In [1]:
```
import os
import rasterio
import numpy as np
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt
from sklearn import model_selection
```

In [2]:
```
os.getcwd()
```

Out[2]:
```
'C:\\Users\\lenovo'
```

In [3]:
```
os.chdir("E:/assignment/band")
```

In [4]:
```
data = rasterio.open('LC08_L2SP_136041_20250116_20250127_02_T1_SR_B1.tif')
```

In [5]:
```
data.name
```

Out[5]:
```
'LC08_L2SP_136041_20250116_20250127_02_T1_SR_B1.tif'
```

In [6]:
```
data.mode
```

Out[6]:
```
'r'
```

In [7]:
```
data.closed
```

Out[7]:
```
False
```

In [9]:
```
data.count
```

Out[9]:
```
1
```

In [10]:
```
data.profile
```

Out[10]:
```
{'driver': 'GTiff', 'dtype': 'uint16', 'nodata': 0.0, 'width': 7641, 'height': 779
1, 'count': 1, 'crs': CRS.from_wkt('PROJCS["WGS 84 / UTM zone 46N",GEOGCS["WGS 8
4",DATUM["WGS_1984",SPHEROID["WGS 84",6378137,298.257223563,AUTHORITY["EPSG","703
0"]],AUTHORITY["EPSG","6326"]],PRIMEM["Greenwich",0,AUTHORITY["EPSG","8901"]],UNIT
["degree",0.0174532925199433,AUTHORITY["EPSG","9122"]],AUTHORITY["EPSG","4326"]],P
ROJECTION["Transverse_Mercator"],PARAMETER["latitude_of_origin",0],PARAMETER["cent
ral_meridian",93],PARAMETER["scale_factor",0.9996],PARAMETER["false_easting",50000
0],PARAMETER["false_northing",0],UNIT["metre",1,AUTHORITY["EPSG","9001"]],AXIS["Ea
sting",EAST],AXIS["Northing",NORTH],AUTHORITY["EPSG","32646"]]'), 'transform': Aff
ine(30.0, 0.0, 383385.0,
       0.0, -30.0, 3150615.0), 'blockxsize': 256, 'blockysize': 256, 'tiled': Tru
e, 'compress': 'deflate', 'interleave': 'band'}
```

In [11]:
```
data.width
```

Out[11]:
```
7641
```

In [12]:
```
data.height
```

Out[12]:
```
7791
```

In [13]:
```
data.bounds
```

Out[13]:
```
BoundingBox(left=383385.0, bottom=2916885.0, right=612615.0, top=3150615.0)
```

In [14]:
```
data.crs
```

Out[14]:
```
CRS.from_wkt('PROJCS["WGS 84 / UTM zone 46N",GEOGCS["WGS 84",DATUM["WGS_1984",SPHE
ROID["WGS 84",6378137,298.257223563,AUTHORITY["EPSG","7030"]],AUTHORITY["EPSG","63
26"]],PRIMEM["Greenwich",0,AUTHORITY["EPSG","8901"]],UNIT["degree",0.0174532925199
433,AUTHORITY["EPSG","9122"]],AUTHORITY["EPSG","4326"]],PROJECTION["Transverse_Mer
cator"],PARAMETER["latitude_of_origin",0],PARAMETER["central_meridian",93],PARAMET
ER["scale_factor",0.9996],PARAMETER["false_easting",500000],PARAMETER["false_north
ing",0],UNIT["metre",1,AUTHORITY["EPSG","9001"]],AXIS["Easting",EAST],AXIS["Northi
ng",NORTH],AUTHORITY["EPSG","32646"]]')
```

In [15]:
```
data.transform
```

Out[15]:
```
Affine(30.0, 0.0, 383385.0,
       0.0, -30.0, 3150615.0)
```

In [16]:
```
data.transform * (0,0)
```

Out[16]:
```
(383385.0, 3150615.0)
```

In [17]:
```
data.meta
```

Out[17]:
```
{'driver': 'GTiff',
 'dtype': 'uint16',
 'nodata': 0.0,
 'width': 7641,
 'height': 7791,
 'count': 1,
 'crs': CRS.from_wkt('PROJCS["WGS 84 / UTM zone 46N",GEOGCS["WGS 84",DATUM["WGS_19
84",SPHEROID["WGS 84",6378137,298.257223563,AUTHORITY["EPSG","7030"]],AUTHORITY["E
PSG","6326"]],PRIMEM["Greenwich",0,AUTHORITY["EPSG","8901"]],UNIT["degree",0.01745
32925199433,AUTHORITY["EPSG","9122"]],AUTHORITY["EPSG","4326"]],PROJECTION["Transv
erse_Mercator"],PARAMETER["latitude_of_origin",0],PARAMETER["central_meridian",9
3],PARAMETER["scale_factor",0.9996],PARAMETER["false_easting",500000],PARAMETER["f
alse_northing",0],UNIT["metre",1,AUTHORITY["EPSG","9001"]],AXIS["Easting",EAST],AX
IS["Northing",NORTH],AUTHORITY["EPSG","32646"]]'),
 'transform': Affine(30.0, 0.0, 383385.0,
        0.0, -30.0, 3150615.0)}
```

In [18]:
```
data.indexes
band1 = data.read(1)
band1
```

Out[18]:
```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0]], dtype=uint16)
```

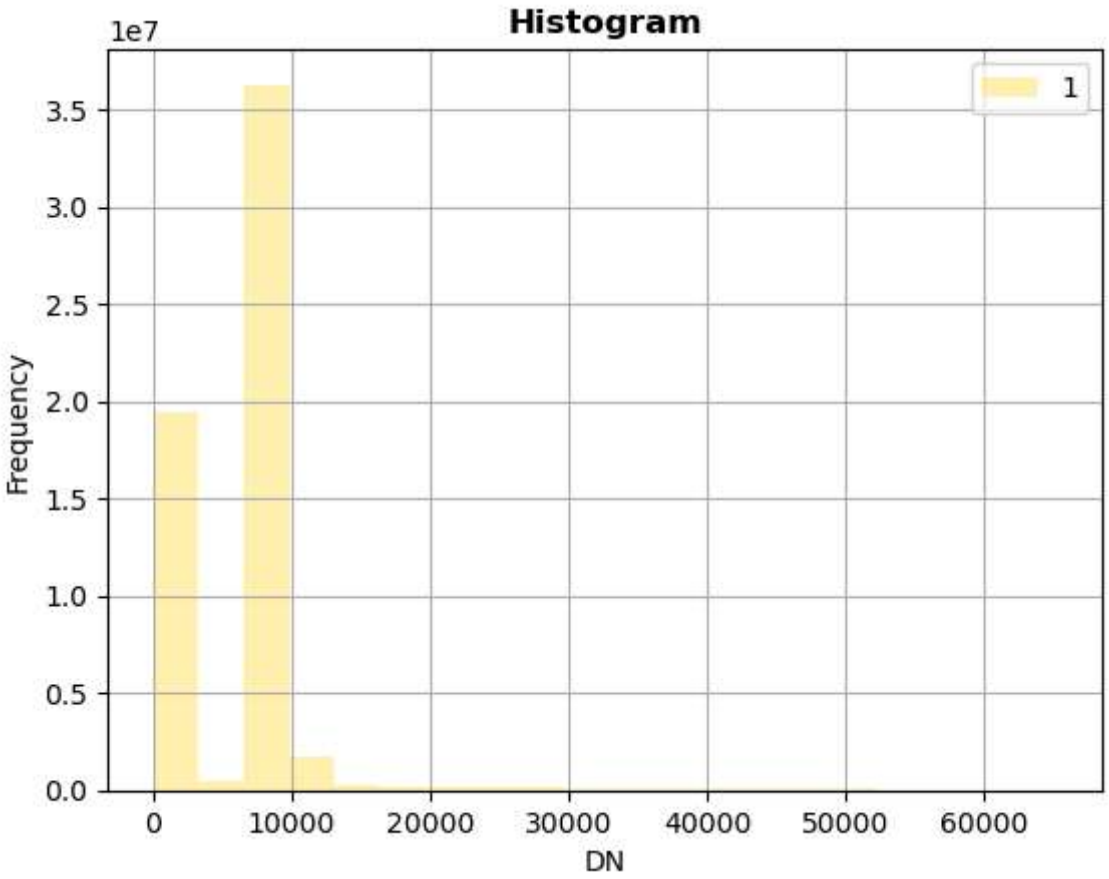
In [19]:
```
x, y = (data.bounds.left + 100000, data.bounds.top - 50000)
row, col = data.index(x, y)
row, col
```

Out[19]: (1666, 3333)

In [20]:
```
band1[row, col]
```

Out[20]: 8466

In [21]:
```
from rasterio.plot import show_hist
show_hist(band1, bins=20, lw=0.0, stacked=False, alpha=0.3,
        histtype='stepfilled', title="Histogram")
```



In [22]:
```
data.read().shape
```

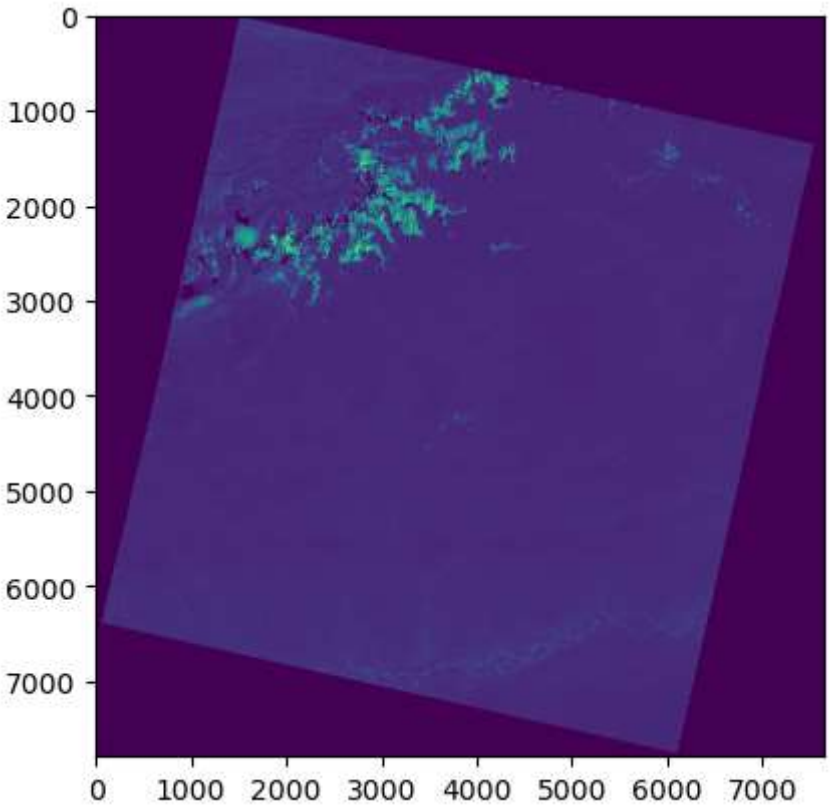
Out[22]: (1, 7791, 7641)

In [23]:
```
data.read(1).shape
```

Out[23]: (7791, 7641)

In [24]:
```
plt.imshow(data.read(1))
```

Out[24]: <matplotlib.image.AxesImage at 0x1498bf633e0>



In [25]:
```
import glob
```

In [26]:
```
data_dir = 'LC08_L2SP_136041_20250116_20250127_02_T1/'
files = glob.glob(r"E:\Assignment\Band\*.tif")
print(files)
files = files[4:11]
files
```

```
['E:\\Assignment\\Band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B1.TIF', 'E:\\As
signment\\Band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B2.TIF', 'E:\\Assignment
\\Band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B3.TIF', 'E:\\Assignment\\Band
\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B4.TIF', 'E:\\Assignment\\Band\\LC08_L
2SP_136041_20250116_20250127_02_T1_SR_B5.TIF', 'E:\\Assignment\\Band\\LC08_L2SP_1360
41_20250116_20250127_02_T1_SR_B6.TIF', 'E:\\Assignment\\Band\\LC08_L2SP_136041_20250
116_20250127_02_T1_SR_B7.TIF']
```

Out[26]:
```
['E:\\Assignment\\Band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B5.TIF',
 'E:\\Assignment\\Band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B6.TIF',
 'E:\\Assignment\\Band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B7.TIF']
```

In [27]:
```
src = rasterio.open(files[2])
meta = src.meta
meta
```

Out[27]:
```
{'driver': 'GTiff',
 'dtype': 'uint16',
 'nodata': 0.0,
 'width': 7641,
 'height': 7791,
 'count': 1,
 'crs': CRS.from_wkt('PROJCS["WGS 84 / UTM zone 46N",GEOGCS["WGS 84",DATUM["WGS_19
84",SPHEROID["WGS 84",6378137,298.257223563,AUTHORITY["EPSG","7030"]],AUTHORITY["E
PSG","6326"]],PRIMEM["Greenwich",0,AUTHORITY["EPSG","8901"]],UNIT["degree",0.01745
32925199433,AUTHORITY["EPSG","9122"]],AUTHORITY["EPSG","4326"]],PROJECTION["Transv
erse_Mercator"],PARAMETER["latitude_of_origin",0],PARAMETER["central_meridian",9
3],PARAMETER["scale_factor",0.9996],PARAMETER["false_easting",500000],PARAMETER["f
alse_northing",0],UNIT["metre",1,AUTHORITY["EPSG","9001"]],AXIS["Easting",EAST],AX
IS["Northing",NORTH],AUTHORITY["EPSG","32646"]]'),
 'transform': Affine(30.0, 0.0, 383385.0,
        0.0, -30.0, 3150615.0)}
```

In [28]:
```
meta.update(count = len(files))
```

In [30]:
```
meta
```

Out[30]:
```
{'driver': 'GTiff',
 'dtype': 'uint16',
 'nodata': 0.0,
 'width': 7641,
 'height': 7791,
 'count': 3,
 'crs': CRS.from_wkt('PROJCS["WGS 84 / UTM zone 46N",GEOGCS["WGS 84",DATUM["WGS_19
84",SPHEROID["WGS 84",6378137,298.257223563,AUTHORITY["EPSG","7030"]],AUTHORITY["E
PSG","6326"]],PRIMEM["Greenwich",0,AUTHORITY["EPSG","8901"]],UNIT["degree",0.01745
32925199433,AUTHORITY["EPSG","9122"]],AUTHORITY["EPSG","4326"]],PROJECTION["Transv
erse_Mercator"],PARAMETER["latitude_of_origin",0],PARAMETER["central_meridian",9
3],PARAMETER["scale_factor",0.9996],PARAMETER["false_easting",500000],PARAMETER["f
alse_northing",0],UNIT["metre",1,AUTHORITY["EPSG","9001"]],AXIS["Easting",EAST],AX
IS["Northing",NORTH],AUTHORITY["EPSG","32646"]]'),
 'transform': Affine(30.0, 0.0, 383385.0,
        0.0, -30.0, 3150615.0)}
```

In [32]:
```
import os
import glob
import numpy as np
import rasterio

# Your folder
data_dir = r"E:\assignment\band"

# Find B1-B7 (works with SR_B1, SR_B2, etc.)
multi_bands = glob.glob(os.path.join(data_dir, '*SR_B[1-7].TIF'))
multi_bands = sorted(multi_bands)

print("Bands found:", multi_bands)

# Read all into a NumPy array
bands_array = []
for band_path in multi_bands:
```

```
    with rasterio.open(band_path) as src:
        bands_array.append(src.read(1))

# Stack into 3D array
bands_array = np.stack(bands_array, axis=0)
print("Shape of stacked bands:", bands_array.shape)
```

```
Bands found: ['E:\\assignment\\band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B1.
TIF', 'E:\\assignment\\band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B2.TIF',
'E:\\assignment\\band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B3.TIF', 'E:\\ass
ignment\\band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B4.TIF', 'E:\\assignment
\\band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B5.TIF', 'E:\\assignment\\band
\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B6.TIF', 'E:\\assignment\\band\\LC08_L
2SP_136041_20250116_20250127_02_T1_SR_B7.TIF']
Shape of stacked bands: (7, 7791, 7641)
```

In [33]:
```
multi_bands = glob.glob(data_dir + '/*_B[1-7].TIF')
multi_bands = multi_bands[0:7]   # first 7 bands
print(multi_bands)
```

```
['E:\\assignment\\band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B1.TIF', 'E:\\as
signment\\band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B2.TIF', 'E:\\assignment
\\band\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B3.TIF', 'E:\\assignment\\band
\\LC08_L2SP_136041_20250116_20250127_02_T1_SR_B4.TIF', 'E:\\assignment\\band\\LC08_L
2SP_136041_20250116_20250127_02_T1_SR_B5.TIF', 'E:\\assignment\\band\\LC08_L2SP_1360
41_20250116_20250127_02_T1_SR_B6.TIF', 'E:\\assignment\\band\\LC08_L2SP_136041_20250
116_20250127_02_T1_SR_B7.TIF']
```

In [34]:
```
# Get all bands B1-B7
multi_bands = glob.glob(data_dir + '/*_B[1-7].TIF')
multi_bands = sorted(multi_bands)

# Read all into a NumPy array
bands_array = []
for band_path in multi_bands:
    with rasterio.open(band_path) as src:
        bands_array.append(src.read(1))

bands_array = np.stack(bands_array, axis=0)
print("Shape of stacked bands:", bands_array.shape)
```

```
Shape of stacked bands: (7, 7791, 7641)
```

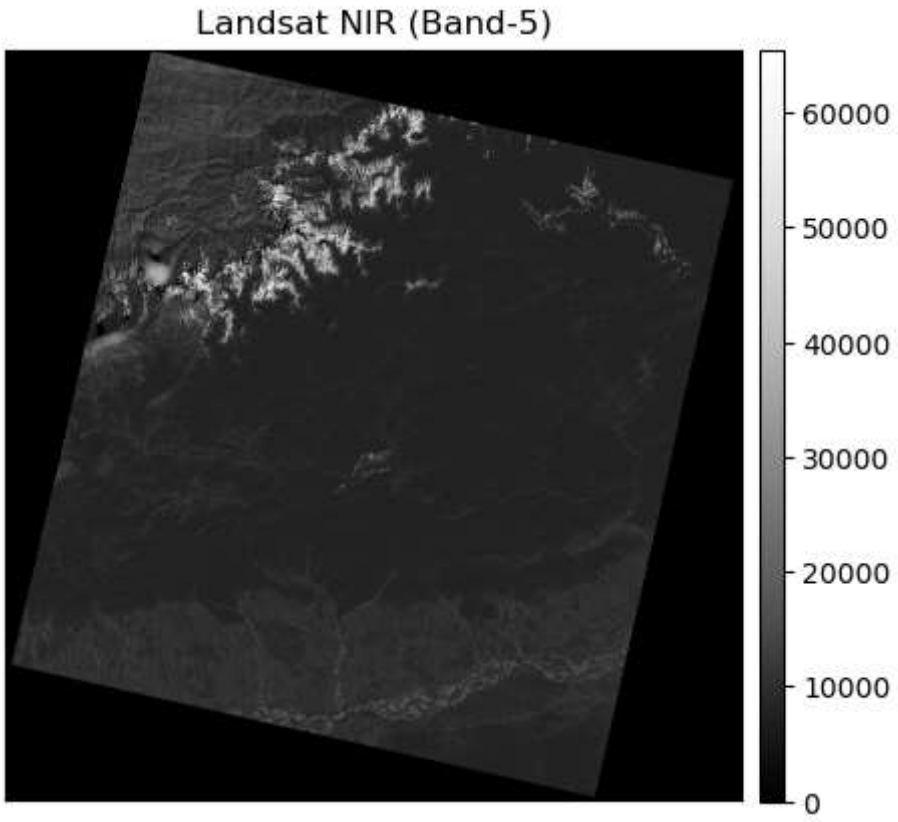
In [35]:
```
src = rasterio.open(multi_bands[3])
landsat_band4 = src.read()
landsat_band4.shape
```

Out[35]:
```
(1, 7791, 7641)
```

In [37]:
```
import earthpy.plot as ep
import matplotlib.pyplot as plt
```

In [38]:
```
ep.plot_bands(landsat_band4[0],
              title="Landsat NIR (Band-5)",
              scale=False,
```

```
                figsize=(5, 6))
plt.show()
```

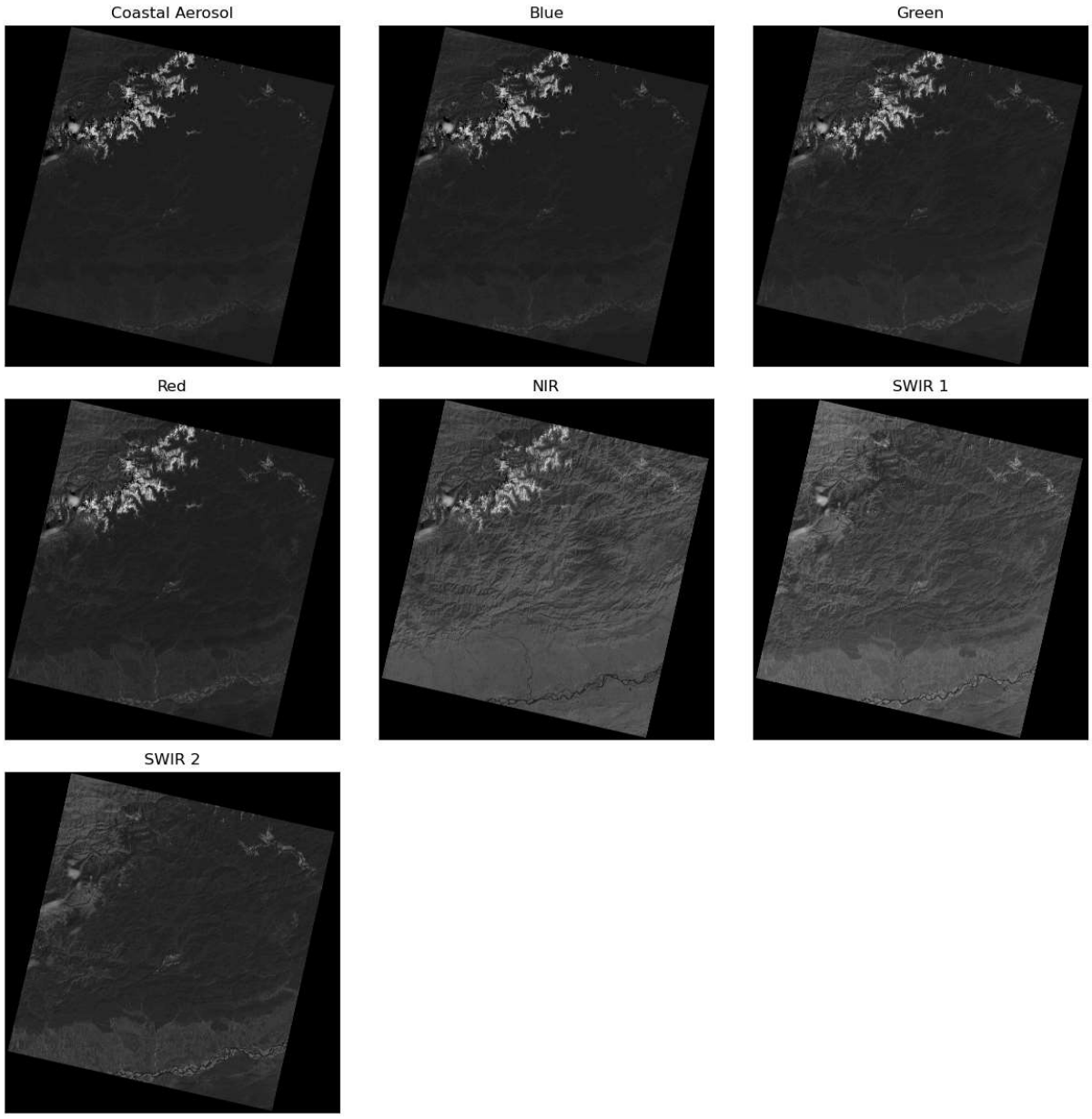


In [39]:
```
landsat_multi_path = data_dir + "landsat_multi.tif"
```

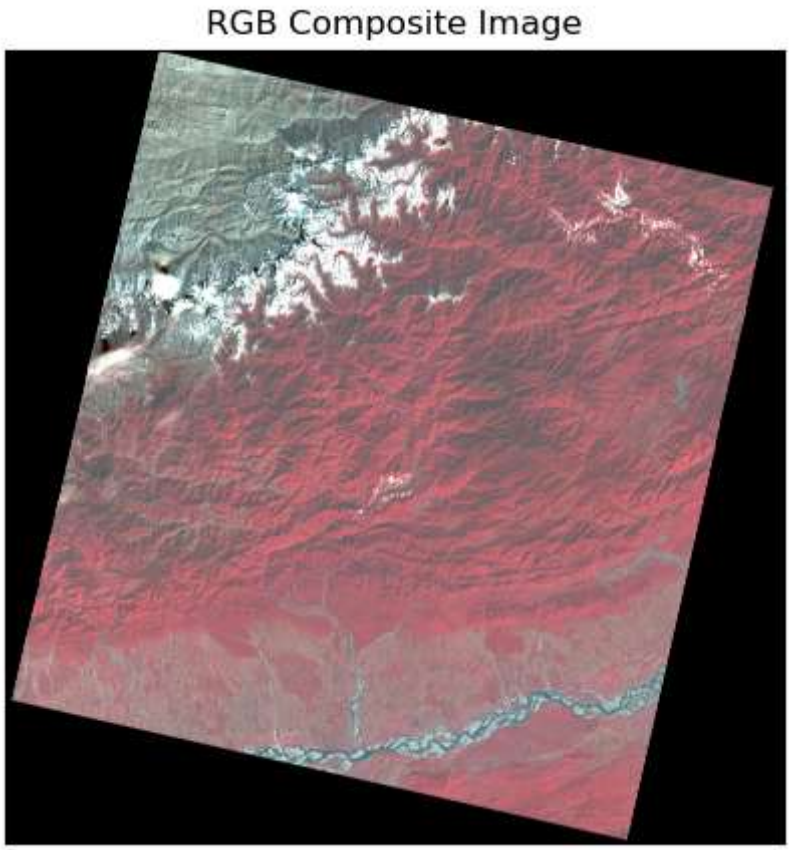
In [40]:
```
landsat_multi_path = data_dir + "landsat_multi.tif"
```

In [43]:
```
import os
import glob
import rasterio
import earthpy.spatial as es
import earthpy.plot as ep
import matplotlib.pyplot as plt

# Define your directory and stacked file path
data_dir = r"E:\assignment\band"
landsat_multi_path = os.path.join(data_dir, "landsat_multi.tif")

# Collect SR_B1-SR_B7
multi_bands = glob.glob(os.path.join(data_dir, '*SR_B[1-7].TIF'))
multi_bands = sorted(multi_bands)

# Stack into one raster
land_stack, land_meta = es.stack(multi_bands, landsat_multi_path)

# Open the stacked raster
with rasterio.open(landsat_multi_path) as src:
    landsat_multi = src.read()

# Titles for plotting
```

```
band_titles = ["Coastal Aerosol", "Blue", "Green", "Red", "NIR", "SWIR 1", "SWIR 2"
ep.plot_bands(landsat_multi, title=band_titles, cbar=False)
plt.show()
```



In [44]:
```
ep.plot_rgb(landsat_multi,
            rgb=[4,3,2],
            stretch=True,
            figsize=(5, 6),
            title="RGB Composite Image")
plt.show("RGB.jpg")
```



In [ ]: