Visualize data at TRAM harvest sites

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Import modules

In [ ]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import rasterio
#from rasterio.plot import show
import os
from pathlib import Path
import numpy as np
from src.raster_utils import read_pkrasteri_for_extent
```

Read SpaFHy results:

Average Saturation Deficit (SatDef) during harvest operation. SatDef is hydrologically adjusted TWI, goes to zero where ground water is at the surface. The domain consists of several sub-catchments modeled independently; results merged to large netCDF-file and then exported to AsciiGrid-format

In [ ]:
```
f = r"C:\Data\TRAM\spafhy_results\site5_sat_deficit_doy_183_199.asc"

s = rasterio.open(f, 'r')
print(s.meta)
print(s.bounds)
# bbox to read peruskarttarasteri for extent of ascii-grids
bbox = s.bounds
#print(bbox)
satdef = s.read()
#satdef[satdef==-9999] = np.NaN

# read nodata mask --> set values outside sub-cathcments to zero.
smask = s.read_masks(1)
smask = smask / 255
smask[np.where(smask==0)] = np.NaN
#s.close()
```

```
{'driver': 'AAIGrid', 'dtype': 'float32', 'nodata': -9999.0, 'width': 75, 'heigh
t': 53, 'count': 1, 'crs': None, 'transform': Affine(16.0, 0.0, 323648.0,
       0.0, -16.0, 6703088.0)}
BoundingBox(left=323648.0, bottom=6702240.0, right=324848.0, top=6703088.0)
```

Read vol. moisture

In [ ]:
```
f = r"C:\Projects\TRAM\spafhy_results\combined\site5_vol_moisture_doy_183_199.as

v = rasterio.open(f, 'r')
print(v.meta)
print(v.bounds)
```

```
# bbox to read peruskarttarasteri for extent of ascii-grids
bbox = v.bounds
#print(bbox)
wliq = v.read()
#wliq[wliq==-9999] = np.NaN
# read nodata mask
wmask = v.read_masks(1)
wmask = wmask / 255
#print(np.unique(wmask))
wmask[np.where(wmask==0)] = np.NaN
#s.close()
```

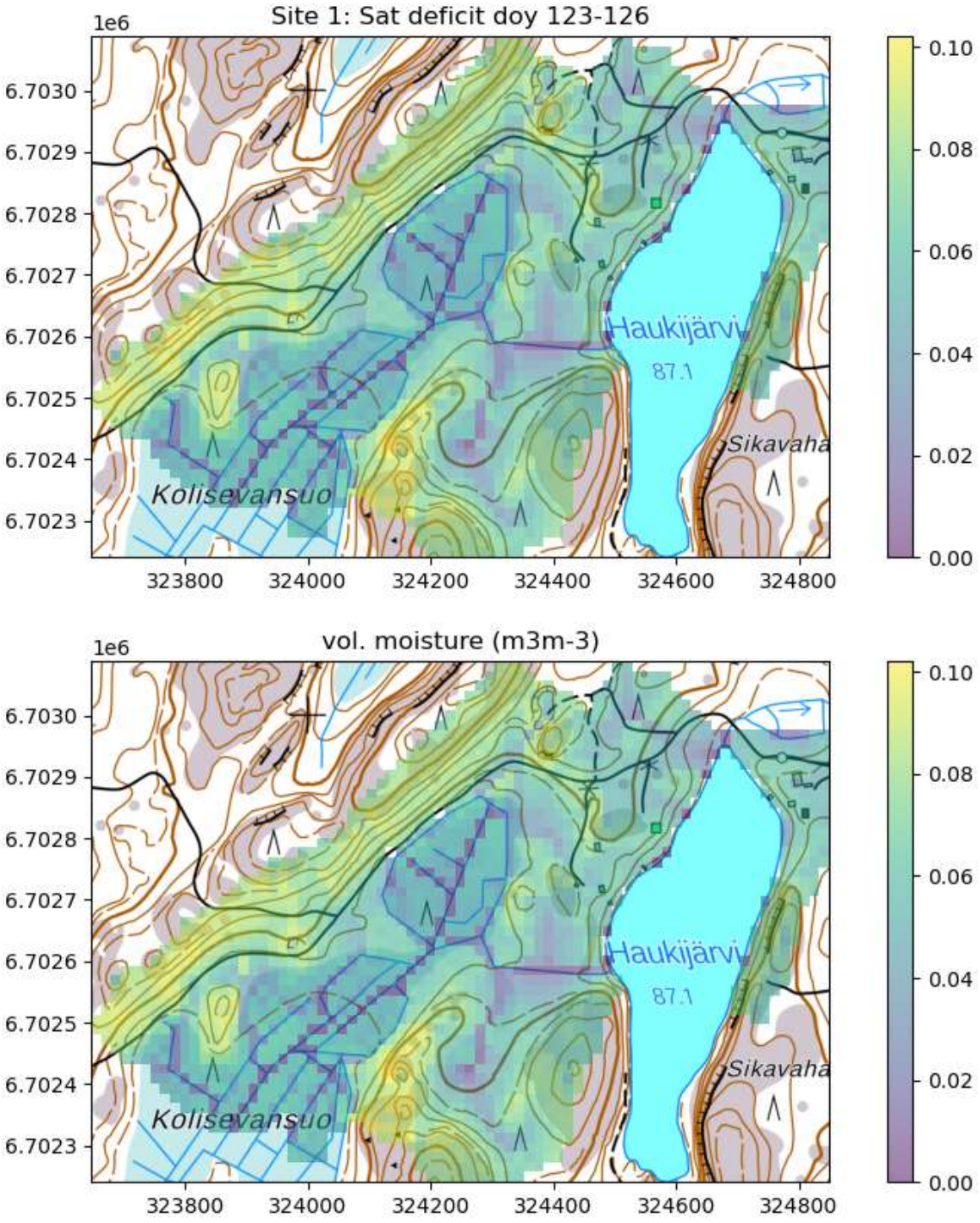
```
{'driver': 'AAIGrid', 'dtype': 'float32', 'nodata': -9999.0, 'width': 75, 'heigh
t': 53, 'count': 1, 'crs': None, 'transform': Affine(16.0, 0.0, 323648.0,
       0.0, -16.0, 6703088.0)}
BoundingBox(left=323648.0, bottom=6702240.0, right=324848.0, top=6703088.0)
```

Read Peruskartta geotiff and plot raster overlays.

See RasterProcessing -notebook how singleband pk-tiff was created. Note: needs tweak'ing to plot colorbar.

Note Vol. moisture outsize forest incorrect; need to fix LAI and vegetation parameters.

In [ ]:
```
# read peruskarttarasteri
f = r"c:\Data\Tram\pkrasteri\TRAM_peruskartta.tif"

pk, meta = read_pkrasteri_for_extent(f, bbox, showfig=False)

# show raster overlays
plt.close('all')

fig1, ax1 = plt.subplots(2,1, figsize=(10,10))
rasterio.plot.show(pk, transform=meta['transform'], ax=ax1[0])

rr = rasterio.plot.show(satdef * smask, transform=s.transform, ax=ax1[0], alpha=
# this creates colorbar
im = rr.get_images()[1]
ax1[0].set_title('Site 1: Sat deficit doy 123-126')
fig1.colorbar(im, ax=ax1[0], shrink=1)

rasterio.plot.show(pk, transform=meta['transform'], ax=ax1[1]);
#show(twi * mask, transform=r.transform, ax=ax1, alpha=0.5, vmin=5., vmax=10.0)
rr = rasterio.plot.show(wliq * wmask, transform=v.transform, ax=ax1[1], alpha=0.
im = rr.get_images()[1]
ax1[1].set_title('vol. moisture (m3m-3)')
fig1.colorbar(im, ax=ax1[1], shrink=1)
plt.show()

fig1.savefig('Site1_moisture.png', dpi=300)
```



Estimate amount of logs and fibre from mNFI data.

Csaba - here is one possibility; here site 5 used as an example.

- Read mNFI variables (m3 ha-1)
- convert volumes to mass per grid-cell: asume density of fresh wood is 850 kg m-3
- Ponsse forwarder maximum capacity in 14 tons
- In clear-cutting all logs + fibre harvested
- In thinnings, the thinning intensity should be based on variable 'ppa' (basal area, m2 ha-1). Let's assing thinning target to be 16m2 ha-1; the removed basal area fraction

is then:

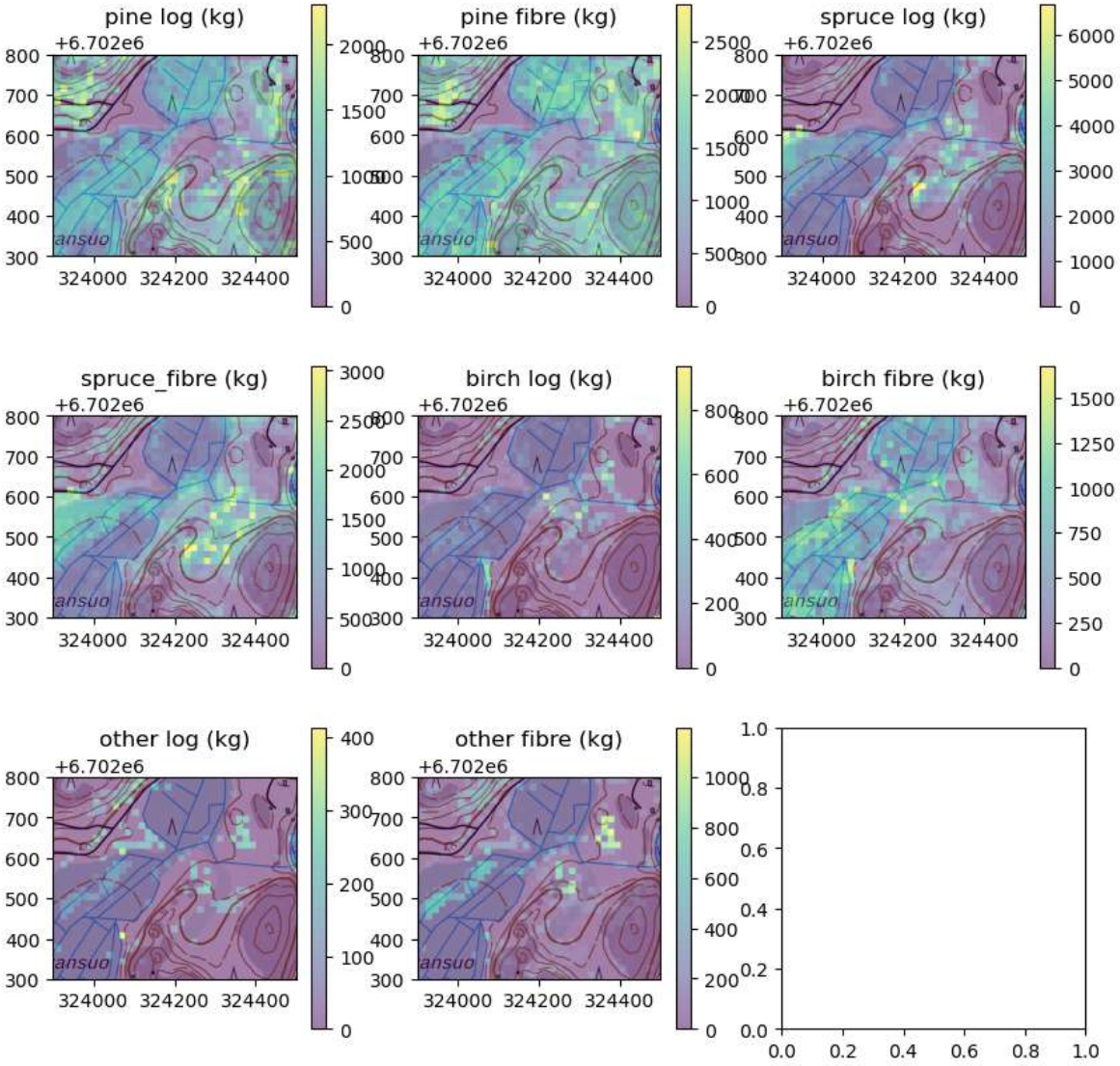
fBA = max(0, BA - 16.0) / BA, where BA == ppa in the data.

- Let's further assume that removed volumes and mass are proportional to fBA. For the 1st guess: assume all thinned wood is 'fibre', 2nd guess could be 1/3 is logs and 2/3 fibre.

In [ ]:
```
# mNFI -variables of interest
variables = ['mantytukki', 'mantykuitu', 'kuusitukki', 'kuusikuitu', 'koivutukki
# translations
varnames = ['pine log', 'pine fibre', 'spruce log', 'spruce_fibre', 'birch log',

# These data are in m3 ha-1; convert to mass per 16c16m grid as follows:
cell_area_ha = 16*16 / 10000 # 1 ha = 10 000 m2
fresh_wood_density = 850.0 # kg m-3, Metsäteho 1992

mNFI = {}

for v in variables:
    fname = r'c:/Data/TRAM/sitedata/site_5/' + v + '.asc'

    d = rasterio.open(fname, 'r')

    # bbox to read peruskarttarasteri for extent of ascii-grids
    bbox = d.bounds
    mNFI_transform = d.transform
    #print(bbox)
    data = d.read()
    data[data>1000] = 0
    # convert to kg / grid-cell
    data = data*cell_area_ha * fresh_wood_density
    # read nodata mask
    dmask = d.read_masks(1)
    dmask = dmask / 255

    dmask[np.where(wmask==0)] = np.NaN
    mNFI[v] = data.copy()
```

In [ ]:
```
# read peruskarttarasteri
f = r"c:\Data\Tram\pkrasteri\TRAM_peruskartta.tif"

pk, meta = read_pkrasteri_for_extent(f, bbox, showfig=False)

# show raster overlays
plt.close('all')

fig1, ax1 = plt.subplots(3,3, figsize=(10,10))
m = 0
for k in range(3):
    for j in range(3):
        if m==8:
            break
        else:
            rasterio.plot.show(pk, transform=meta['transform'], ax=ax1[k,j])

            rr = rasterio.plot.show(mNFI[variables[m]], transform=mNFI_transform
            im = rr.get_images()[1]
```

```
            ax1[k,j].set_title(varnames[m] + ' (kg)')
            fig1.colorbar(im, ax=ax1[k,j], shrink=1)
            m += 1
plt.show()

#fig1.savefig('Site1_moisture.png', dpi=300)
```



Close rasterfiles

In [ ]:
```
v.close()
s.close()
d.close()
```