Oceanography
Coastal Erosion along the Central CA Coast -- Importing and Creating KML Files

Goals:
Recognize and measure seacliff erosion rates along the central California coast
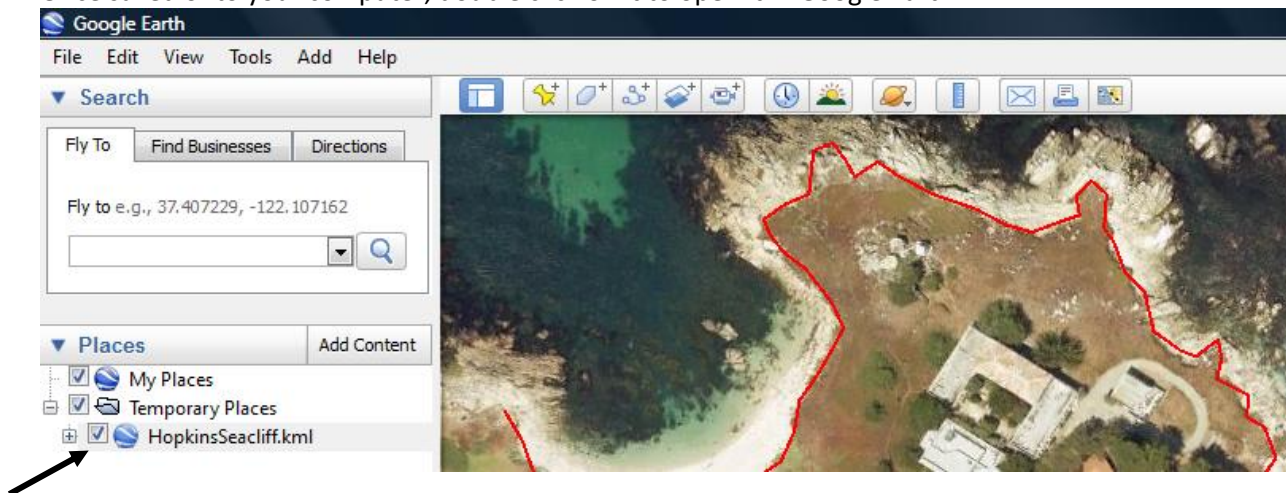Become proficient at manipulating kml files for use in Google Earth

Introduction
It is often useful to import additional placemarks, lines, shapes (polygons), or images into Google Earth.
These types of information are stored as .kml or .kmz files. They are accessed in Google Earth by
pressing File>Open and then locating and opening the appropriate file.

1. Go to http://www.mpcfaculty.net/alfred_hochstaedter/OceanData.htm
Download the HopkinsSeacliff.kml file by right-clicking it and choosing "Save Target As…".
Save it to your computer in a place you will remember it. Be sure the extension is ".kml" and not
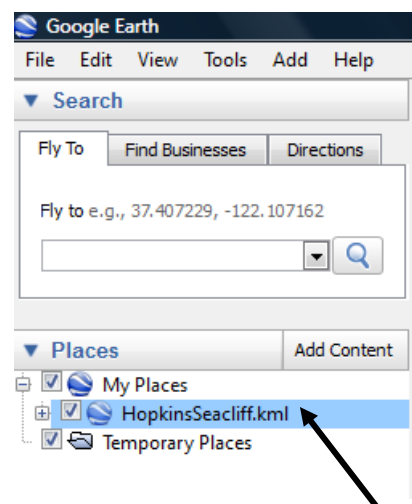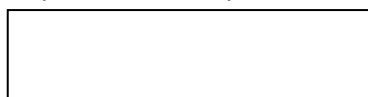something else (my laptop has trouble with this).

Once saved onto your computer, double click on it to open it in Google Earth.

Upon opening the kml file, you should see something like the image above. The kml file consists of the
red line along the top of the seacliff near Hopkins Marine Lab, part of which is shown.

- Note that the HopkinSeacliff.kml file is located under "Temporary
  Places". This means that if you exit Google Earth, this layer will go
  away (this is often a good thing).
- You can right click this layer and press "Save To My Places". This
  makes the layer more permanent by placing it the My Places area
  as shown in the image at right. Now, when opening Google Earth
  the next time, this layer will automatically appear in the My
  Places area.
- You can delete the layer by right clicking it and pressing Delete.
- You can load the layer back into Google Earth by pressing
  File>Open and selecting the kml file from your computer.
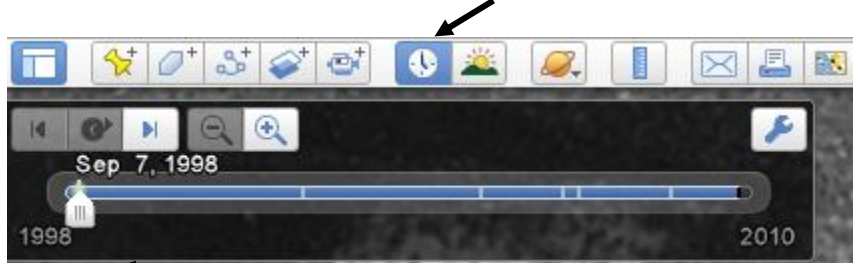- Now you should be back where you started.

1. Go through this sequence enough times and to convince yourself
you are proficient. Convince your instructor you can do it by getting
him/her to initial here.

2. Now let's look at the variation in the coastal erosion rates along the Monterey coastline.

The red line in the HopkinsSeacliff.kml file shows the location of the top of the seacliff. But where was the top of the seacliff years ago?

Turn on the Historical Imagery by clicking the little clock in the toolbar across the top of the image.

Then put the curser towards the start of the timeline to display an image from Sept 7, 1998.

What do you see? Has there been much seacliff erosion at Hopkins Marine Lab since 1998?
a. Yes, I can see some evidence of erosion.   B. No, I can't see much evidence of erosion.

Turn off the Historical Imagery before moving on.

3. Now let's go somewhere else.

Fly to 36.660891N, 121.821781W. Don't drag the view anywhere.
Zoom out far enough so that you can see where you are.

In general terms—not lat and long—where is this place?_____

Zoom in so that the eye altitude is close to 500 meters.

Now enter a Path, i.e., a line, that shows the top of the seacliff.
First highlight the Temporary Places in the Places box on the left of the screen

Then press the Add Path button on the tool bar across the top.
In the dialog box that opens:
In the "Description" tab, give the file a name that you will remember, something like FtOrdSeacliff1
Write a one-sentence description in the Description box
In the "Style, Color" tab, choose a nice bold color like red, make the width 2.0, and the opacity 100%
In the "View" tab press "Snapshot current view"; this tells Google Earth how to display your line.
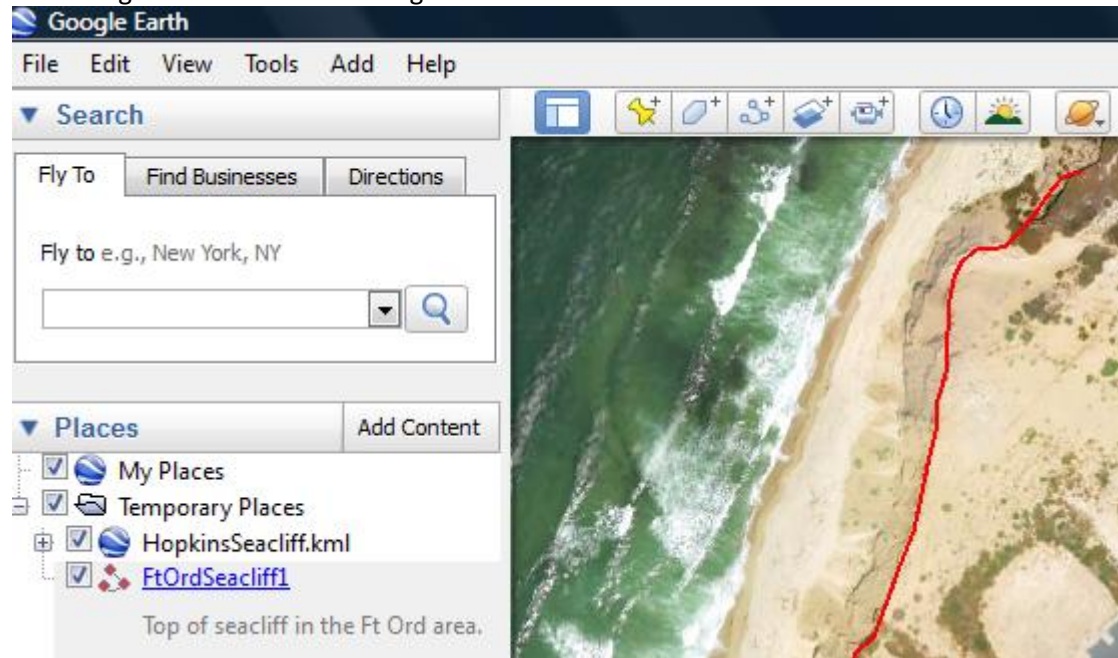Do not press "OK", yet.
Drag the dialog box out of the way (but don't close it).

Now draw the line by left clicking the curser at every incremental distance along the very top of the seacliff.
When you get to the end, go back to your dialog box that you left open, and press "OK".

Your final product should look something like the image on the next page, where only a portion of the line is shown.

Your image should look something like this:

4. Now, how much seacliff erosion has occurred in this area?

Turn on the Historical Imagery by clicking the little clock in the toolbar across the top, like we did for the Hopkins area.
Then put the curser towards the start of the timeline to display an image from Sept 7, 1998.

Where is your red line? It should look as though it lies right on top of a structure.

Do you know what this structure is?_____

Use the ruler to measure the distance from your line to the top of the seacliff in 1998.

How far is it in meters?_____

How many years has it been since 1998?_____

What is the rate, in meters/year of seacliff retreat in this area?_____

Click here to see what this area looked like in 1997 and 1998:
http://coastal.er.usgs.gov/cgi-bin/response.pl?site=cc&loc=41

The structure is Stillwell Hall, part of the former Ft Ord. It was demolished to prevent it from falling into the Pacific Ocean due to seacliff erosion.

Turn off the Historical Imagery.

5. Now let's travel down the coast a little bit.
Fly to 36.644868N, 121.829349W and zoom to an eye altitude of about 500 meters.

Go through the same sequence of steps as we did for the Stillwell Hall area in the previous section.
Complete the table:

Distance between old and current seacliffs	Years between images	Erosion rate

Which of the two locations, Stillwell Hal, or this last one, do you think gives the best estimate of the natural seacliff erosion rate over the last few hundred years? For clues, look at the images on the website referenced above and the shape of the coastline in the 1998 Stillwell Hall Google Earth images. Why do you think this? Support your answer with observations from the images.

6. Fly to 36.610678N, 121.858609W.
This is the Best Western Beach Resort Monterey.
http://bestwesterncalifornia.com/hotels/best-western-beach-resort-monterey/

What kind of hazards or problems do you think this structure will most likely be exposed to over the next few years? Why?

7. Fly to 36.605227N, 121.866566W.
Was this a wise place to build condominiums? Why or why not?

8. Go back to Hopkins Marine Lab. Do this by double clicking HopkinsSeacliff.kml in the Places box, or by scrolling there.
Based on the evidence in this lab, was this a wise place to build structures? Why or why not?