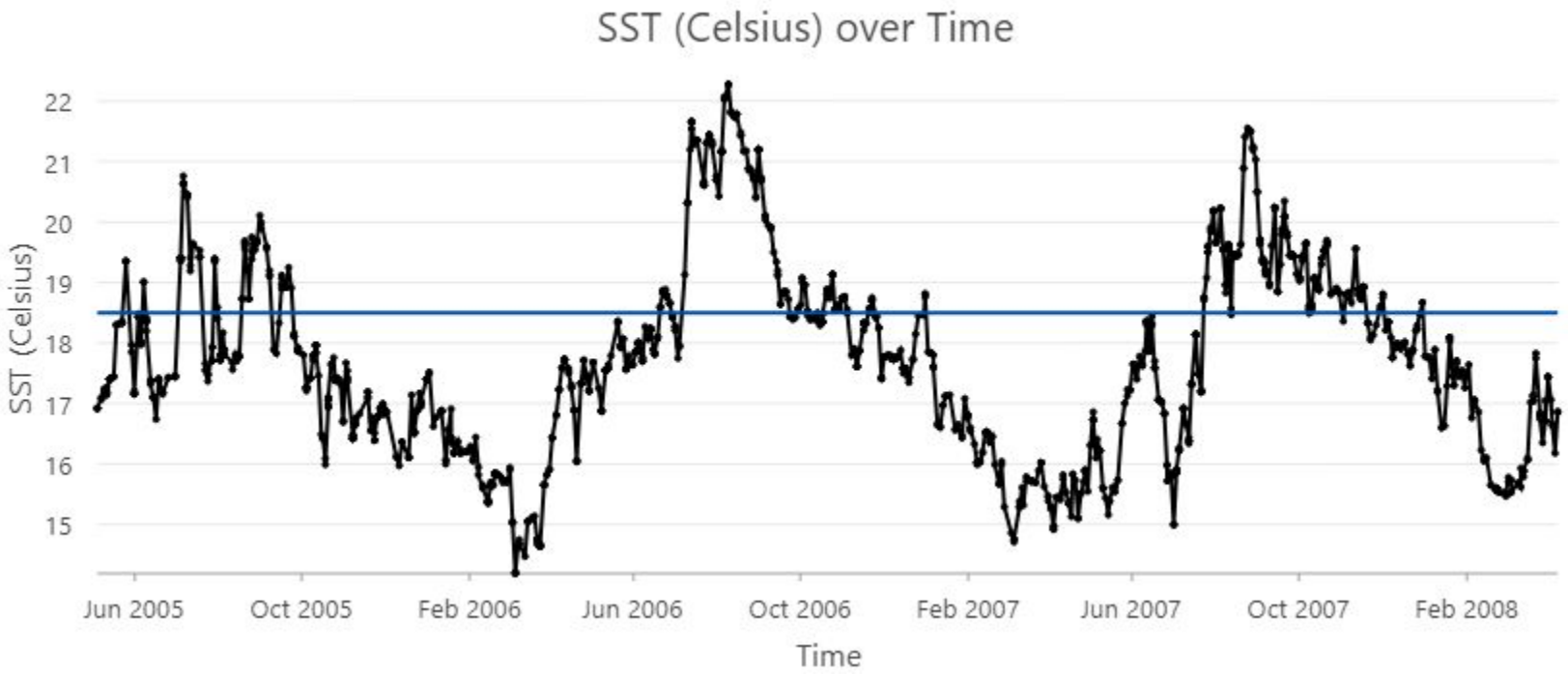


Tutorial: Parameter Graph Output

1. Right-click on the turtle track by SST layer, click “Create Chart”, then select “Line Chart”
2. Select “StdTime” for the Date or Number variable
3. Set Aggregation to “<none>”, then under Numeric field(s) click “+ Select” and choose “SST (Celsius)”
4. Visually tailor the graph by adding a horizontal guide under Guides at 18.5°C to indicate the TurtleWatch Zone and changing any of the other General settings desired
5. Click the “Export” in the top left corner of the graph and “Export As Graphic”
6. Name the file and select the desired folder to save the chart, then be sure to change the file type to Portable Network Graphic (*.png) and click “Save”



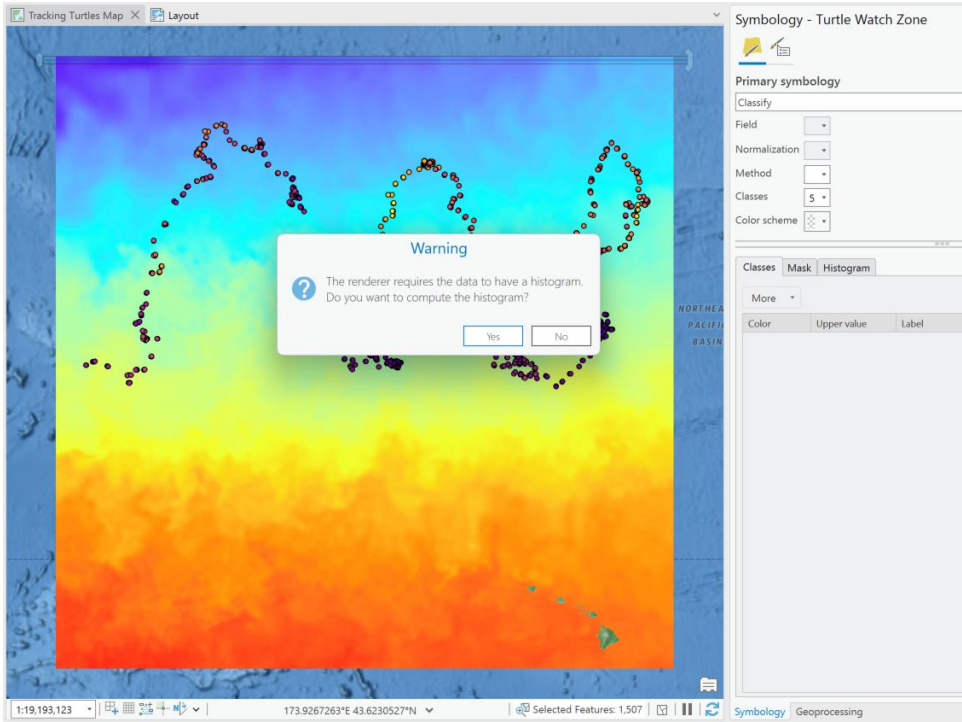
Tutorial: Parameter Graph Output



NOAA OceanWatch & PacIOOS

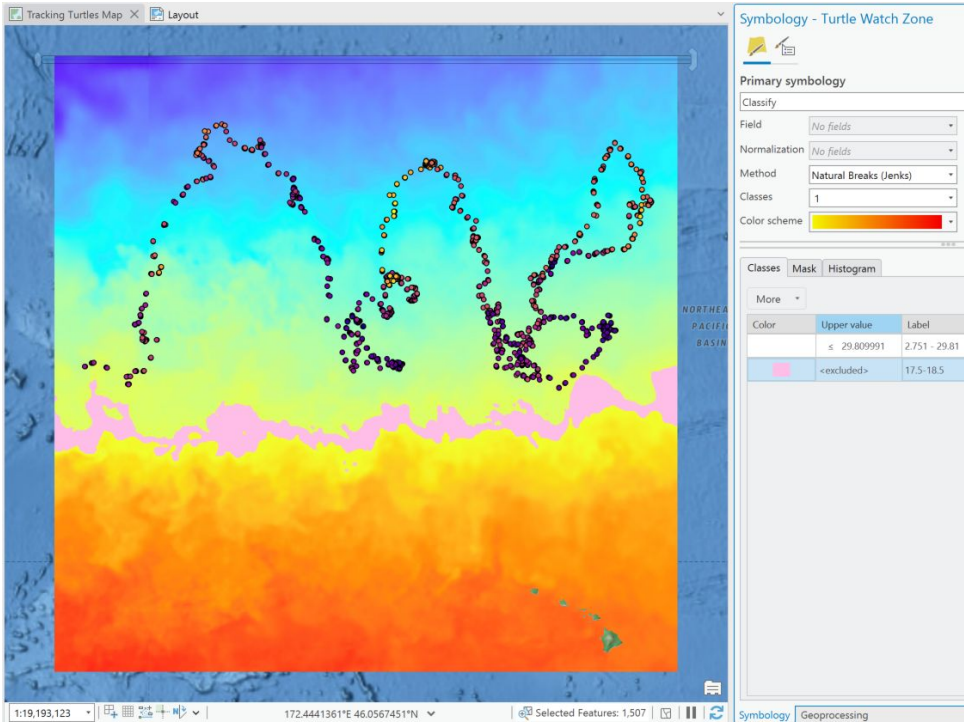
Tutorial: Data Processing

1. Create a layer for the TurtleWatch Zone
   a. Right-click on the OceanWatch SST layer, click “Copy”
   b. Right-click on the Map project, click “Paste”
   c. Rename the new layer “TurtleWatch Zone”
   d. In the top ribbon menu bar, click on “Raster Layer” and then “Symbology”
   e. Change the Primary symbology to Classify and click “Yes” to compute the histogram



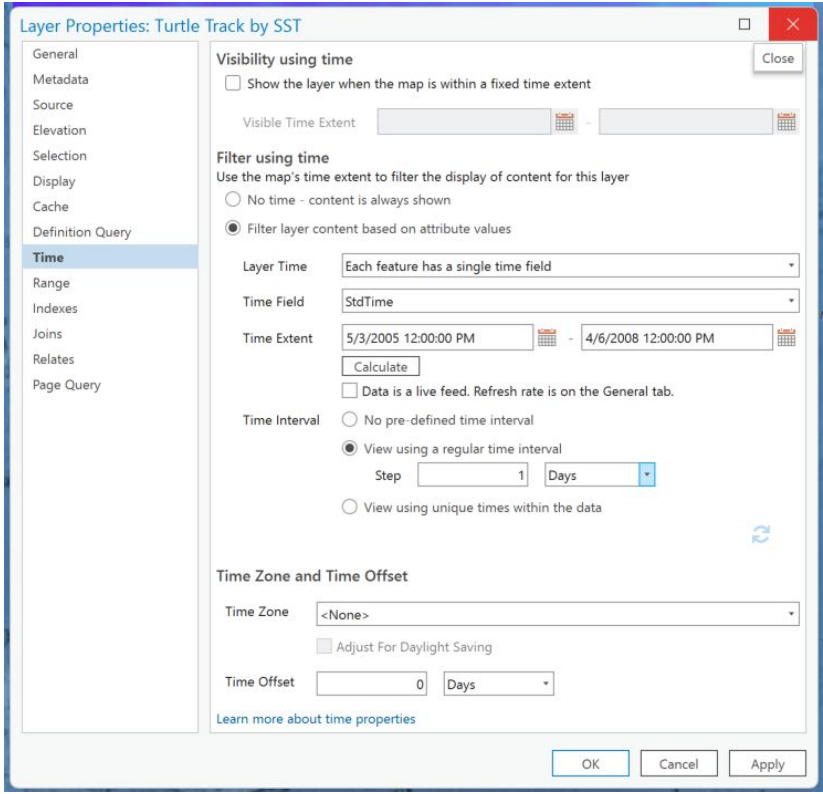
Tutorial: Data Processing

1. Create a layer for the TurtleWatch Zone (con't.)
   f. Click on "Advanced symbology options" at the top and click "Data exclusion"
   g. Set the exclusion range to 17.5-18.5
   h. Back under Primary symbology, change the number of Classes to 1
   i. Under the Classes tab below, click "More" and then "Show excluded values"
   j. Click the square for the <excluded> values and select a pink or purple color
   k. Change the Label from <excluded> to "17.5 - 18.5"
   l. Click the square for the single class and set it to No color



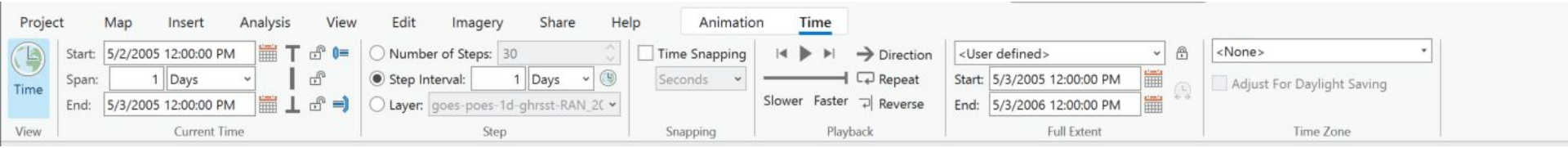
Tutorial: Data Processing

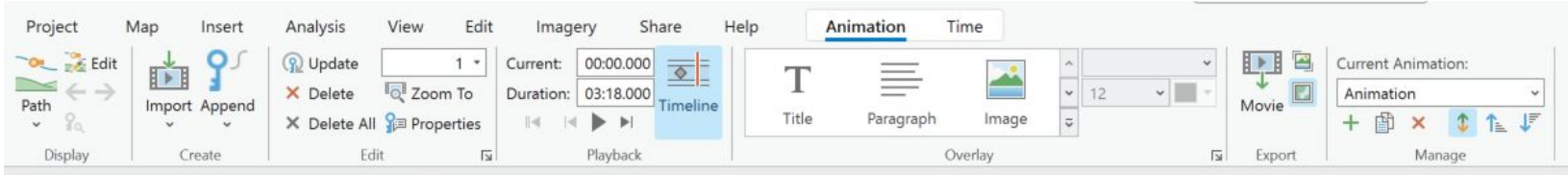
1. Enable time on the single loggerhead turtle dataset (05/04/2005 - 04/07/2008)
   a. Double-click the loggerhead data layer to open the Layer Properties box
   b. Click on “Time” in the right-hand menu
   c. Select “Filter layer content based on attribute values”
   d. Leave the default of “Each feature has a single time field” in the Layer Time box, then select your new “date_time” column for the Time Field. This should then auto-populate the Time Extent field.
   e. Change the Time Interval to “View using a regular time interval” and set the Step to 1 Days, then click “OK”



NOAA OceanWatch & PacIOOS

Tutorial: Video Output





1. Under Time in the top ribbon menu bar, find the Full Extent box and select <User Defined> layer from the drop-down menu and change the set the values to “5/3/2005 12:00:00 PM” and “5/3/2006 12:00:00 PM”
2. Change the Playback speed to Faster by sliding the bar all the way to the right, then press play to view the animation play over time
3. Click View in the top ribbon menu bar, then click “Add” in the Animation menu box; This will add a new Animation tab in the top ribbon menu bar
4. Click the Import menu in the Create menu box, then select “Time Slider Steps”
5. In the Playback box, change the Duration to “03:18.000” and hit enter to change the time between frames
6. Press the play arrow in the Playback box or Animation Timeline to play the video

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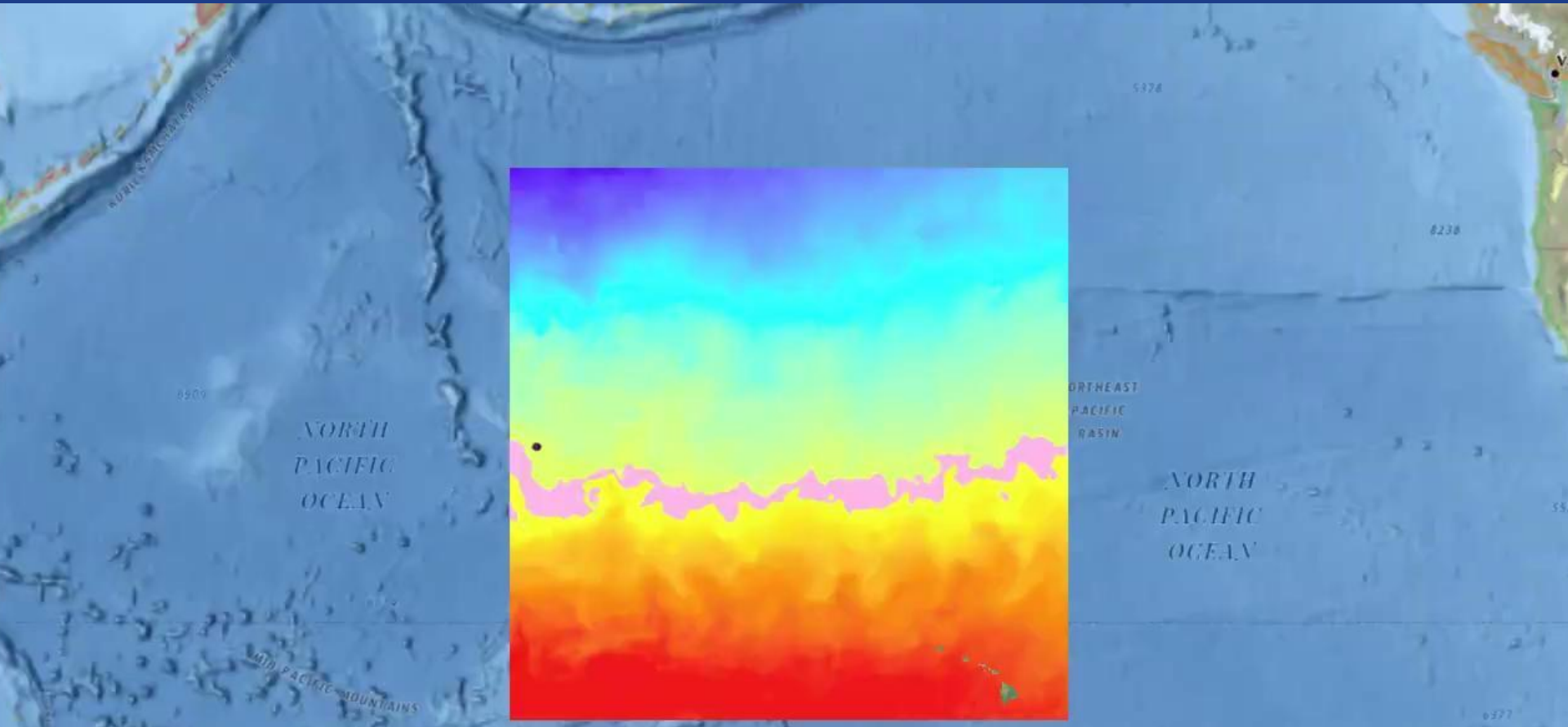
Tutorial: Video Output



Mahalo!

Daisy (Hui) Shi, OceanWatch Researcher
Lauren R. Kaiser, PacIOOS Data Management Specialist

https://oceanwatch.pifsc.noaa.gov/index.html

https://pacioos.org

NOAA OceanWatch & PacIOOS

Tutorial: Tracking Turtles