

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

# Project Spatial Ecology in R

Galluzzi Filippo

## Real Color and Coordinates

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

## Introduction

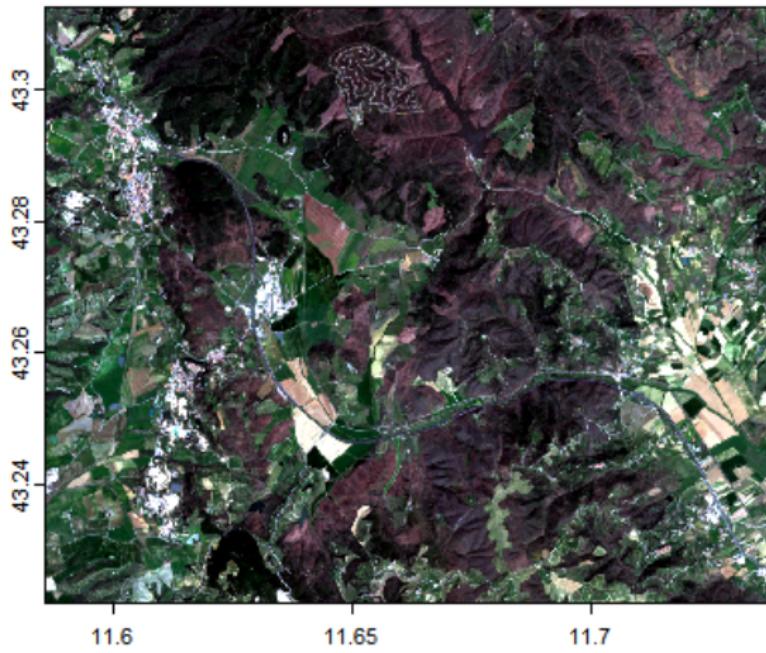
NDVI

## Vegetation

## PCs and Spatial Variability

## Classification

2022-2021



# Comparison Real Color Images April

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

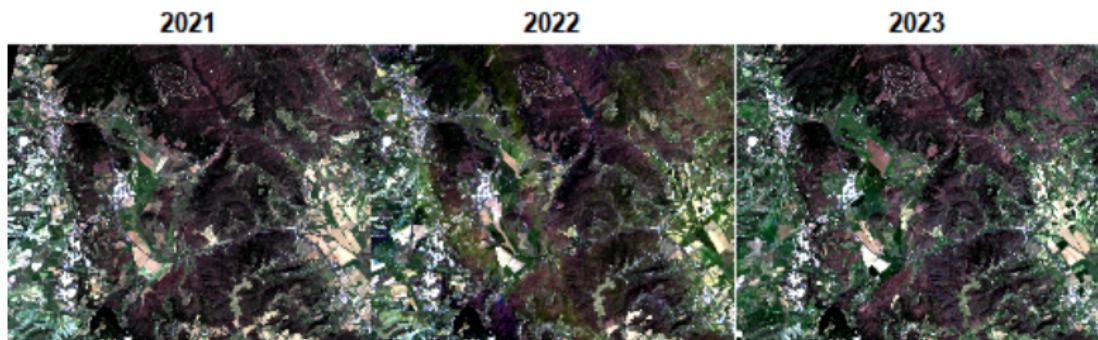
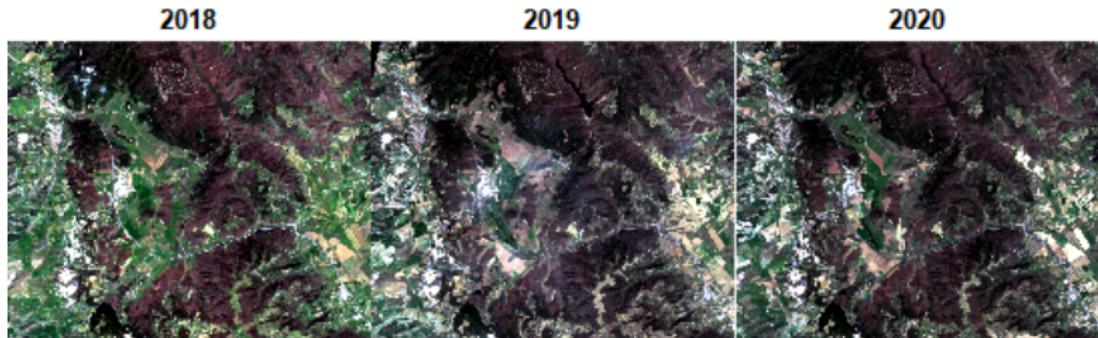
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



- NDVI
- Vegetation
- Principal Components and Spatial Variability
- Classification
- Monthly Comparison

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

# Normalized Difference Vegetation Index

# NDVI

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

```
ndvi18<-(S18_8-S18_4)/(S18_8+S18_4)  
ndvi19<-(S19_8-S19_4)/(S19_8+S19_4)  
ndvi20<-(S20_8-S20_4)/(S20_8+S20_4)  
ndvi21<-(S21_8-S21_4)/(S21_8+S21_4)  
ndvi22<-(S22_8-S22_4)/(S22_8+S22_4)  
ndvi23<-(S23_8-S23_4)/(S23_8+S23_4)
```

# Comparison NDVI for April

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

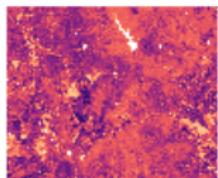
Vegetation

PCs and  
Spatial  
Variability

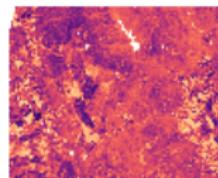
Classification

2022-2021

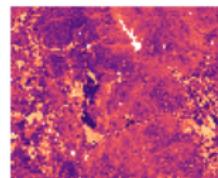
2018



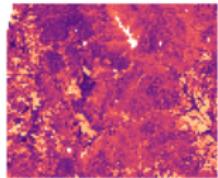
2019



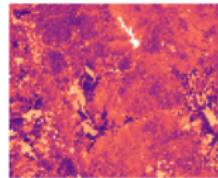
2020



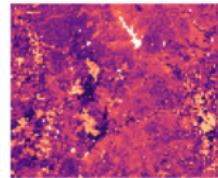
2021



2022



2023



# NDVI for April

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

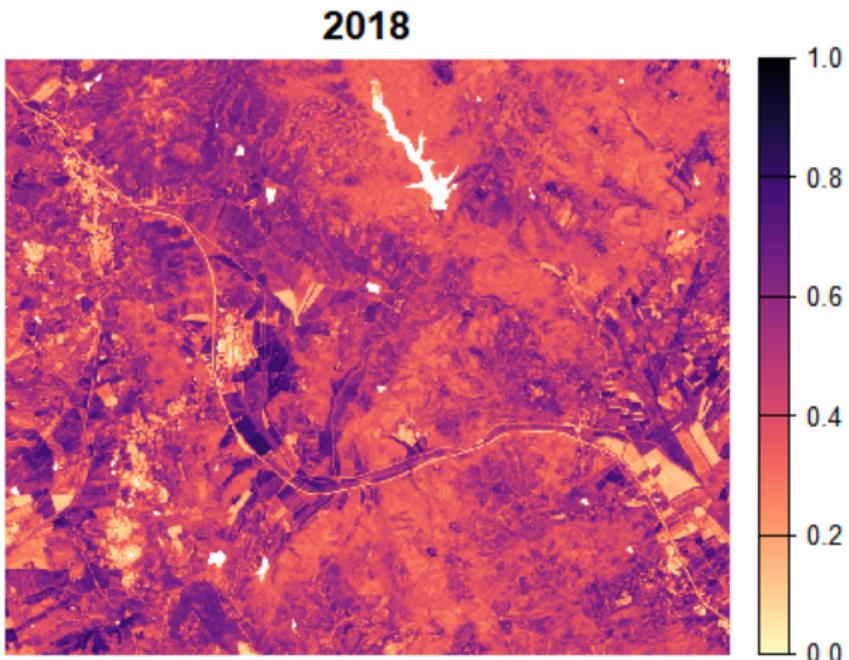
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# NDVI for April

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

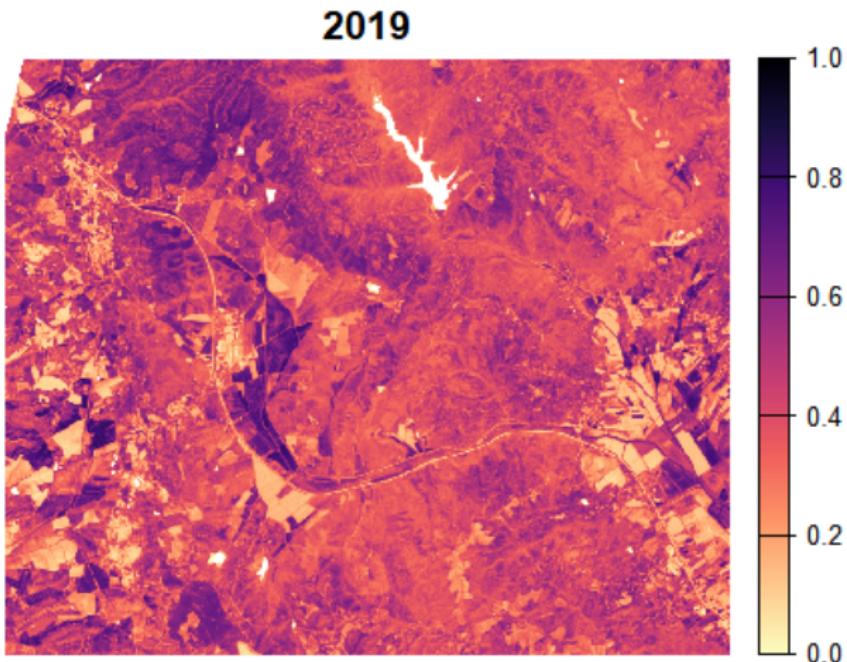
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# NDVI for April

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

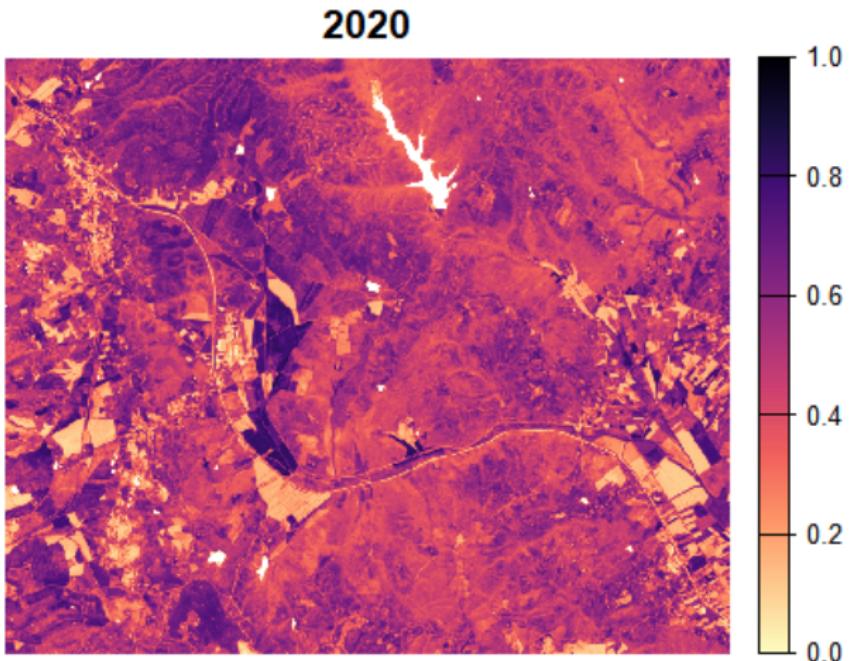
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# NDVI for April

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

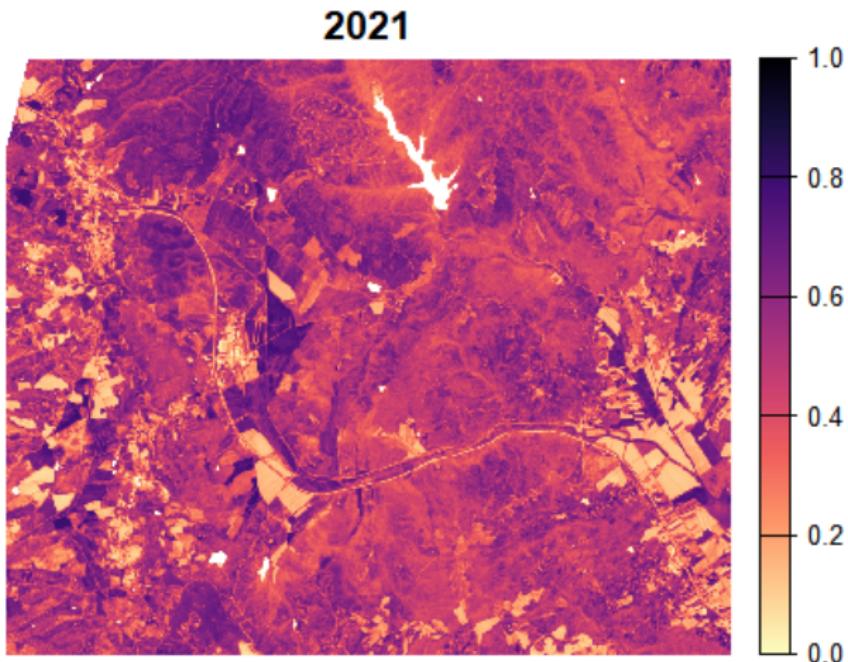
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# NDVI for April

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

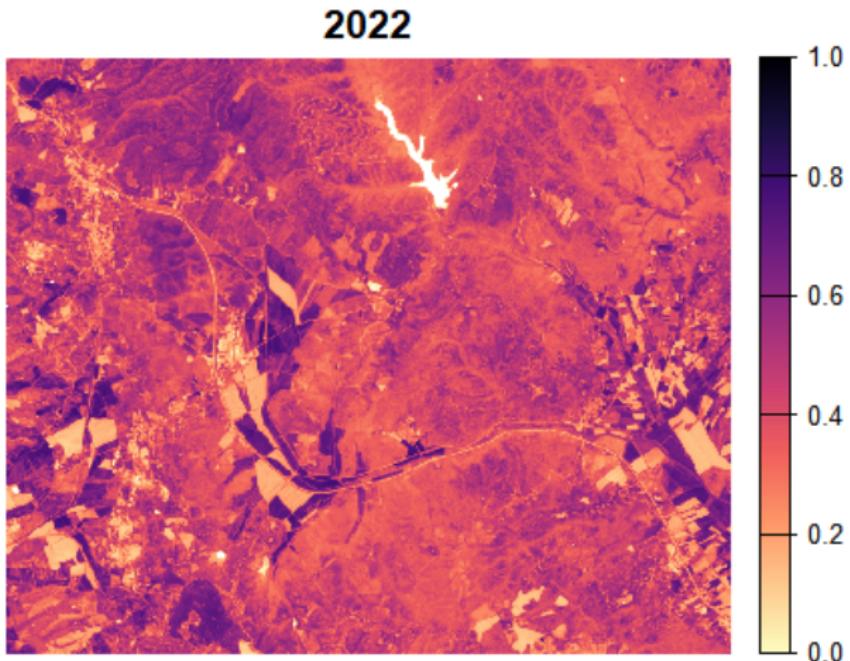
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# NDVI for April

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

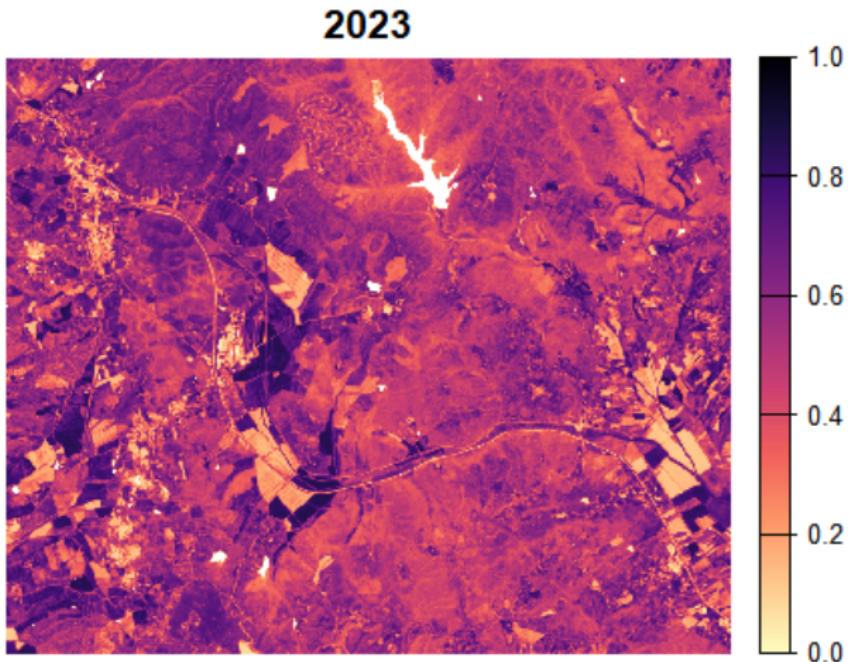
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Frequency Distribution

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

```
h18<-hist(ndvi18, main = "2018", xlab = "NDVI",
           col = "wheat", xlim = c(0, 1),
           ylim = c(0, 70000), breaks = 50, xaxt = "n",
           axis(side=1, at = seq(0, 1, 0.1),
                labels = seq(0, 1, 0.1)))
```

# Frequency Distribution of NDVI

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

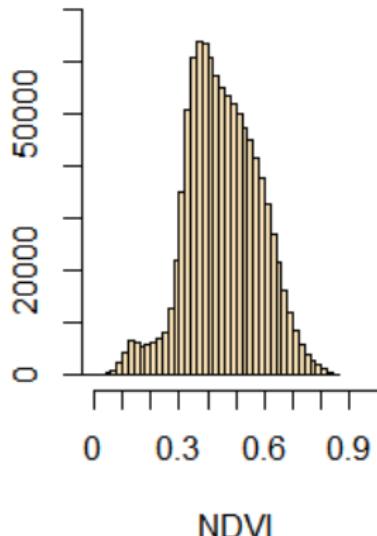
Vegetation

PCs and  
Spatial  
Variability

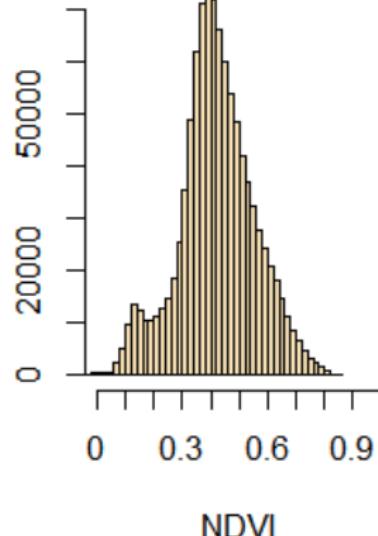
Classification

2022-2021

2018



2019



# Frequency Distribution of NDVI

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

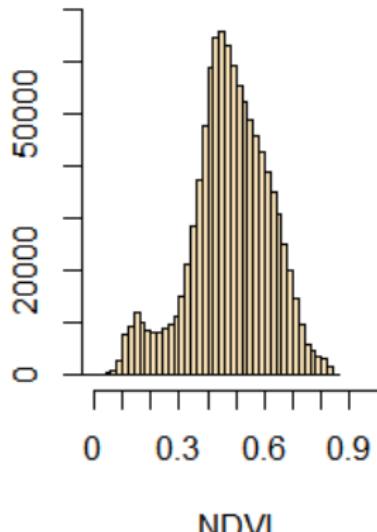
Vegetation

PCs and  
Spatial  
Variability

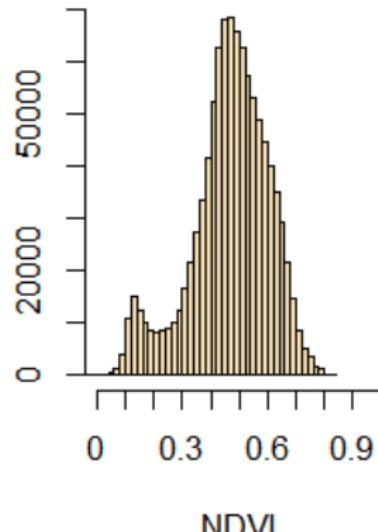
Classification

2022-2021

2020



2021



# Frequency Distributions of NDVI

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

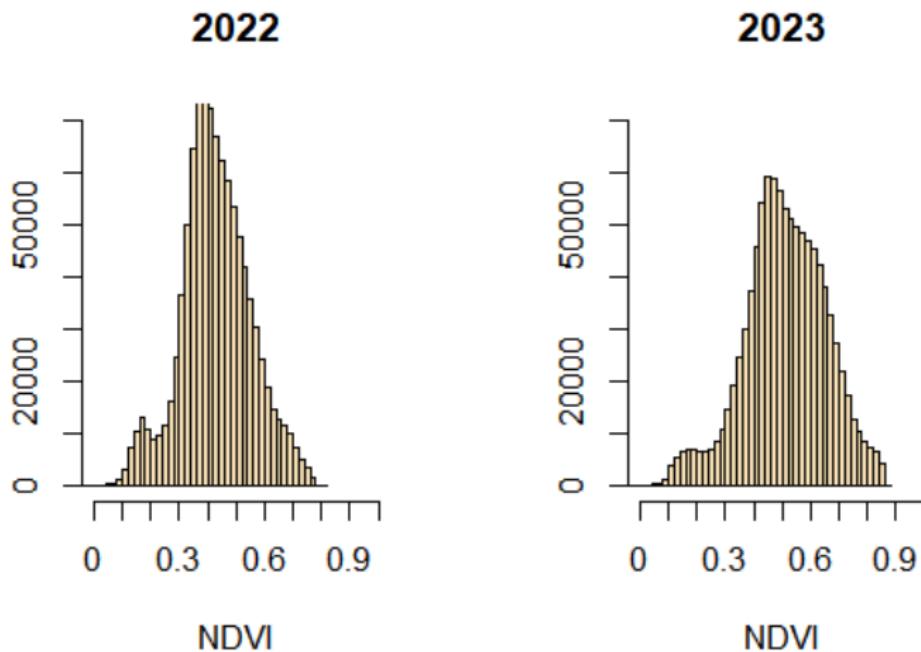
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# NDVI Trend

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

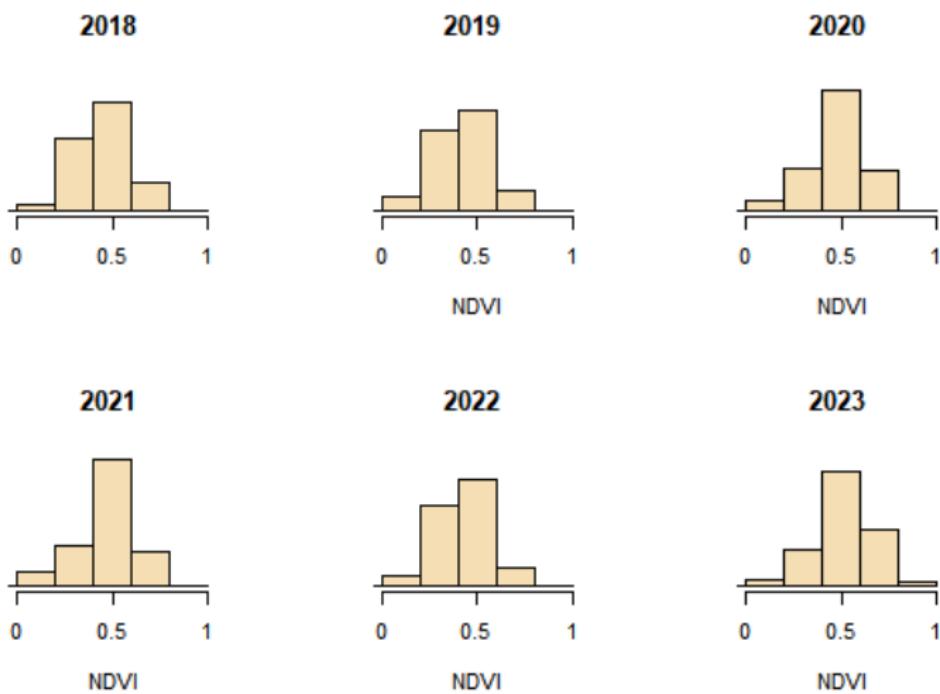
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

# Vegetation

# Vegetation Overlaps

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

2018

2019

2020



2021

2022

2023



# Vegetation Overlaps

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

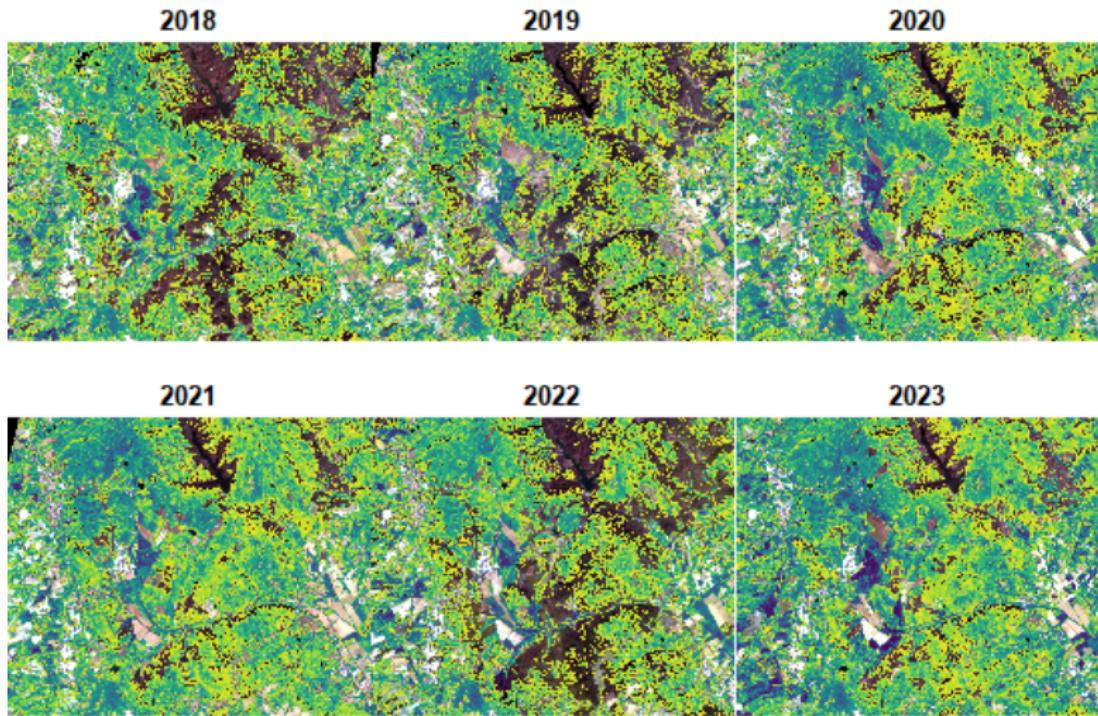
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# False Color Composite

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Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

By using (RGB) → (NIR,R,G), vegetation will be shown with a red tone

# 2018 False Color and Vegetation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

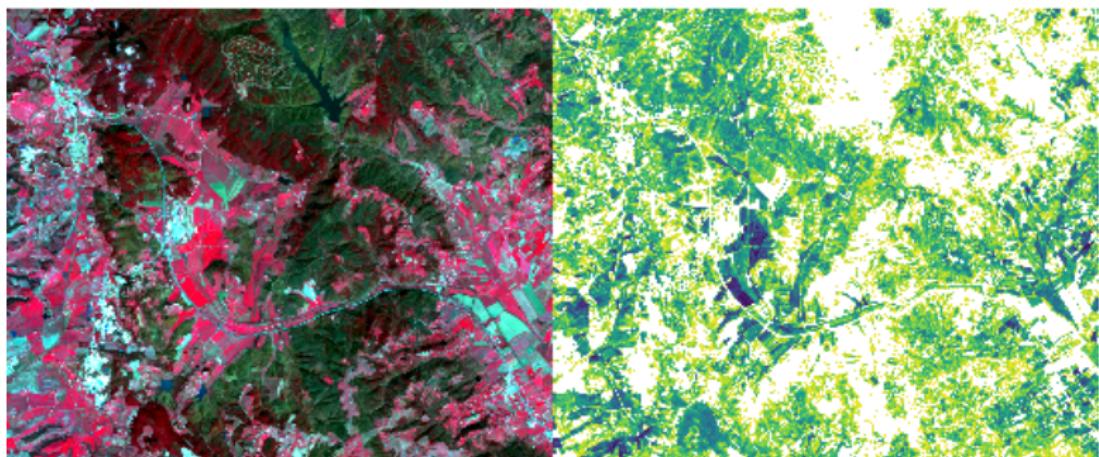
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# 2020 False Color and Vegetation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

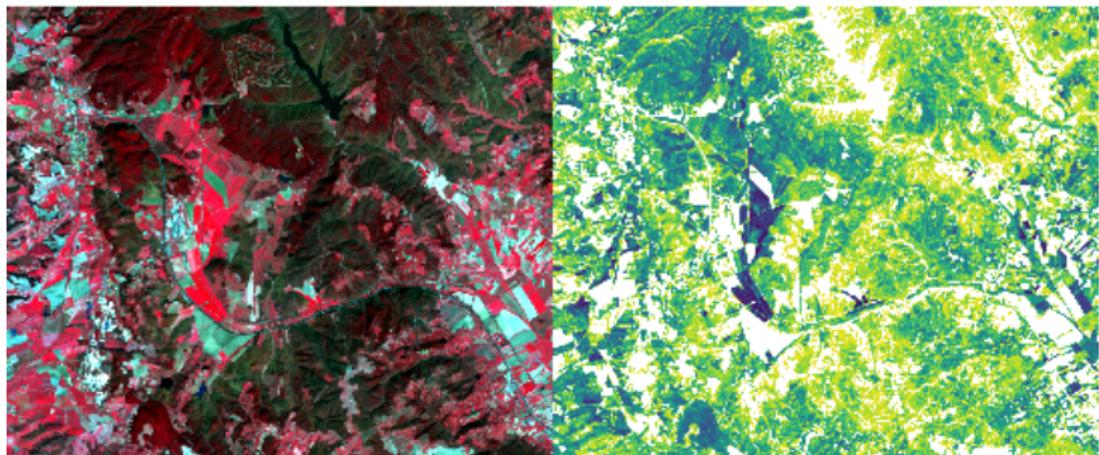
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# 2022 False Color and Vegetation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

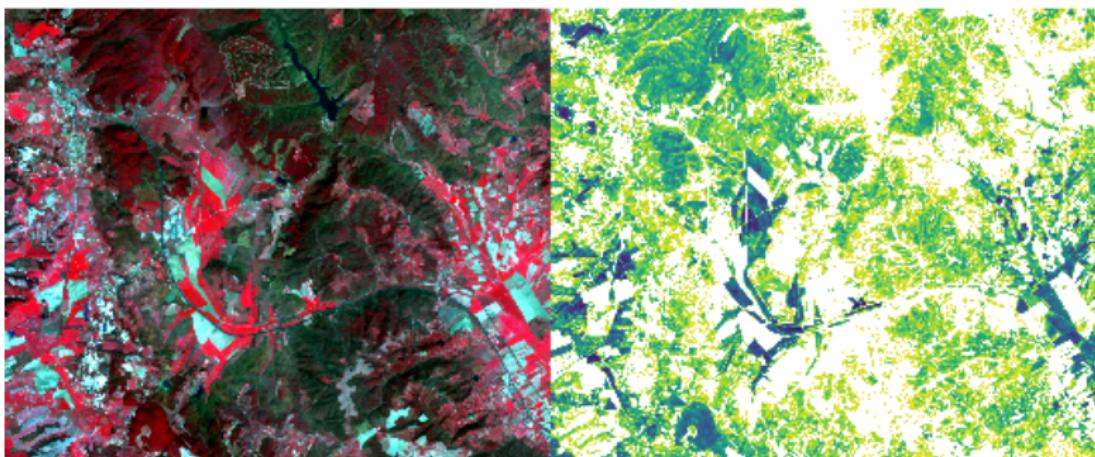
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Vegetation Trends

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

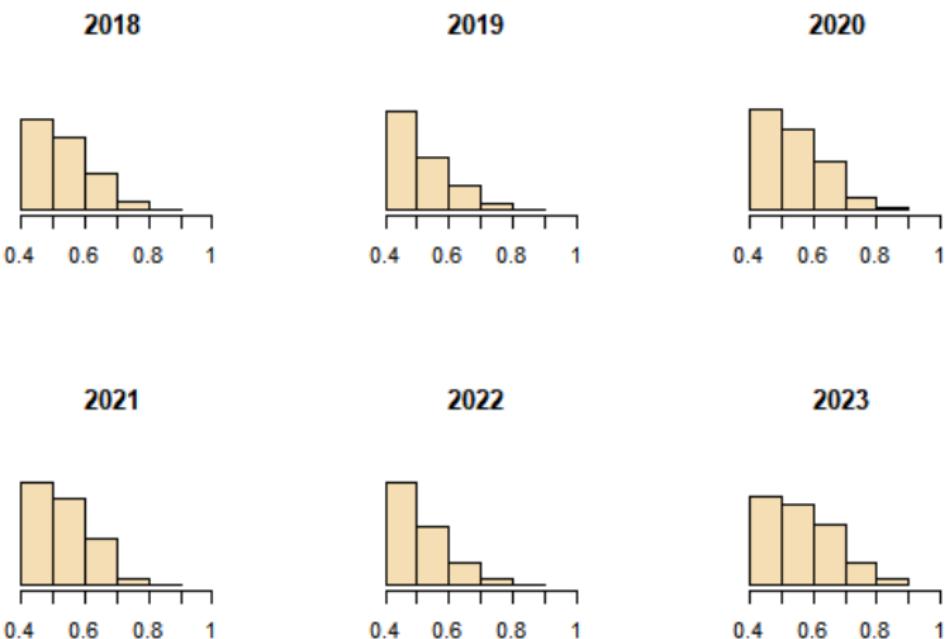
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Temporal Variation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

```
veg18 <- clamp(ndvi18, 0.4, values=FALSE)
veg19 <- clamp(ndvi19, 0.4, values=FALSE)
veg20 <- clamp(ndvi20, 0.4, values=FALSE)
veg21 <- clamp(ndvi21, 0.4, values=FALSE)
veg22 <- clamp(ndvi22, 0.4, values=FALSE)
veg23 <- clamp(ndvi23, 0.4, values=FALSE)

stack2<-c(veg18, veg19, veg20,
         veg21, veg22, veg23)
diff21=stack2[[2]] - stack2[[1]]
diff22=stack2[[3]] - stack2[[1]]
diff23=stack2[[4]] - stack2[[1]]
diff24=stack2[[5]] - stack2[[1]]
diff25=stack2[[6]] - stack2[[1]]
```

# Temporal Variation of Vegetation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

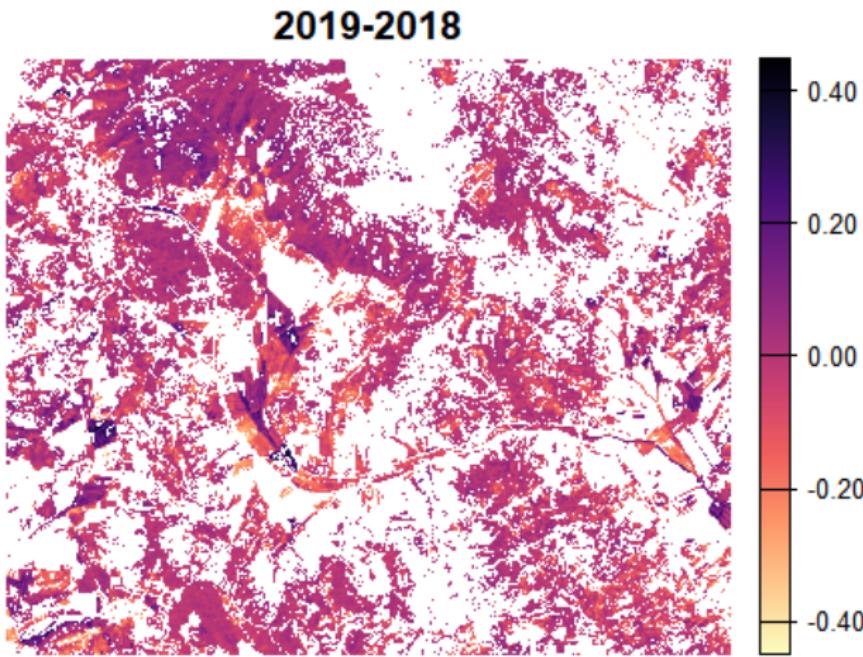
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Temporal Variation of Vegetation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

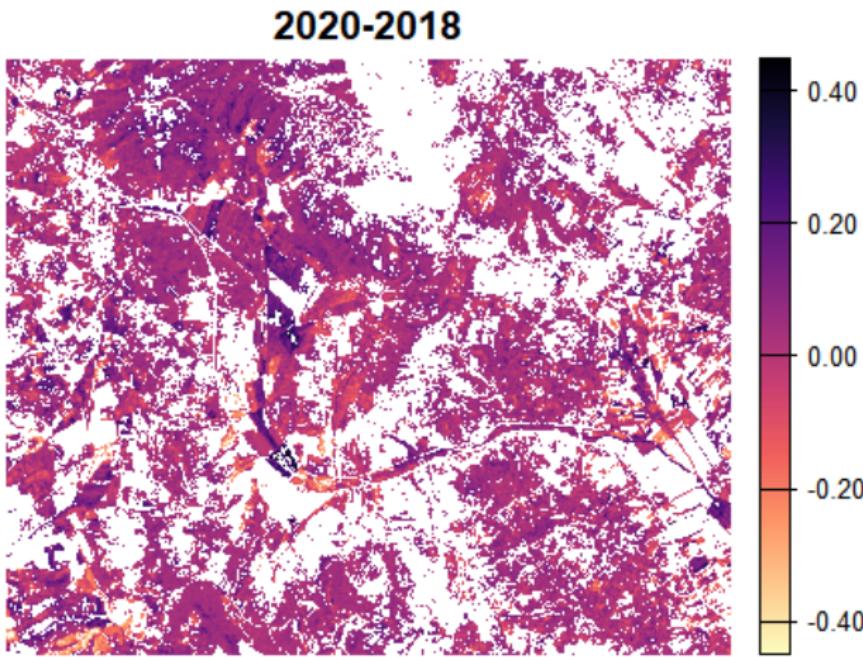
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Temporal Variation of Vegetation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

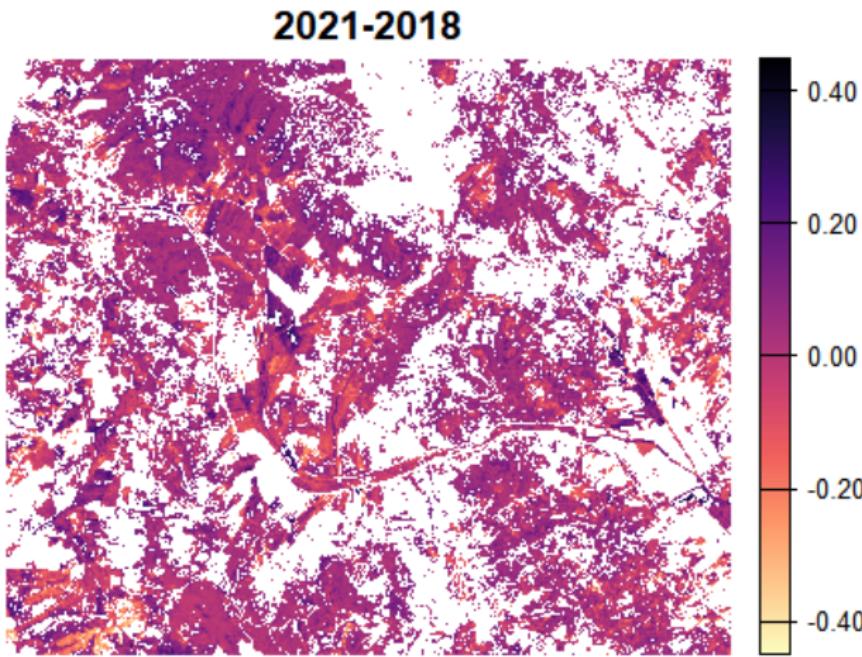
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Temporal Variation of Vegetation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

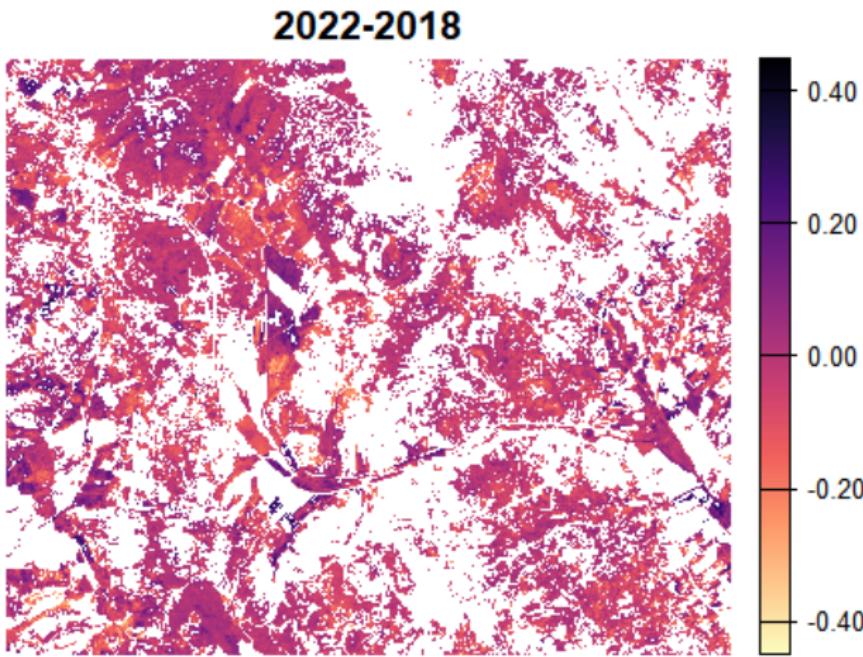
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Temporal Variation of Vegetation

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

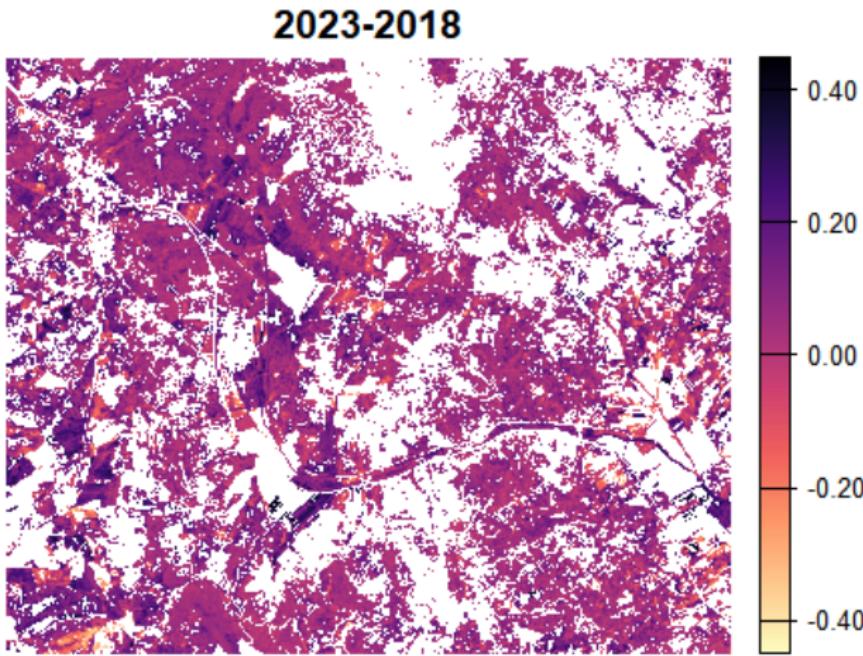
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

# Principal Components and Spatial Variability

# Principal Component

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

```
m <- matrix(1/49,7,7)
S18pc<-im.pca2(S18); S18_pc1<-S18pc$PC1
S18_pc1sdm<-focal(S18_pc1, m, fun=sd)
```

# First Principal Component

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Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

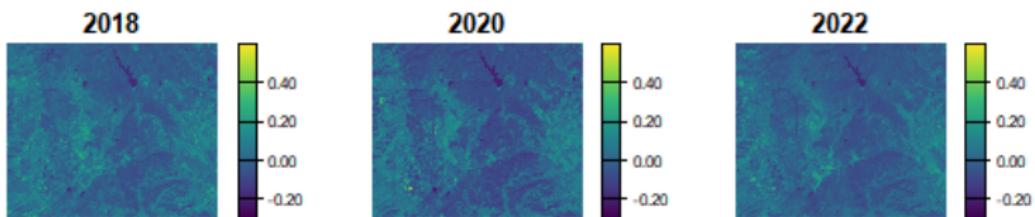
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Comparison NIR-PC1 2018

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

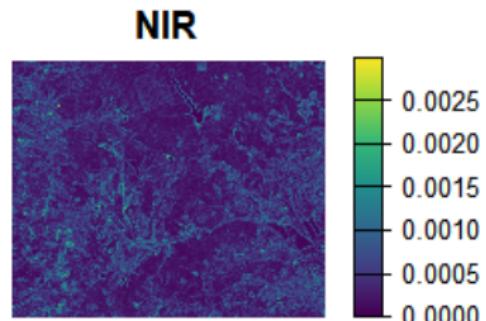
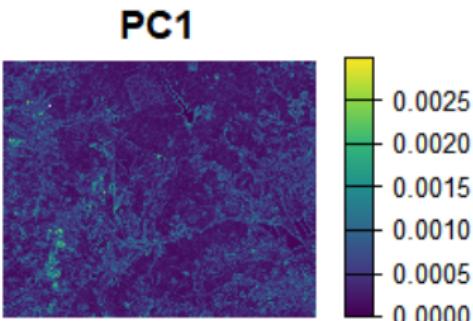
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Comparison NIR-PC1 2020

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

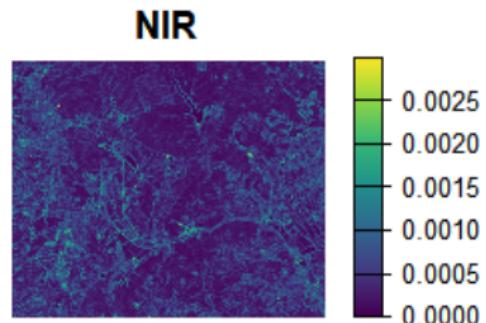
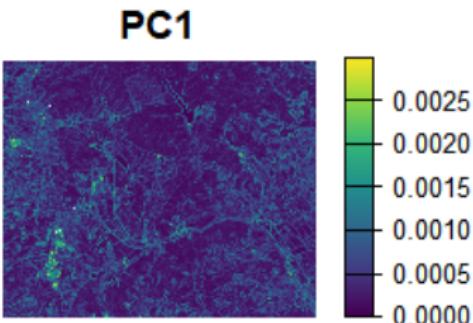
NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021



# Comparison NIR-PC1 2022

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

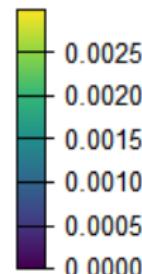
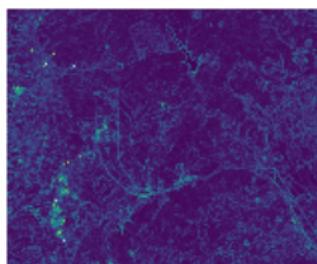
Vegetation

PCs and  
Spatial  
Variability

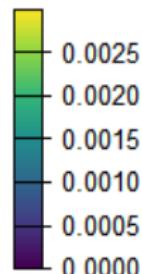
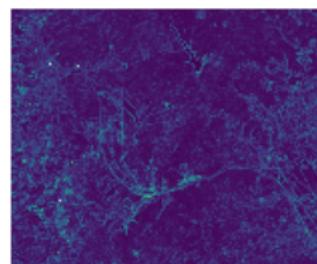
Classification

2022-2021

**PC1**



**NIR**



Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

# Classification

# April 2018

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

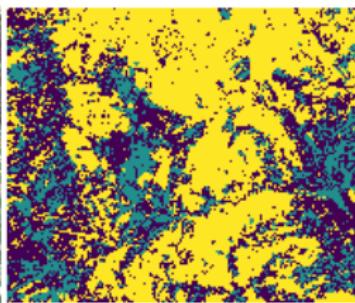
Classification

2022-2021

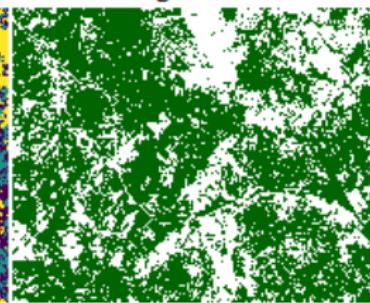
Real Colors



Classification



Vegetation



# April 2020

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

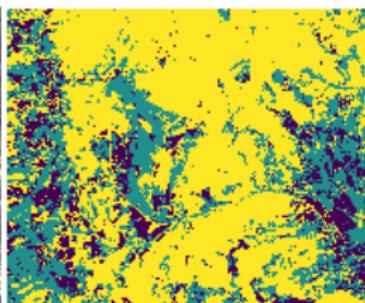
Classification

2022-2021

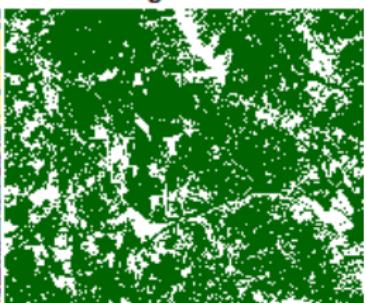
Real Colors



Classification



Vegetation



# April 2022

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

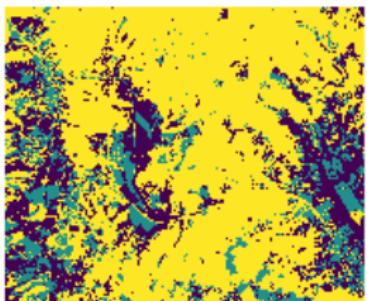
Classification

2022-2021

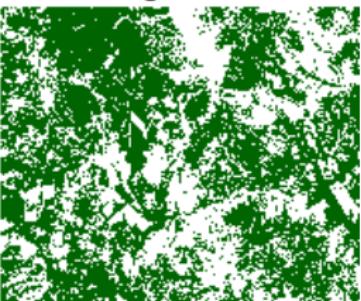
Real Colors



Classification



Vegetation



Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

# Monthly Comparison

# Real Color Images

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

January 2022



May 2022



September 2022



January 2021



May 2021



September 2021



# Vegetation Difference Spatial

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

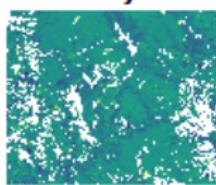
Jan



Mar



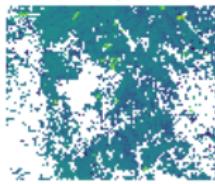
May



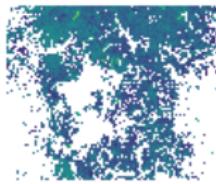
July



Sept



Nov



# Vegetation Difference

Project  
Spatial  
Ecology in R

Galluzzi  
Filippo

Introduction

NDVI

Vegetation

PCs and  
Spatial  
Variability

Classification

2022-2021

