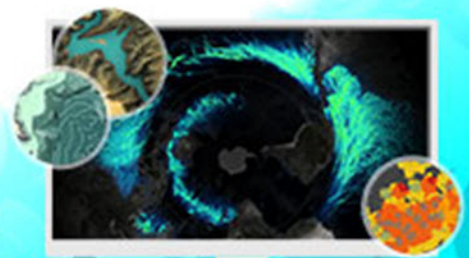


# Exercise

## Create a 2D Animation through Time

Section 6 Exercise 3

05/2020



# Create a 2D Animation through Time

### Instructions

Use this guide and ArcGIS Pro to reproduce the results of the exercise on your own.

*Note: The version of ArcGIS Pro that you are using for this course may produce slightly different results from the screen shots that you see in the course materials.*

### Time to complete

Approximately 50-60 minutes

### Software requirements

ArcGIS Pro 2.5

ArcGIS Pro Standard license (or higher)

*Note: The MOOC provides a separate ArcGIS account (user name and password) that you will need to use to license ArcGIS Pro and access other software applications used throughout the MOOC exercises. This account (user name ending with \_cart) provides the appropriate ArcGIS Online role, ArcGIS Pro license, ArcGIS Pro extensions, and credits. We strongly recommend that you use the provided course ArcGIS account to ensure that you have the appropriate licensing to complete the exercises. Exercises may require credits. Using the provided course ArcGIS account ensures that you do not consume your organization's credits. Esri is not responsible for any credits consumed if you use a different account. Moreover, Esri will not provide technical support to students who use a different account.*

## Introduction

In the 18th and 19th centuries, thousands of ships from seafaring nations explored the globe for commerce, war, and colonization. As they traveled, captains would capture their ship's position and other data in their logbooks. Hundreds of years later, an organization called CLIWOC (Climatological Database for the World's Oceans) would convert surviving information from British, Dutch, French, and Spanish ships' logbooks into a GIS database.

**Note:** Learn more about the data sources at <http://pendientedemigracion.ucm.es/info/cliwoc> (<https://bit.ly/2qI80zC>).

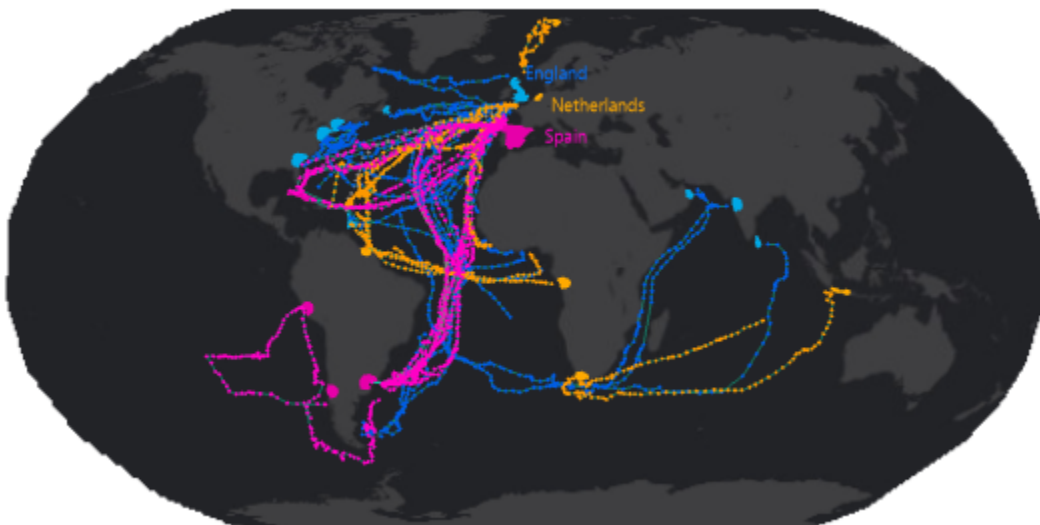
For this exercise, you will be visualizing one specific year of content, 1770, as an animated video that highlights the frequency and routes used by the ships of the day.

You will start with a simple 2D map showing ships and important colonial ports, use the date information for each ship to animate the content through time, and then share it as a video suitable for YouTube, Instagram, or Twitter.

*Note: If you would like a sneak peek of the finished video for this scenario, you can find the Animations\_Complete\_WorldShipping1770.mp4 video in the VideoResults folder on your computer where you extracted the exercise data files.*

### Step 1: Open a map

- a If necessary, start ArcGIS Pro and open the Animations\_<your first and last name>.aprx project file that you saved in the previous exercise.
- b At the top of the map window, click the World Shipping 1770 tab to open the map.
- c If it is still open, close the Animation Timeline pane.



The World Shipping 1770 map has the following layers pre-authored for you:

- **Country Labels:** This layer has point features with labels for the three seafaring countries that you are focusing on: England, the Netherlands, and Spain. Three label classes have been applied so each country's name can be shown in a distinct color. This not only indicates where "home" is for each ship in the ocean, but it also provides an in-map color palette for other layers to use without the need for a viewer to reference a separate legend.
- **Ship Positions:** This layer has point symbols showing the (usually) daily ship locations calculated from captains' logs. The colors of the dots match the Country Labels.
- **Colonial Ports:** This layer has polygonal areas that show the home countries and the important colonial ports of the time (indicated as an area of influence of a few hundred miles). The colors of the polygons match those of the Country Labels.
- **Ship Paths:** This layer has simple, straight-line-connected paths for each ship's journey across the ocean. The spacing between vertices indicates the travel speed of the ship. The wider the gap, the faster the speed.

A couple other design decisions for this map include the following choices:

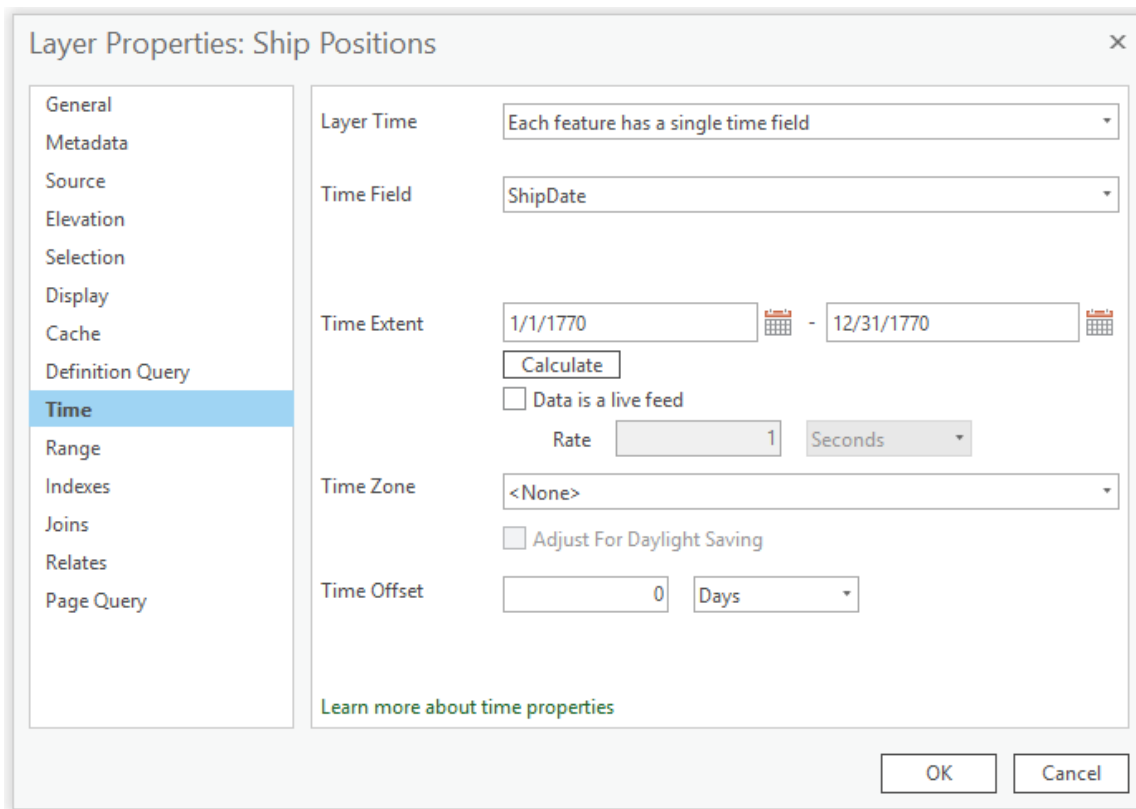
- The map is in the Robinson projection, a coordinate system specifically designed to show the whole world as a flat image, though it is neither equal area nor conformal. Most of the distortion is near the poles, which is not a concern for 18th-century shipping.
- It uses a muted basemap with no displayed text, allowing the colors of the shipping content to take center stage.

What is missing is the temporal component. Temporal data is data that represents a state in time.

## Step 2: Add time properties to a layer

Each shipping point has a property value that declares which date the position was logged. It does not include the time of capture, though, so you must assume that it was captured around the same time of day. You can use this date value to add time properties to the shipping points layer.

- a In the Contents pane, right-click the Ship Positions layer and choose Properties.
- b In the Layer Properties dialog box, click the Time tab.
- c For Layer Time, choose Each Feature Has A Single Time Field.
- d For Time Field, choose ShipDate.



The ShipDate field in the layer attribute table contains the date that the ship's position was captured in the captain's log. All the ships sailed in 1770; note how the Time Extent field in the Layer Properties dialog box is now populated with values from 1/1/1770 to 12/31/1770.

- e Click OK to close the Layer Properties dialog box.

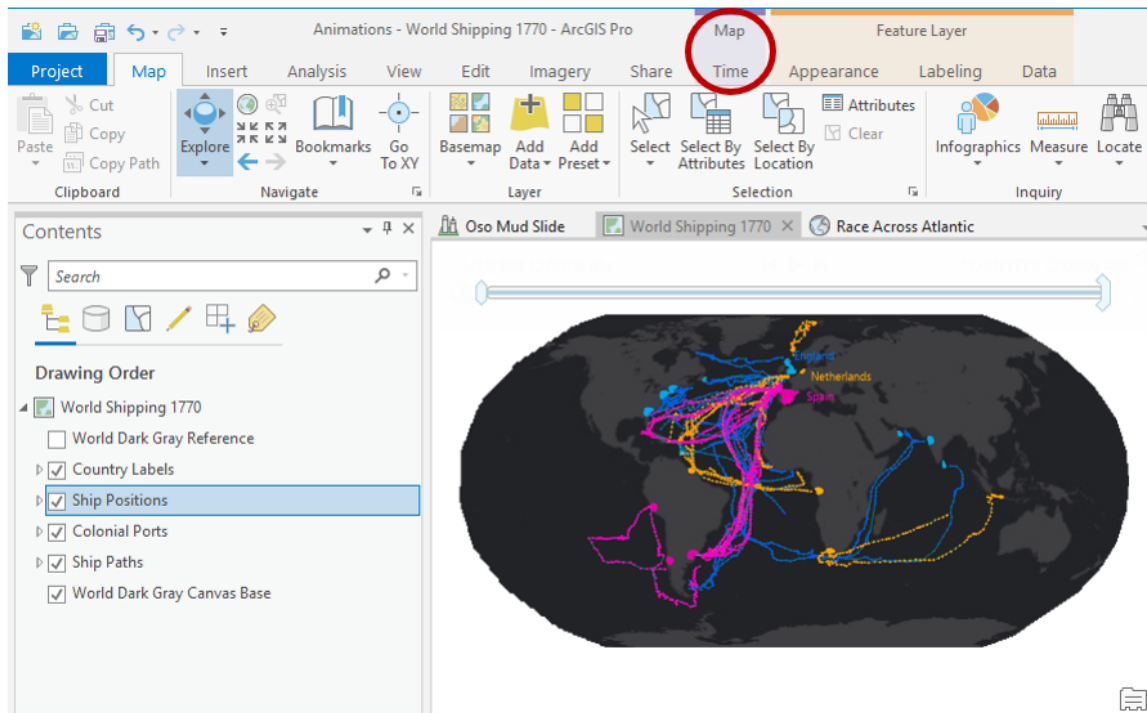
A time slider will appear at the top of the map, providing controls that allow you to visualize temporal data.

- f Near the top of the map window, point to the time slider.



To use the time slider, you must enable time on one or more layers in the map. The red mark over the clock on the left side indicates that time has not been enabled for the map yet.


Now that the map contains temporal layers, a Time contextual tab has been added to the ribbon.




Note: Refer to ArcGIS Pro Help to learn more about using the [time slider](https://bit.ly/2GPFbfz) (<https://bit.ly/2GPFbfz>).

### Step 3: Set the map time

Next, you will enable time in the map so you can explore the data through time using the time slider.

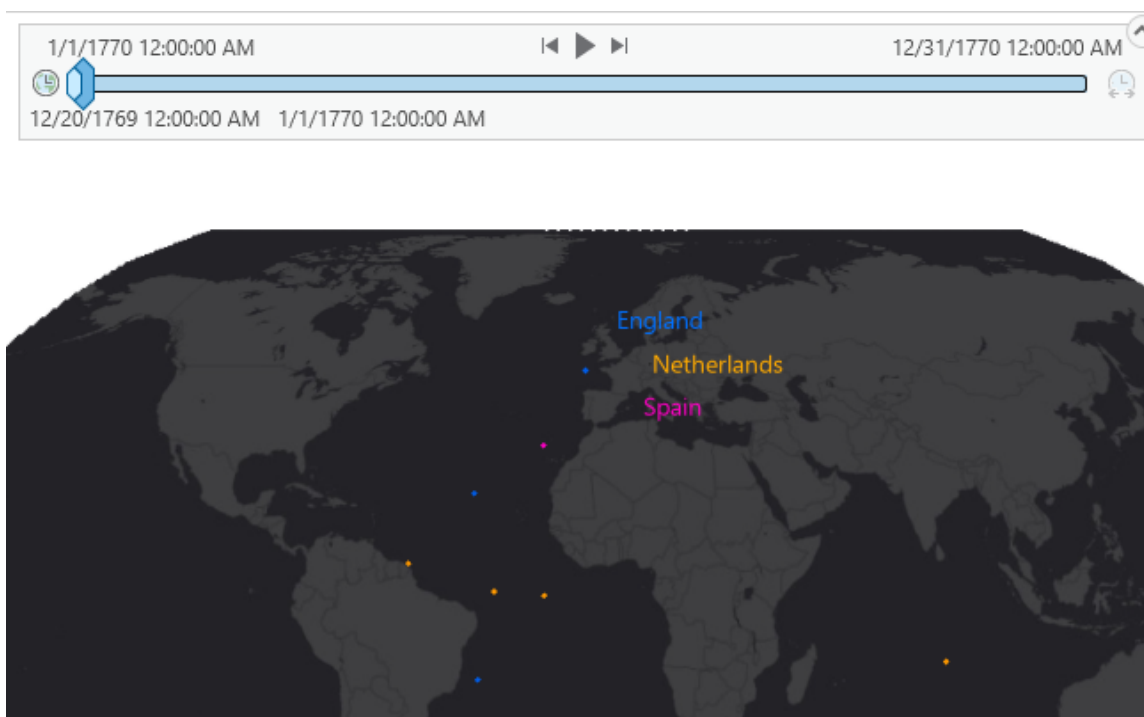
- In the Contents pane, turn off the Colonial Ports and Ship Paths layers.
- On the time slider, on the left side, click the Time Disabled button  to enable time on the map.



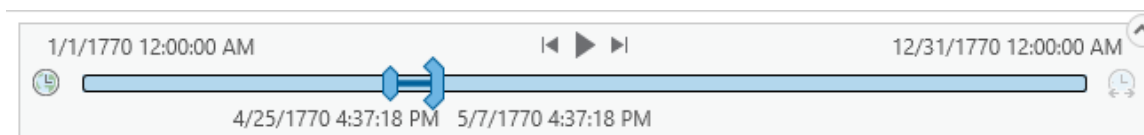
Note: The Time Disabled button  acts as a toggle for enabling and disabling time.



Most of the points on the map will disappear because they are now being filtered out by the time slider. Only those points that represent ship positions on January 1, 1770, are displayed.

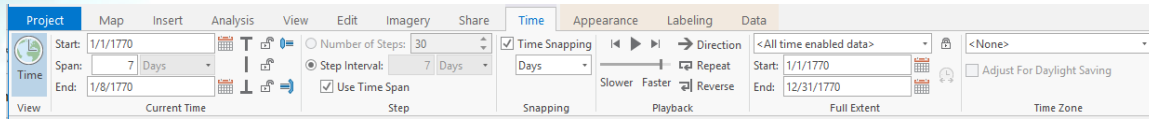


You can interactively drag the slider to see a different time span.




*Note: You can drag the current time duration by dragging the right control, or increase or decrease the time extent by dragging the left control.*

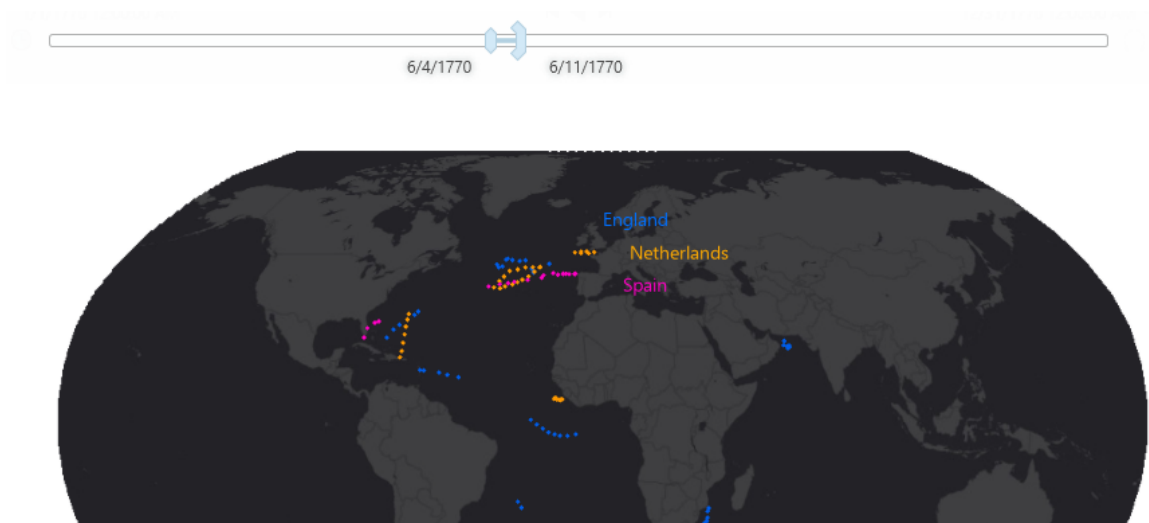
- c On the ribbon, click the Time tab to view all the configuration properties for map time.
- d In the Snapping group, check the Time Snapping box and set the units to Days, if necessary.
- e In the Current Time group, set Start to **1/1/1770**.
- f Set the Span to **7** days.



You will see that the End field is automatically filled in using the information that you provided for the two other fields.

- g** In the Playback group, click the Step Forward button  to step through time in a series of weeks.

You will see the time slider jump ahead as you step forward.

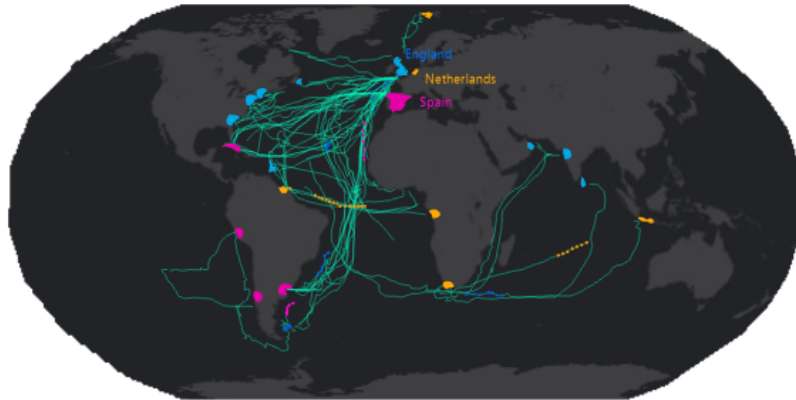


- h** In the Current Time group, set the Start field back to **1/1/1770** and the End field to **1/8/1770**.
- i** In the Contents pane, turn on the Colonial Ports and Ship Paths layers.





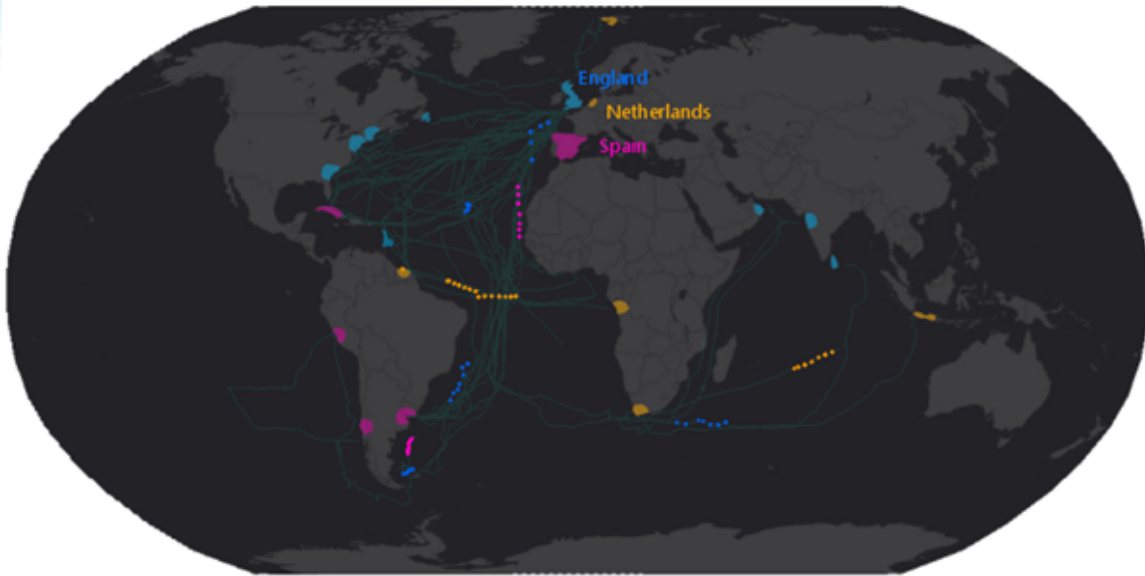
1/7/1770



### Step 4: Reduce the visual impact of the Colonial Ports and Ship Paths layers

Because you want to highlight the frequency and routes used by the ships of the day, some adjustments are needed to reduce the visual impact of the map. The Colonial Ports and Ship Paths layers are too bright; they are distracting from the Ship Positions layer, which is the purpose of the video. You can reduce their impact by making them partially transparent.

- a In the Contents pane, select the Colonial Ports layer.
- b From the Appearance tab, in the Effects group, change the transparency setting to 50%.
- c In the Contents pane, select the Ship Paths layer and change its transparency setting to 90%.



The appearance of the map changes, and the Ship Positions points now appear more prominently. The paths and ports are less prominent.

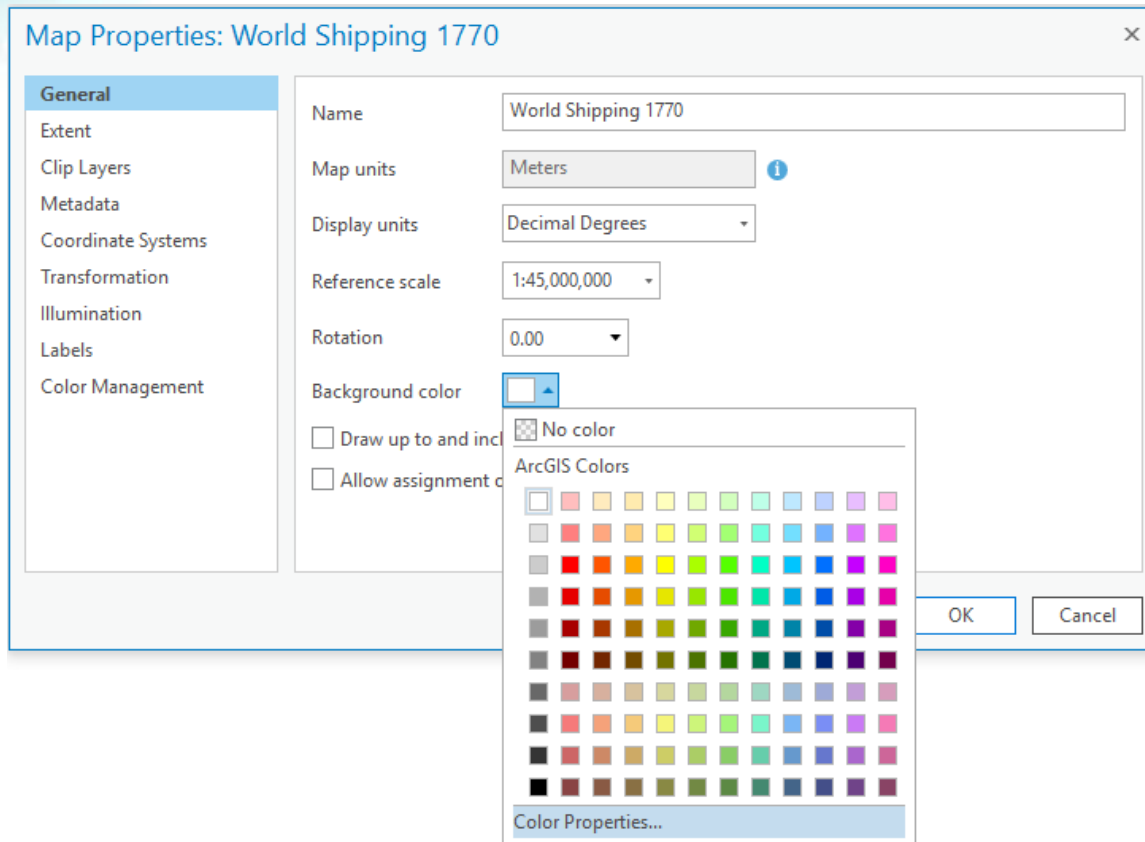
- d Save your project.

Next, you will define an animation for this map that will play through the year of data.

### Step 5: Change the background color of the map

In this scenario, you will create a video for Twitter. First, you will change the background color of the map so that the dark gray fills up the entire video.

- a In the Contents pane, right-click the World Shipping 1770 map and choose Properties.
- b In the Map Properties dialog box, from the General tab, click the Background Color down arrow.
- c In the color palette window, click Color Properties.



- d In the Color Editor window, set the Red, Green, and Blue values all to **35**.




- e Click OK to close the Color Editor window, and then click OK to close the Map Properties dialog box.

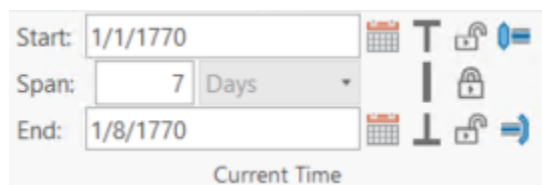
Next, you will add an animation for the map.

## Step 6: Add animation to the map using temporal keyframes

Similarly to how you added animation in the previous scenario to the Oso Mud Slide scene, you will create keyframes. For this scenario, you will create temporal keyframes to show changes in ship positions over the course of a single year.

You will start by defining the change in temporal extent for each time step, which will become the first keyframe in the animation.

- a From the Time tab, in the Current Time group, perform the following steps:
  - Set Span to **7** Days, if necessary, and then next to the Span field, click the Span Unlocked button  to maintain the seven-day duration.
  - Verify that the Start field is set to **1/1/1770** and press Enter.

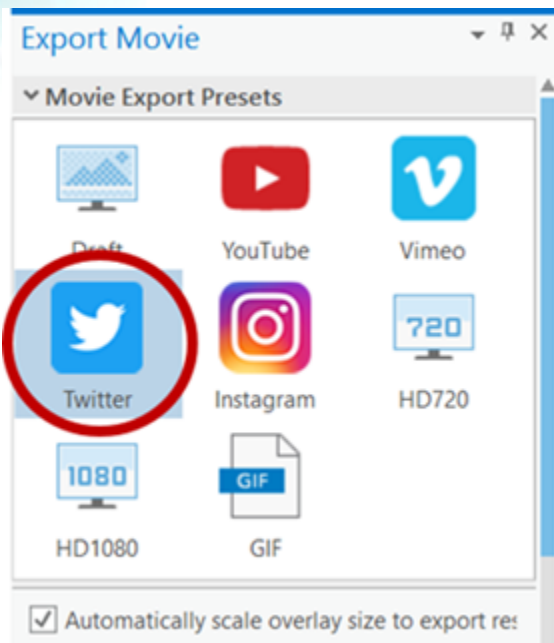


- b From the View tab, in the Animation group, click Add to open the Animation Timeline pane.
- c In the Animation Timeline pane, click Create First Keyframe.

*Note: Do not worry about the current map extent for now; you will update it shortly.*

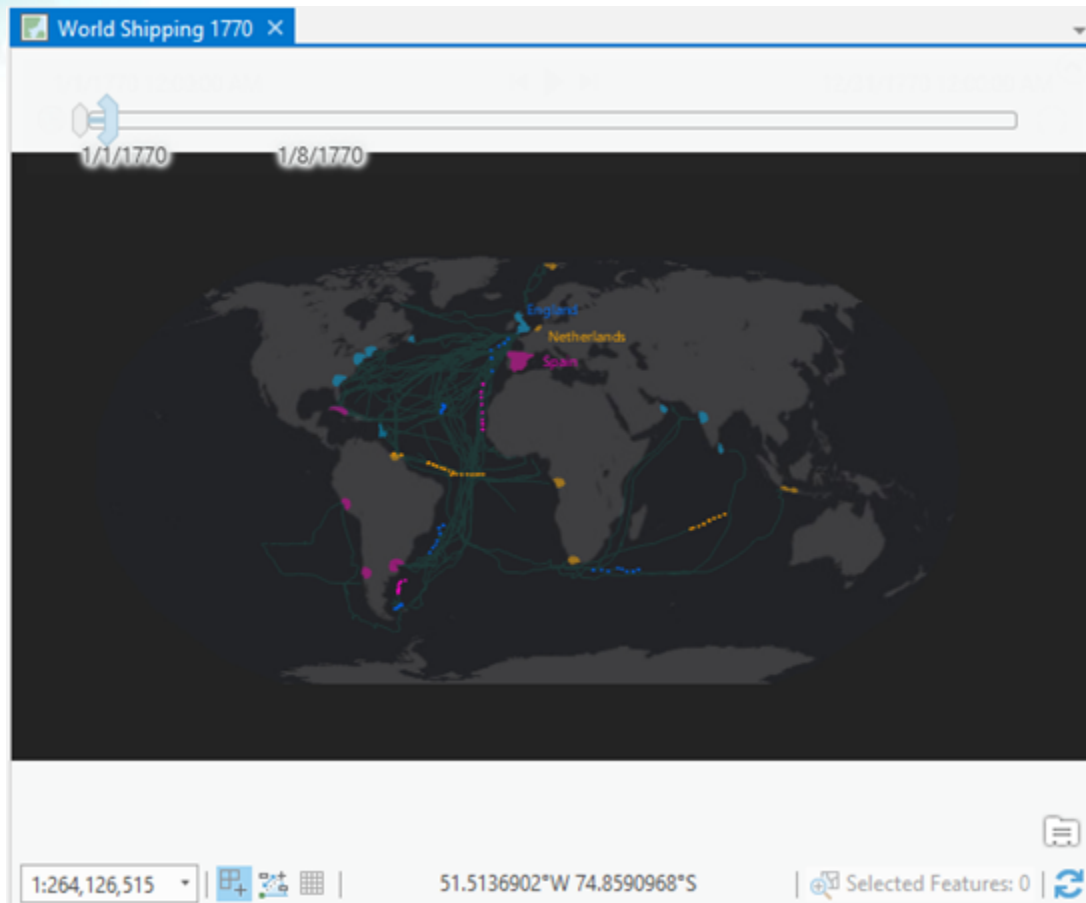
The view has been clipped to match the current export aspect ratio. You will check to see that it is set correctly for Twitter.

- d From the Animation tab, in the Export group, click Movie to open the Export Movie pane.
- e In the Export Movie pane, in the Movie Export Presets gallery, select the Twitter preset.



Twitter's recommended video resolution is 640 pixels wide by 360 pixels high.

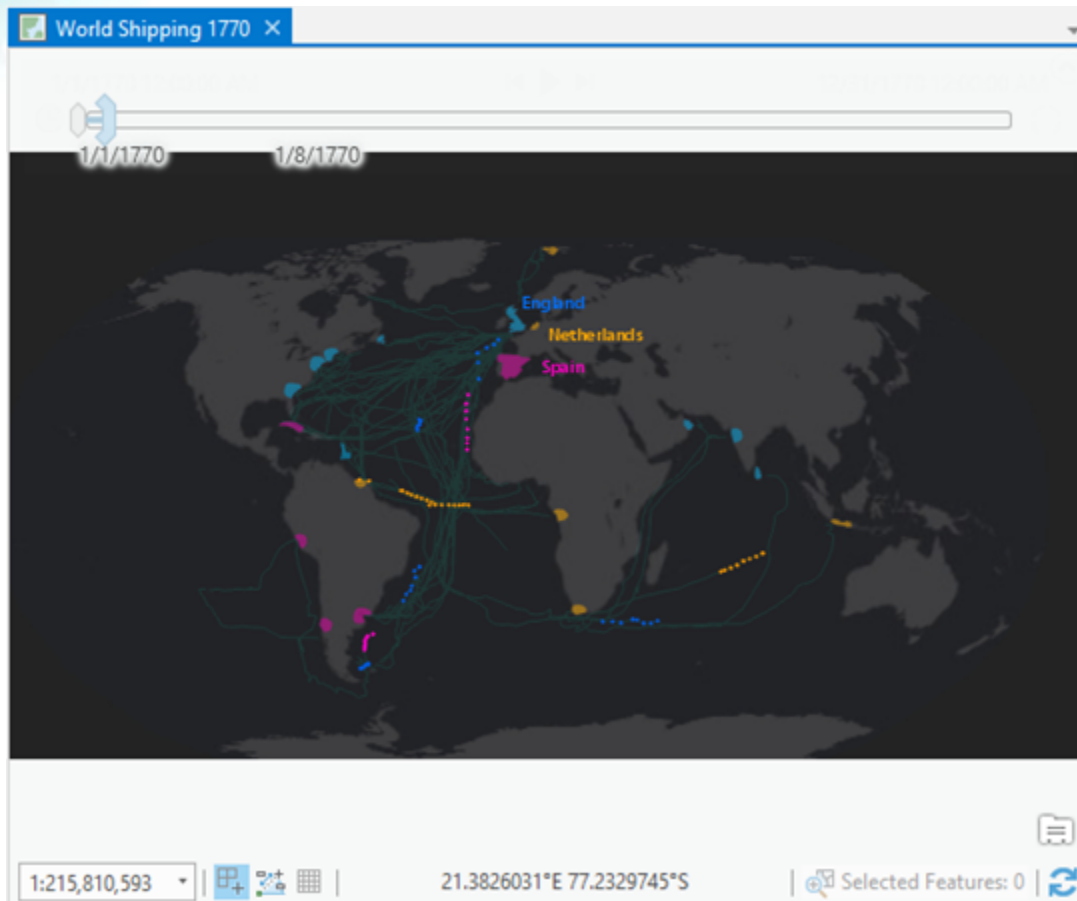
The display in your view is now clipped to reflect this aspect ratio and should look something like the following graphic.



When animating content in a temporal map, a technique that helps highlight the changing content (rather than the map) is to maintain the same extent for the duration of the video. This means that the only movement within the video will be the ship points. It also means that your choice of extent, which will not change at all, is important.

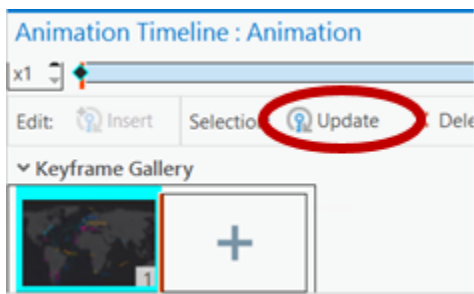
- f** Pan and zoom in the map until you get a display with Antarctica at the base of the frame and a small area of blank space at the top of the frame for a title, like the following graphic.






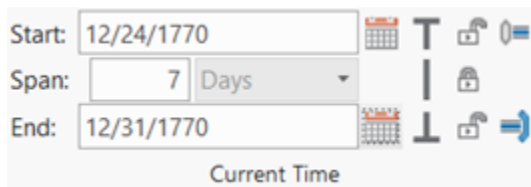
*Note: It is okay if your map does not look exactly like the preceding graphic; just get it as close as you can.*

- g In the Animation Timeline pane, select the first keyframe and click Update.




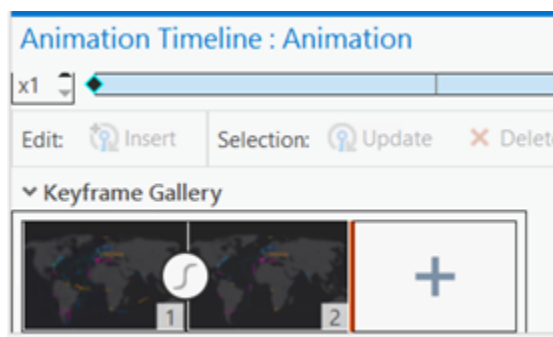
This will be the starting point of the video. You will keep the same spatial extent for the entire video.

- h** From the Time tab, in the Current Time group, perform the following steps:
- Verify that Span is set to **7** Days, and then next to the Span field, confirm that the Span Locked button  is visible.
  - Set the End field to **12/31/1770** and press Enter.



*Note: The Start field will automatically update to 12/24/1770 because of the seven-day duration.*

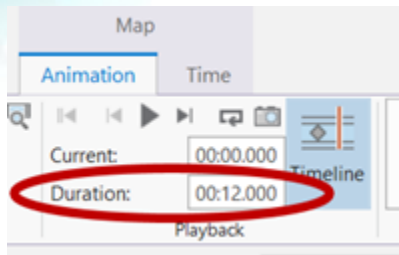
- i** In the Animation Timeline pane, click the Append Next Keyframe button  to add a second keyframe.



The temporal animation has now been defined using just two keyframes.

The video is currently defined to be the default length of 3 seconds. You can update the duration of the video to any length that you want. However, it is useful to choose a length that is easy to explain, such as a duration of 12 seconds to represent a playback speed of one second per month.

- j** From the Animation tab, in the Playback group, set the Duration to **12** seconds.



- k In the Playback group, click the Reset button  to return to the start of the animation, and then click the Play button  to preview the animation.

The animation will play through time, and the dot trails will appear to move over the map. As mentioned previously, do not be too concerned with the interactive playback performance because the export process will ensure that everything renders smoothly.

## Step 7: Add overlay text to show the passage of time

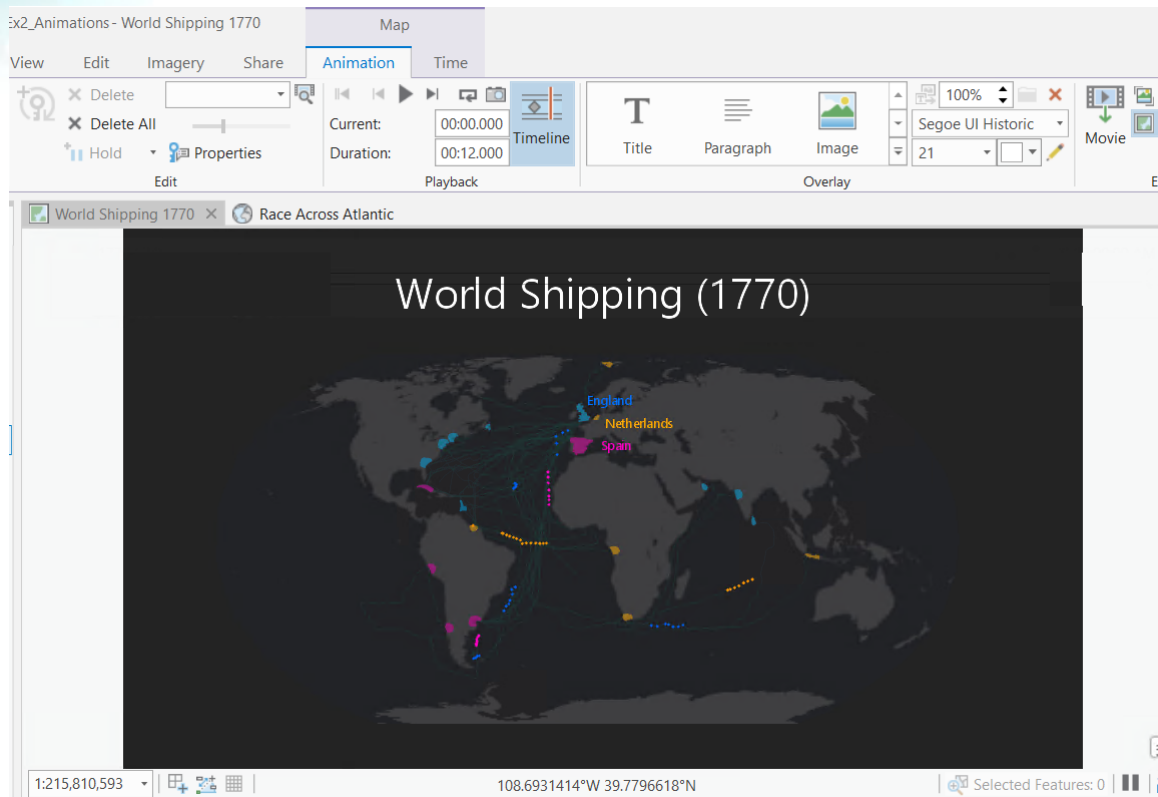
The animation is presenting data through time, so including the changing dates within the video will help communicate how fast time is changing.

There is only a single year of content, so you can add that information in as static overlay text in the title.

- a In the Animation Timeline pane, select all the keyframes.

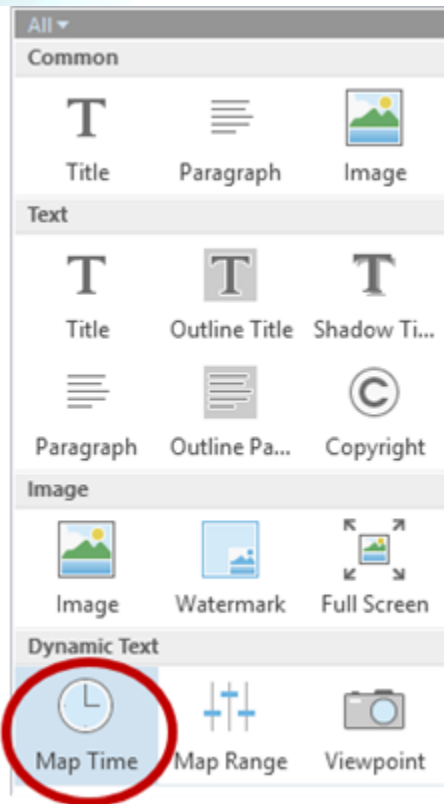
As overlays are added, they will display for the entire duration of the video.

- b From the Animation tab, in the Overlay group, click Title.
- c In the text box that appears, type **World Shipping (1770)**.
- d In the top-right corner of the map window, click the red X to close the text editing mode.
- e From the Animation tab, in the Overlay group, update the font to something like Segoe UI Historic, 21-point, Arctic White.



The day and month, however, are changing throughout the video. For dynamic overlay text, you will add in a specifically tagged element.

- f** From the Animation tab, in the Overlay group, expand the gallery of preset items.
- g** In the Dynamic Text section, click Map Time.



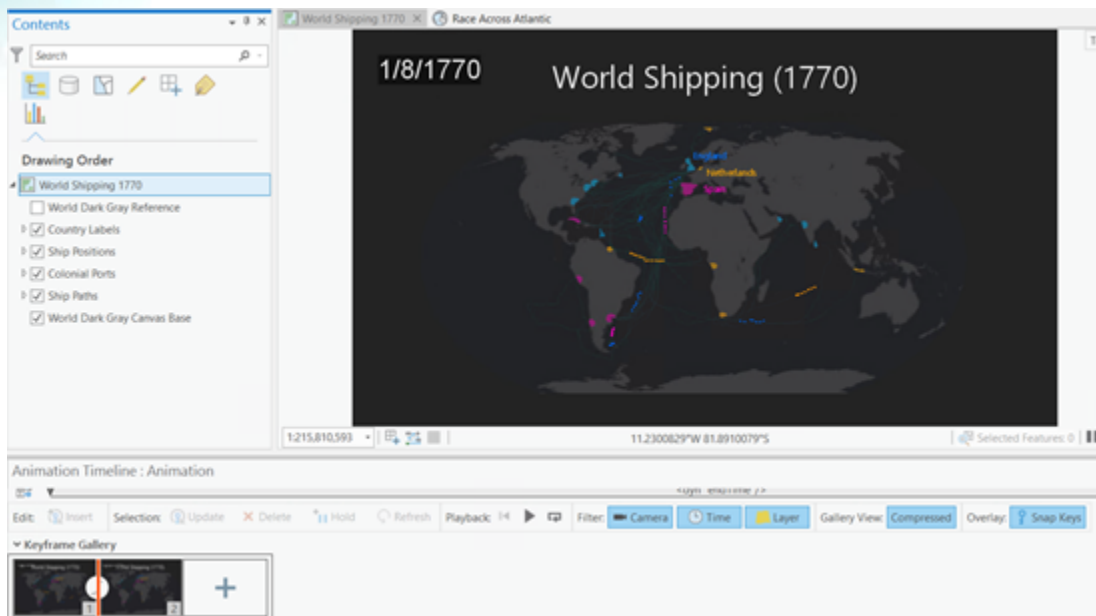
This will add a predefined tagged HTML element for showing dynamic time. You only want to see the end date, and you do not need the time of day displayed.

- h** In the element text box, delete the first line of text (for the startTime).
- i** In the second line of text, delete the | long characters from the formatting section of the endTime line.

```
<dyn type="animation" property="endTime" format="short"/>
```

*Note: Be sure that the endTime line is at the top of the element text box.*

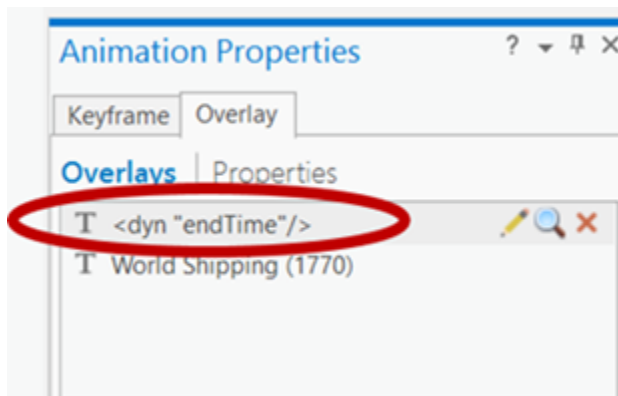
- j** Click the red X to close the editing mode.
- k** Update the font to match the title text that you set earlier (Segoe UI Historic, 21-point, Arctic White).



The end date for the first keyframe (1/8/1770) is now displayed in the upper-left corner of the frame. If you were to replay the animation, it would flip over to subsequent days in sync with the video.

You will now simplify and fine-tune how the dynamic text is shown.

- I** From the Animation tab, in the Edit group, click Properties to open the Animation Properties pane.
- m** At the top of the Animation Properties pane, click the Overlay tab.
- n** Click the `<dyn "endTime"/>` element to select it, if necessary.

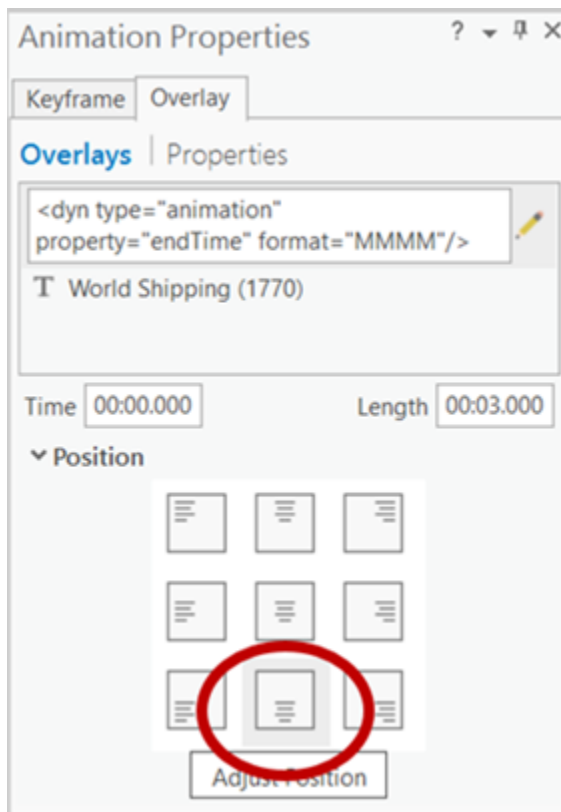


- o** Point to the `<dyn "endTime"/>` element, click the Edit button , and update the text to `<dyn type="animation" property="endTime" format="MMMM"/>`.



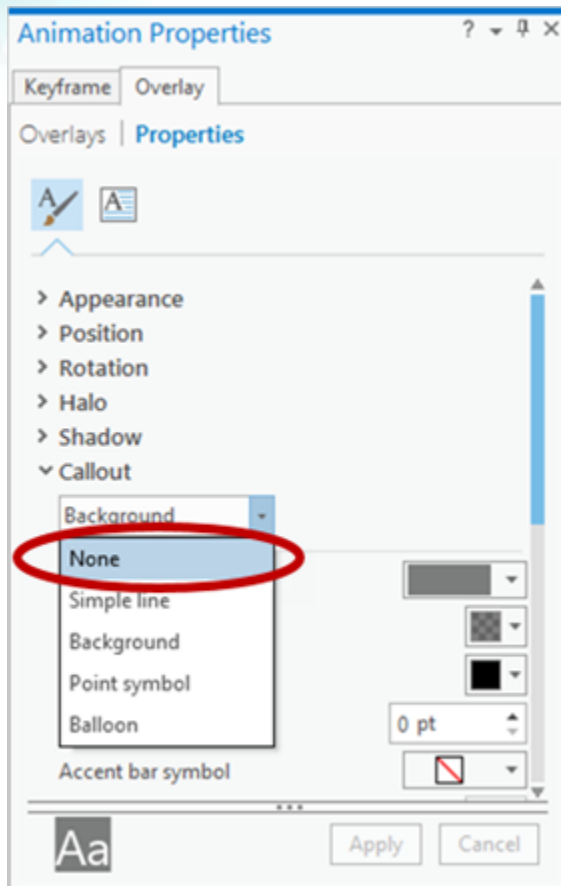
This will display just the month name, rather than the month/day/year numeric format.



- p In the Animation Properties pane, in the Position section, select the bottom-center alignment.



- q Near the top of the Animation Properties pane, click the Properties tab to access the advanced properties for the text.
- r Expand the Callout section, and then, if necessary, from the drop-down list, choose None and click Apply.

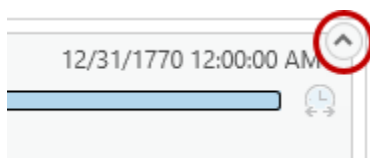
*Note: If the callout is already set to None, the Apply button will remain grayed out.*



- s From the Animation tab, in the Playback group, click the Reset button  to return to the start of the animation, and then click the Play button  to preview the animation.

This simplified presentation of the dynamic text is easier to read within the fast playback time yet still communicates how time is passing within the video.

*Note: When you are not using the time slider anymore, you can minimize it into the top-right corner of the view by clicking the collapse arrow in that same corner of the control.*



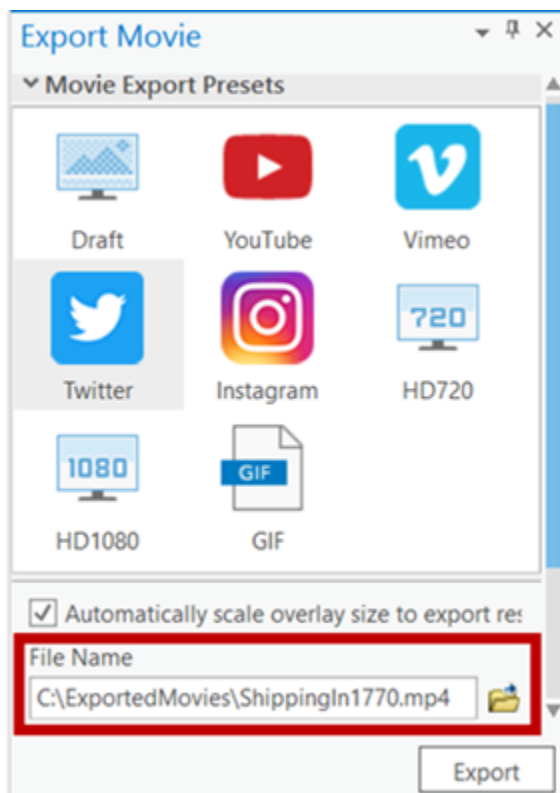
- t Close the Animation Properties pane and save your project.

The animation is now complete and ready to be exported.

## Step 8: Export the animation for use on Twitter

The animation is fully prepared for posting to Twitter.

- a In the Export Movie pane, for the output folder File Name, type a name like **ShippingIn1770.mp4**.



- b Click Export.

Export time will vary, but the video should take approximately 3 to 4 minutes to export.

- c When the export has completed, at the bottom of the Export Movie pane, click Play The Video.

*Hint: You can also browse to the output file location and double-click the MP4 file to view it.*

- d If you are satisfied with your movie, and if you have a Twitter account, sign in to Twitter and post it with an interesting comment.

## Step 9: Update the map extent for Instagram and export the video

Different social media platforms have different recommended video settings, and some of them will affect how you author your animations. For example, Instagram is designed to host square videos, rather than landscape or portrait videos, so you need to allow for this. If you do not, sections of your video will be clipped out.

- a In the Export Movie pane, in the Movie Export Presets gallery, select the Instagram preset.



The map view will update to show the new aspect ratio that Instagram uses.



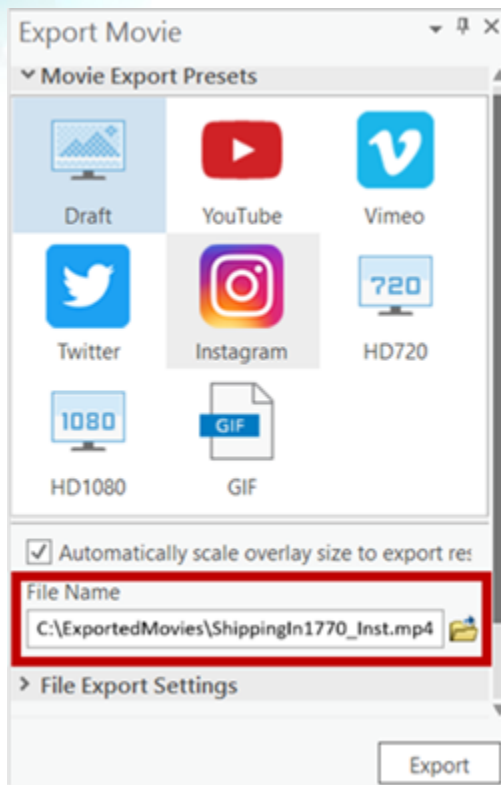
**b** Pan and zoom in the map to update the extent that you would like captured in the video.

*Hint: In this case, zoom in slightly and set an even amount of blank/dark space at the base and top of the screen for the title and month text.*



- c In the Export Movie pane, type an output File Name, such as **ShippingIn1770\_Inst.mp4**.  
*Note: Be sure to give the file a different name than you used for the Twitter version.*





- d Click Export.

The video will take approximately 3 to 4 minutes to export again, this time in the resolution appropriate for Instagram.

- e When the export has completed, save your project.

- f If you have an Instagram account, sign in to Instagram and post the video.

In the next exercise, you will use the same World Shipping dataset to create a stop-motion-style video, using a progressive display of features to simulate movement.

*Note: If you would like to compare your final map to the author's, you can open the Animations\_Complete\_WorldShipping1770.mpkx file in the VideoResults folder on your computer where you extracted the exercise files. There is also a final Animations\_Complete\_WorldShipping.mp4 video file in that same location for comparison purposes.*

- g Close the Export Movie pane and the Animation Timeline pane.

- h Close the World Shipping 1770 map and save your project.

- i If you are continuing to the next exercise now, leave ArcGIS Pro open.

- j If you will continue to the next exercise at a later time, exit ArcGIS Pro.