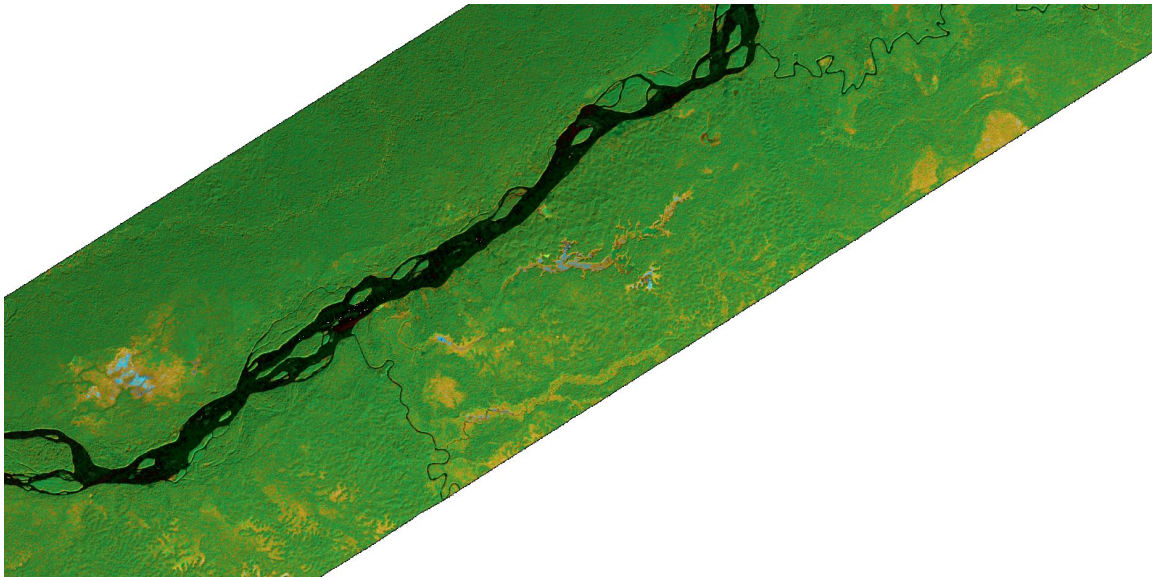
```
RRRRRRRRRRRRRRRRR     iiii                                                  iiii
R::::::::::::::::R   i::::i                                                i::::i
R::::::RRRRRR:::::R   iiii                                                 iiii
RR:::::R     R:::::R
  R::::R     R:::::Riiiiiiippppp   ppppppppp     aaaaaaaaaaaaa  rrrrr   rrrrrrrrr  iiiiiii   aaaaaaaaaaaaa  nnnn  nnnnnnnn
  R::::R     R:::::Ri::::ip::::ppp:::::::::p    a::::::::::::a r::::rrr:::::::::r i:::::i   a::::::::::::a n:::nn::::::::nn
  R::::RRRRRR:::::R  i::::ip:::::::::::::::::p   aaaaaaaaa:::::ar:::::::::::::::::r i::::i   aaaaaaaaa:::::an::::::::::::::nn
  R:::::::::::::RR   i::::ipp::::::ppppp::::::p           a::::arr::::::rrrrr::::::ri::::i            a::::ann:::::::::::::::n
  R::::RRRRRR:::::R  i::::i p:::::p     p:::::p    aaaaaaa:::::a r:::::r     r:::::ri::::i     aaaaaaa:::::a  n:::::nnnn:::::n
  R::::R     R:::::R i::::i p:::::p     p:::::p  aa::::::::::::a r:::::r     rrrrrrri::::i   aa::::::::::::a  n::::n    n::::n
  R::::R     R:::::R i::::i p:::::p     p:::::p a::::aaaa::::::a r:::::r             i::::i  a::::aaaa::::::a  n::::n    n::::n
  R::::R     R:::::R i::::i p:::::p    p::::::pa::::a    a:::::a r:::::r             i::::i a::::a    a:::::a  n::::n    n::::n
RR:::::R     R:::::Ri::::::ip:::::ppppp:::::::pa::::a    a:::::a r:::::r            i::::::ia::::a    a:::::a  n::::n    n::::n
R::::::R     R:::::Ri::::::ip:::::::::::::::::p a:::::aaaa::::::a r:::::r            i::::::ia:::::aaaa::::::a  n::::n    n::::n
R::::::R     R:::::Ri::::::ip::::::::::::::pp   a::::::::::aa:::ar:::::r            i::::::i a::::::::::aa:::a n::::n    n::::n
RRRRRRRR     RRRRRRRiiiiiiiip::::::pppppppp      aaaaaaaaaa  aaaarrrrrrr          iiiiiiii  aaaaaaaaaa  aaaa nnnnnn    nnnnnn
                           p:::::p
                           p:::::p
                          p:::::::p
                          p:::::::p
                          p:::::::p
                          ppppppppp
```



GeoScripting
~TeamTropical

Introduction

Tropical river areas

Benefits:

- Water quality
- River bank stability
- Wildlife habitat
- Erosion
- Flood control

Easy access to information

- Foresters
- Rangers

Structure of the script

Peru

Buffer - 600 meters

- Load and pre-process Landsat 7
- Calculate NDVI, generate map and threshold graph
- Extract water pixels and filter
- Create a buffer and visualize
- User input: Read user's list of coordinates

Time Series - Download ESPA; 2004 to 2015, Cloud cover < 40 %, Landsat 7 = 31 images; VI, FMASK, Fill

- Untar and automatically process a batch of Landsat 7 image series - processLandsatBatch
- Mask the NDVI layers to the riparian buffer zone
- Apply Bfast for deforestation monitoring and output results

Custom functions

CleanAnd Drop

Inside Outside

River Extract

ViCalc

Adaptable Landsat 7 masking tool

Clouds, cloud shadow, fill

Fully scalable input interactive map

Text file with coordinates

User based pixel extraction

Pixel value &
Area threshold

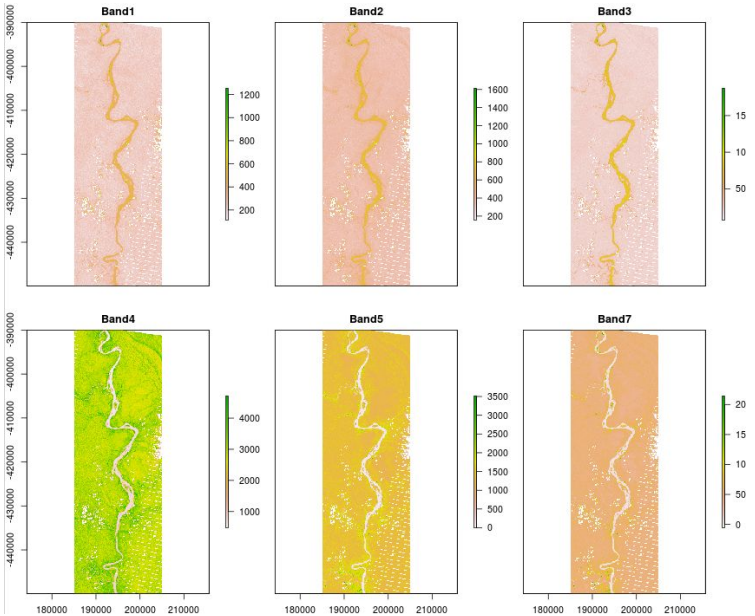
Vi Calculator

NDVI / NDMI

Adataple Landsat 7 masking function

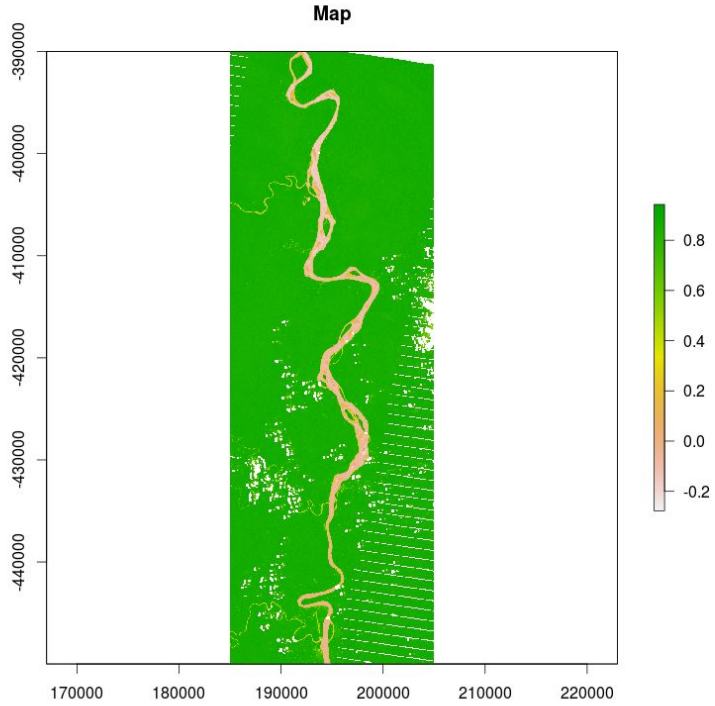
CleanAnd Drop

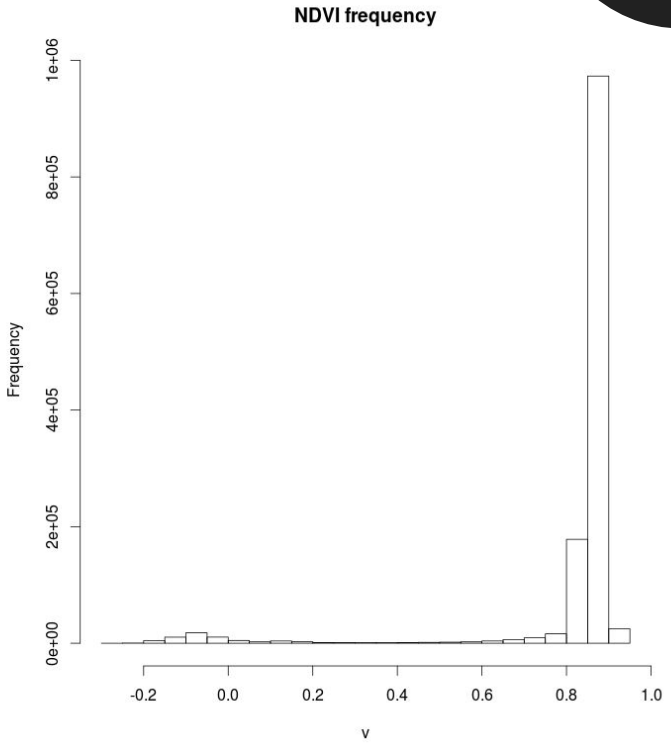
```
# Clean and Drop function for Landsat 7 data
#
# This function masks cloud in combination with the cloud shadow and has an optio to fill the missing data from
# the broken scanline corrector on Landsat 7. After masking this function drops the mask layers
#
# Necessary inputs:
# - dataset: A rasterstack containing all the Landsat 7 files called
# - x: Cloud mask layer (not Nullable)
# - y: Fill mask layer (optional)
#
# Returns:
#  - StudyAreaClean: a RasterBrick containing the masked bands



CleanAndDrop <- function(dataset, x, y) {
  if(missing(y)) {
    clouds <- dataset[[x]]
    cloudshadows <- dataset[[10]]
      CloudMask <- merge(clouds, cloudshadows)
        StudyAreaClean <- dropLayer(dataset, c(1, 2, 9:14))
        StudyAreaClean[CloudMask == 255] <- NA
          return (StudyAreaClean)
  } else {
    fill <- dataset[[y]]
      CloudMask <- merge(dataset[[9]], dataset[[10]], fill)
        StudyAreaClean <- dropLayer(dataset, c(1, 2, 9:14))
        StudyAreaClean[CloudMask == 255] <- NA
          return (StudyAreaClean)
  }
}
```



Calculate NDVI using ViCalc, output map and threshold graph

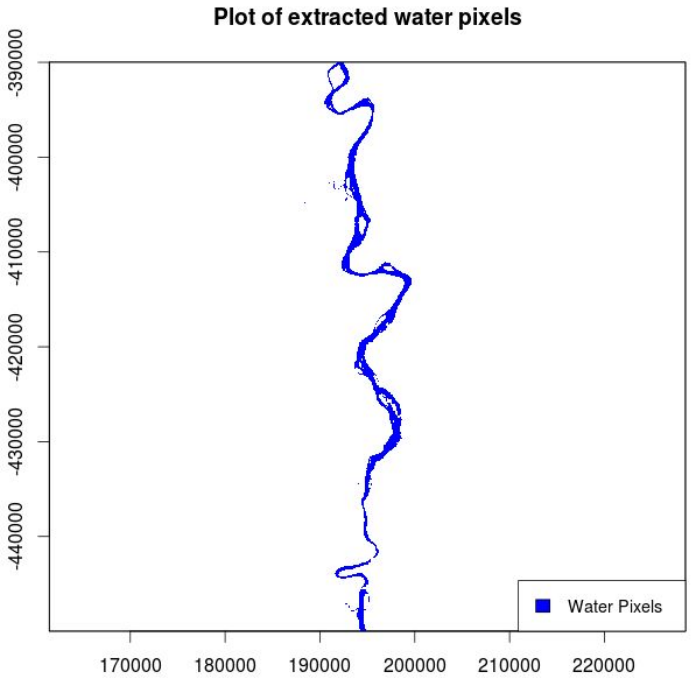
ViCalc

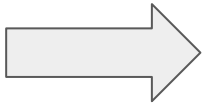


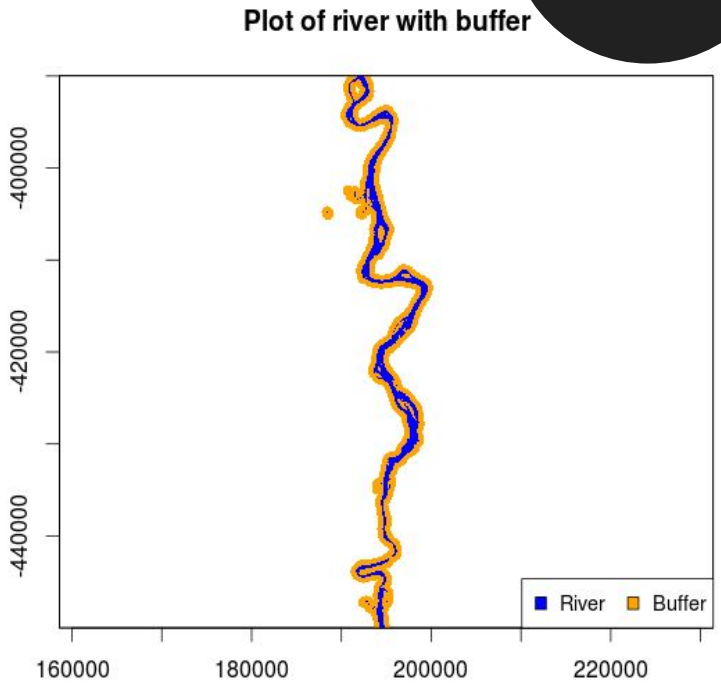


Extract water pixels and filter on area size using custom function and create variable buffer

River Extract







Automatic water pixel detection

Adataple buffer size

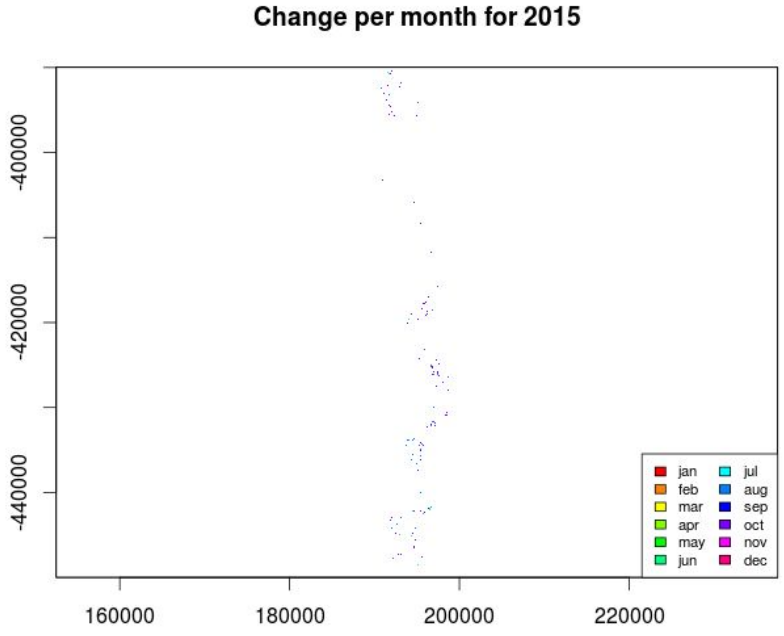
Read user's list of coordinates and determine if locations are inside riparian buffer zones.

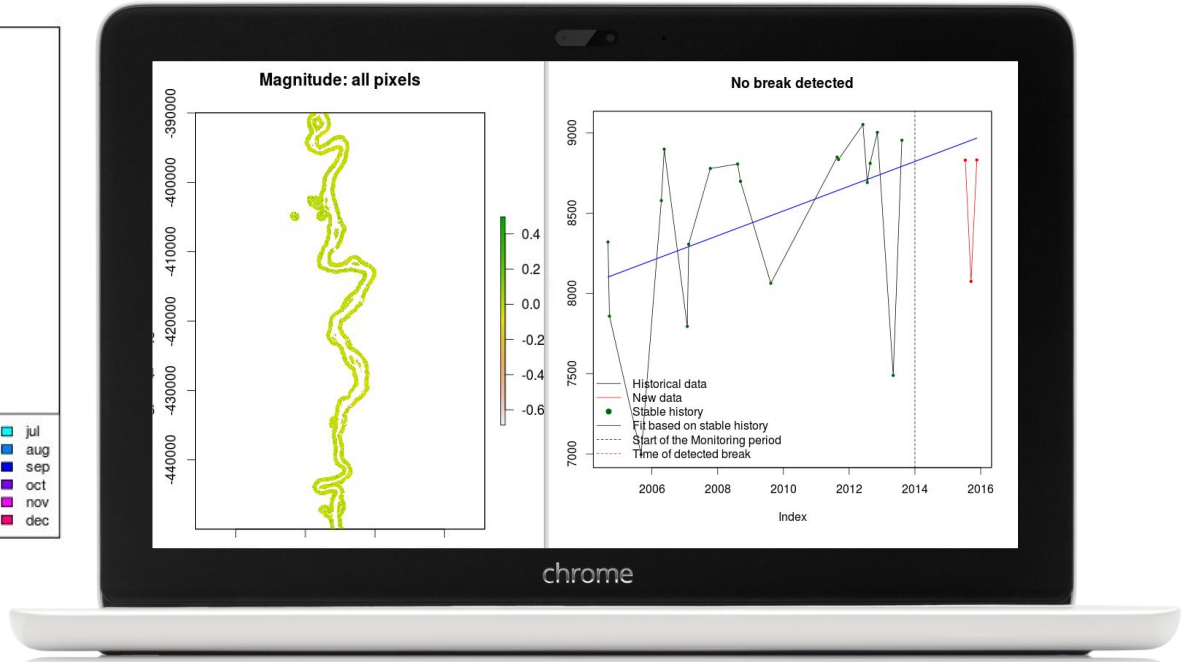
Return an interactive map showing the results

Leaflet

Deforestation monitoring in riparian buffer zones

Bfast
Spatial






RRRRRRRRRRRRRRRR iiii
R::::::::::::::::R i::::i
R::::::RRRRRR:::::R iiii
RR:::::R R:::::R
R::::R R:::::Riiiiiiippppp ppppppppp
R::::R R:::::Ri::::::ip:::ppp:::::::::p
R::::RRRRRR:::::R i::::ip:::::::::::::::::p
R:::::::::::::RR i::::ipp::::::ppppp::::::p
R::::RRRRRR:::::R i::::i p:::::p p:::::p
R::::R R:::::R i::::i p:::::p p:::::p
R::::R R:::::R i::::i p:::::p p:::::p
R::::R R:::::R i::::i p:::::p p:::::pa::::a a:::::a
RR:::::R R:::::Ri::::::ip:::::ppppp::::::pa::::a a:::::a
R::::::R R:::::Ri::::::ip::::::::::::::::p a:::::aaaa::::::a
R::::::R R:::::Ri::::::ip::::::::::::::pp a::::::::::aa:::ar:::::r
RRRRRRRR RRRRRRRiiiiiiiip::::::ppppppppp aaaaaaaaaa aaaarrrrrrr
p:::::p
p:::::p
p:::::::p
p:::::::p
p:::::::p
ppppppppp
iiii
i::::i
iiii
aaaaaaaaaaaaa rrrrr rrrrrrrrr iiiiiii aaaaaaaaaaaaa nnnn nnnnnnnn
a::::::::::::a r::::rrr:::::::::r i:::::i a::::::::::::a n:::nn::::::::nn
aaaaaaaaa:::::ar:::::::::::::::::r i::::i aaaaaaaaa:::::an::::::::::::::nn
a::::arr::::::rrrrr::::::ri::::i a::::ann::::::::::::::n
aaaaaaa:::::a r:::::r r:::::ri::::i aaaaaaa:::::a n:::::nnnn:::::n
aa::::::::::::a r:::::r rrrrrrri::::i aa::::::::::::a n::::n n::::n
a::::aaaa::::::a r:::::r i::::i a::::aaaa::::::a n::::n n::::n
a::::a a:::::a r:::::r i::::i a::::a a:::::a n::::n n::::n
a::::a a:::::a r:::::r i::::::ia::::a a:::::a n::::n n::::n
a::::aaaa::::::a r:::::r i::::::ia::::aaaa::::::a n::::n n::::n
aa::::::::::aa:::ar:::::r i::::::i a::::::::::aa:::a n::::n n::::n
aaaaaaaaaa aaaa rrrrrrr iiiiiiii aaaaaaaaaa aaaa nnnnnn nnnnnn

Questions?