

Analysis of temporal changes in Italian most threatened habitats using Remote Sensing

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Coastal dune ecosystems



Biodiversity conservation

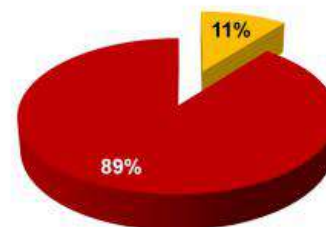


Ecosystem services



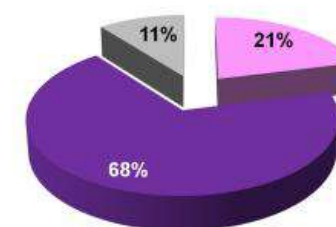
Protection from effects of
climate changes

A - Overall Assessment



U1 - Unfavourable Inadequate
U2 - Unfavourable Bad

B - Overall Trend



Stable
Deteriorating
Unknown



Habitat Directive 92/43/EEC

Coastal dunes monitoring

Resurveying historical vegetation plots



Assessing vegetation temporal changes



State of
the art

Aims

Methods

1° year

2° year

3° year

Expected
results

Remote Sensing



Advantages

- Free high-resolution imagery
- Spatial contiguous data at fixed intervals
- Replicability

Possible conservation implications

- Monitor threatened habitats at different spectral and spatial scales
→ reduced costs and time

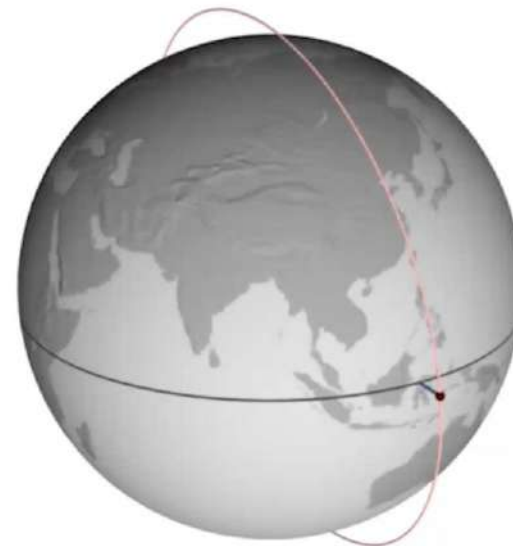
Remote Sensing

- **Spatial resolution**
- Temporal resolution
- Spectral resolution



Remote Sensing

- Spatial resolution
- **Temporal resolution**
- Spectral resolution



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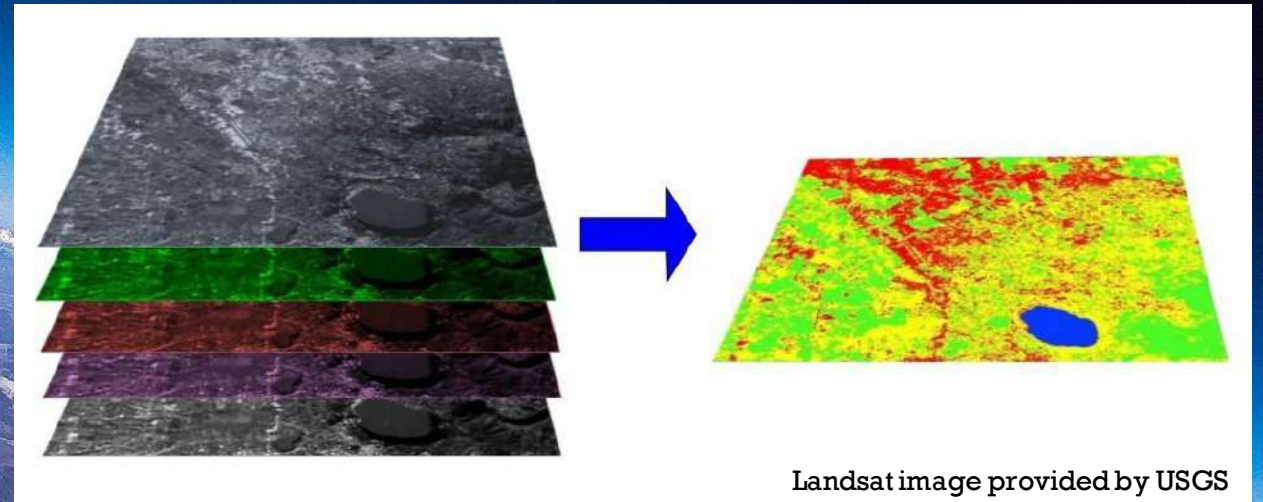
Remote Sensing

- Spatial resolution
- Temporal resolution
- **Spectral resolution**

RGB Orthophotos



Multispectral images



Landsat image provided by USGS

Remote Sensing

- Combine **temporal landscape and vegetation changes** in Italy

→ few studies

Plant Biosystems, 2014
Vol. 148, No. 2, 227–236, <http://dx.doi.org/10.1080/11263504.2013.788572>



Diachronic analysis (1954–2010) of transformations of the dune habitat in a stretch of the Northern Tyrrhenian Coast (Italy)

A. BERTACCHI & T. LOMBARDI

J Coast Conserv (2015) 19:199–212
DOI 10.1007/s11852-015-0381-0

The role of natural vegetation in the analysis of the spatio-temporal changes of coastal dune system: a case study in Sicily

Saverio Sciandrello^{1,2} • Giovanna Tomaselli² • Pietro Minissale¹

Ecosystems (2016) 19: 850–864
DOI: 10.1007/s10021-016-9971-4

ECOSYSTEMS



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Multifaceted Analysis of Patch-Level Plant Diversity in Response to Landscape Spatial Pattern and History on Mediterranean Dunes

Marco Malavasi,^{1*} Luisa Conti,² Marta Carboni,³ Maurizio Cutini,² and Alicia T. R. Acosta²

State of
the art

Aims

Methods

1° year

2° year

3° year

Expected
results

Aims

1988



Monitoring long-term temporal dynamics of coastal dunes across **local**, **regional** and **national** spatial scale by using Remote Sensing



Evaluate **temporal landscape** changes in coastal areas



Investigate the **relationship** between *Remote Sensing* and *vegetation data* in the last decades

2023

0 25 50 m

State of
the art

Aims

Methods

1° year

2° year

3° year

Expected
results

Methods

1988

19880711

19880711

17/07/98

17/07/98

2023

07/2023

0 25 50 m

Use **contemporary** and **past** satellite and airborne imagery for monitoring **long-term temporal trends** of coastal habitats

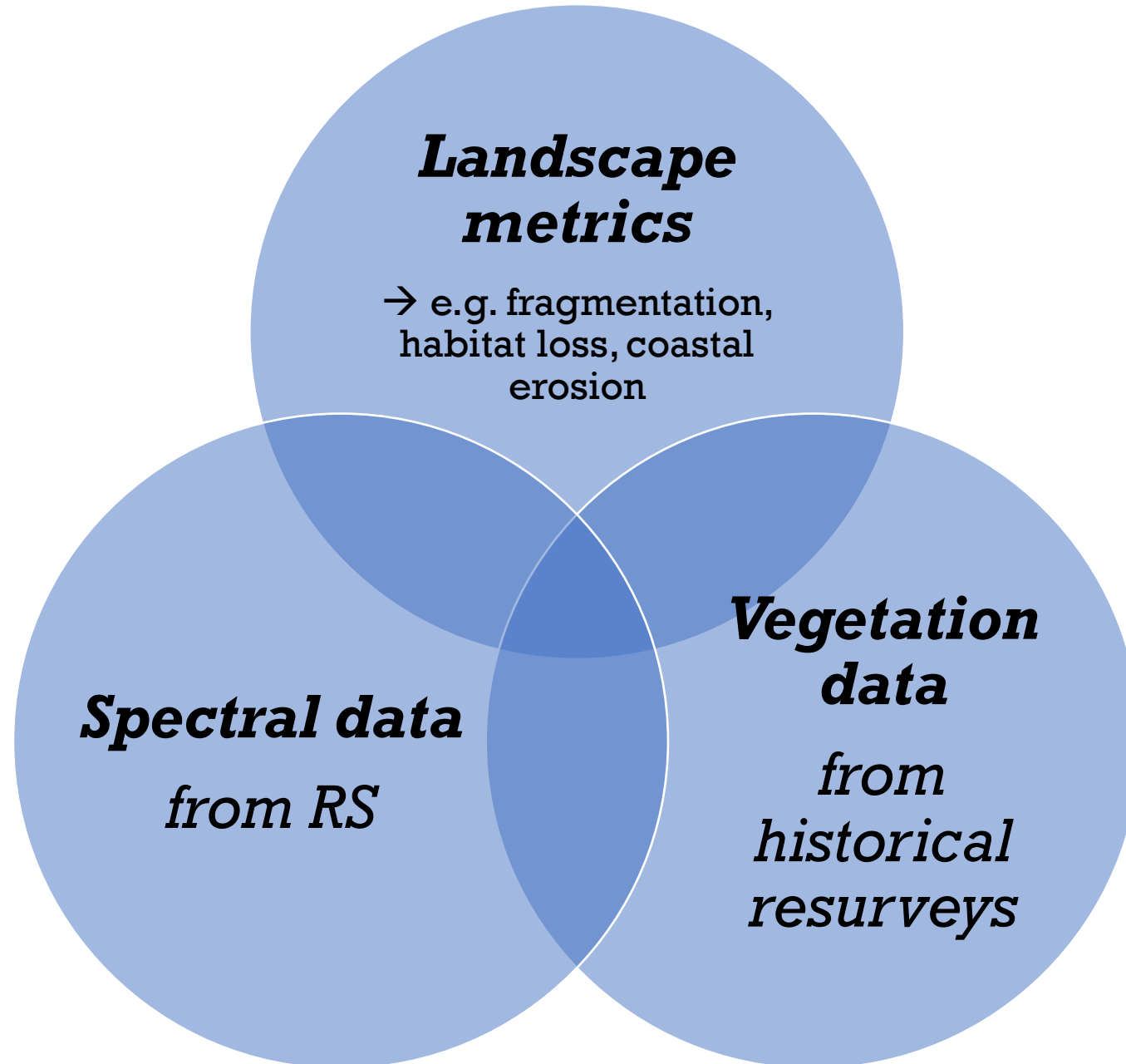
Explore different spatial, temporal and spectral resolutions

Compare with **resurveyed historical vegetation plots** data



Remote Sensing resurveys

Methods



Methods

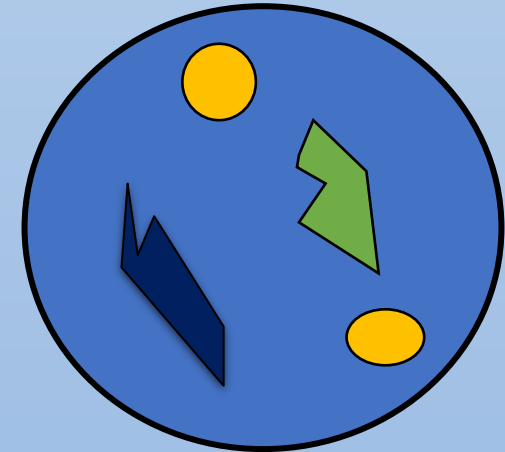
Landscape metrics

→ e.g. fragmentation,
habitat loss, coastal
erosion

***Spectral data
from RS***

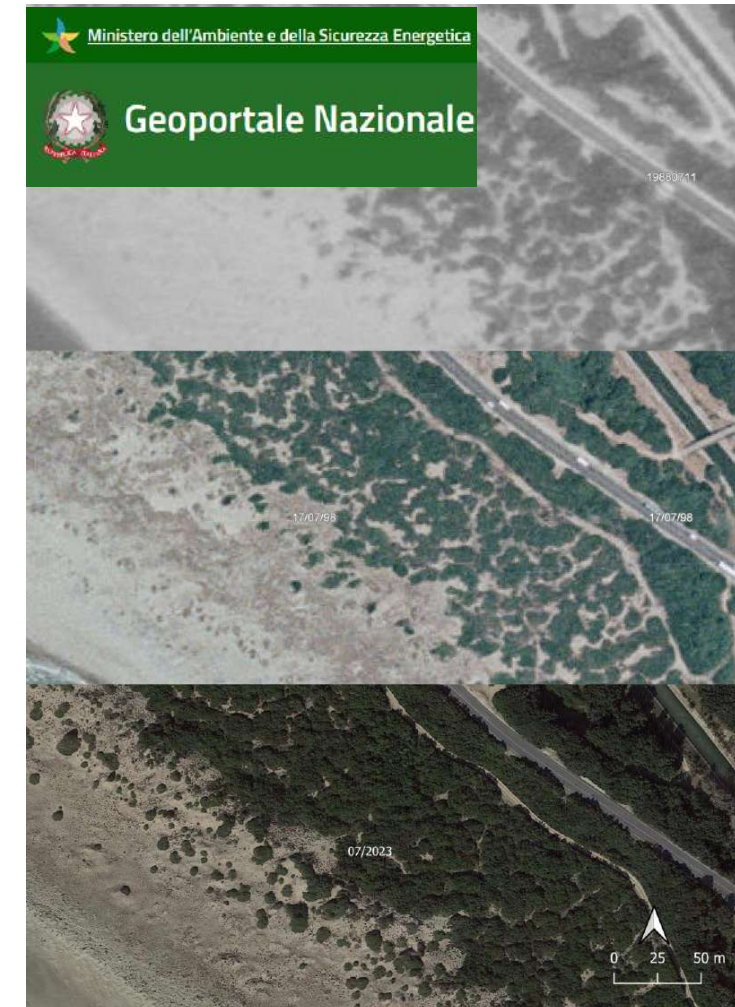
***Vegetation
data
from
historical
resurveys***

For example:

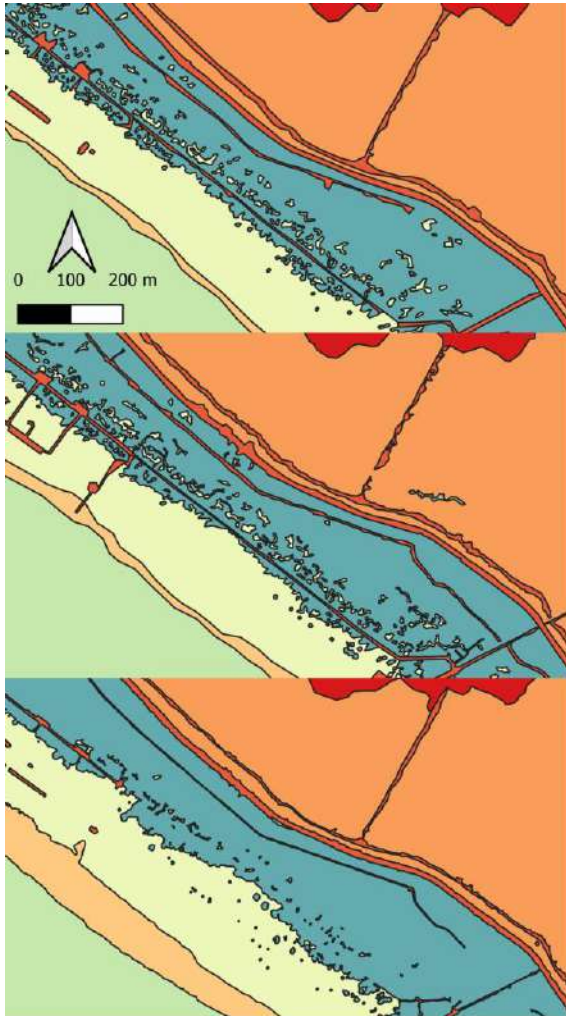


PLand (% of landcover)
Mean Patch Area
Patch density
Edge Density

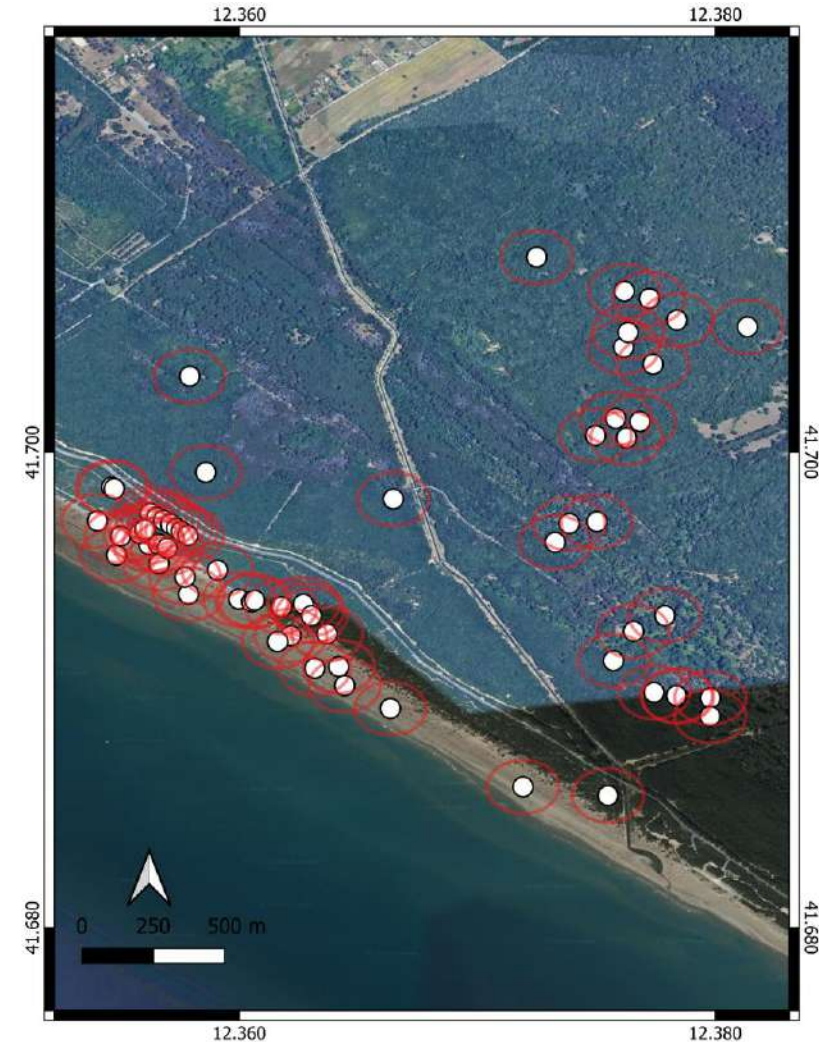
Analysis of temporal trends in the last 35 years by using Remote Sensing in *Castelporziano Presidential estate*



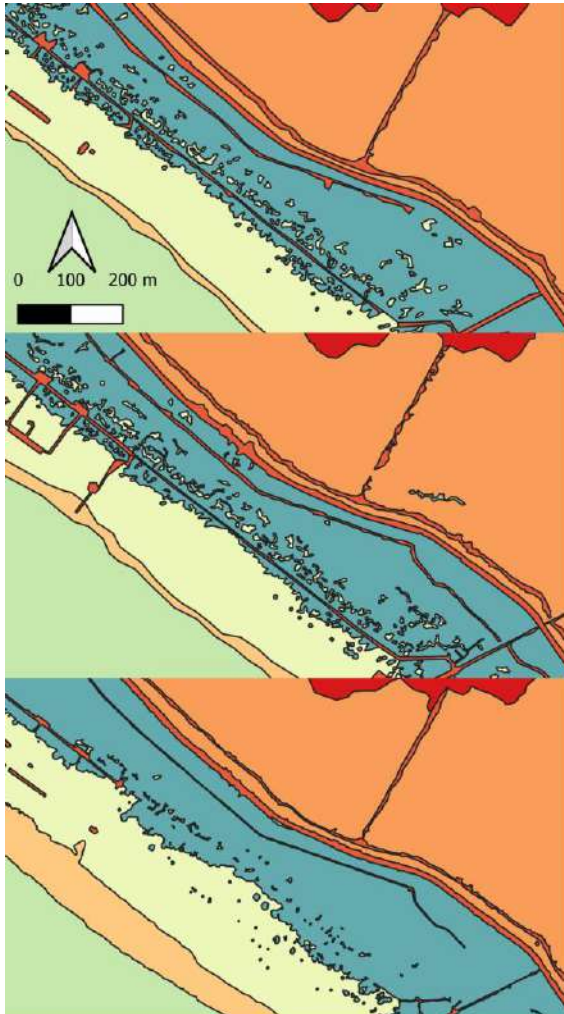
Analysis of temporal trends in the last 35 years by using Remote Sensing in *Castelporziano Presidential estate*



1988 vs 1998 vs 2023
aerial orthophotos for
photo-interpretation
→ landscape metrics
on buffers around 58
resurveyed
vegetation plots



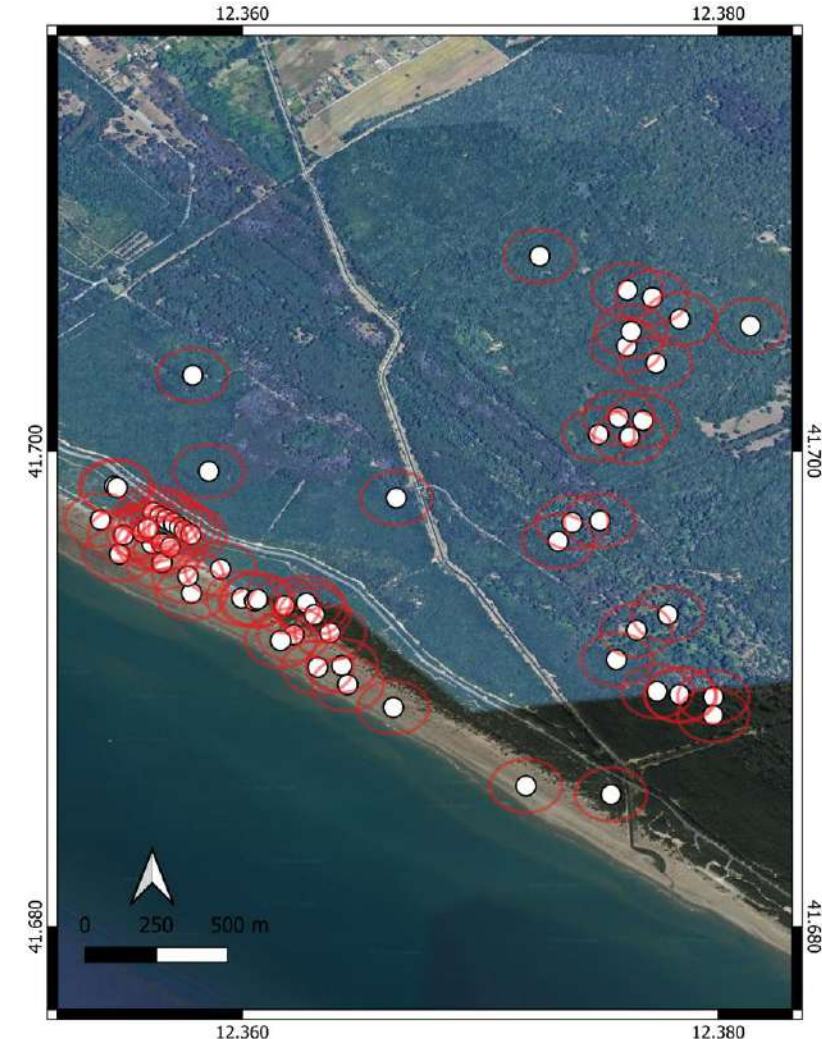
Analysis of temporal trends in the last 35 years by using Remote Sensing in *Castelporziano Presidential estate*



1988 vs 1998 vs 2023
aerial orthophotos for
photo-interpretation
→ landscape metrics
on buffers around 65
resurveyed
vegetation plots

*How the coastal habitats have changed
during the years?*

*What kind of relationship exists between
landscape and vegetation changes?*



Monitoring of temporal trends of coastal dunes by using Remote Sensing in Central Italy

Multispectral images
(e.g. Sentinel 2 or
Planetscope)
last 10 years

- RS resurveys

Use proxies of large
scale ecological
processes

- Plant diversity
- Productivity
- Vegetation indices

Analyze the
relationship
between spectral
and vegetation data

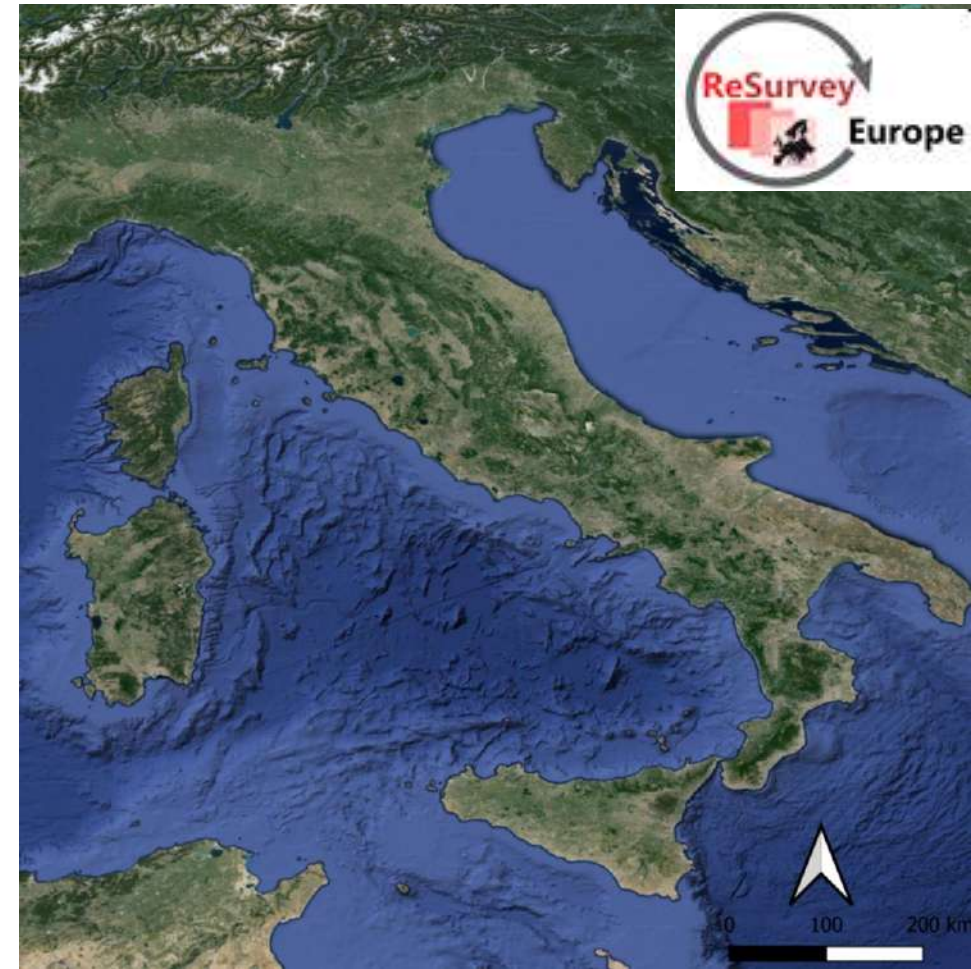


Analysis of temporal trends in coastal dunes by using Remote Sensing at National scale

Long term multispectral data (such as Landsat) for resurveying historical vegetation plots with RS



Study the **relationship** between **large scale landscape changes** (as coastal erosion and urbanization) and **vegetation data** from resurveys



State of
the art

Aims

Methods

1° year

2° year

3° year

Expected
results

In a nutshell



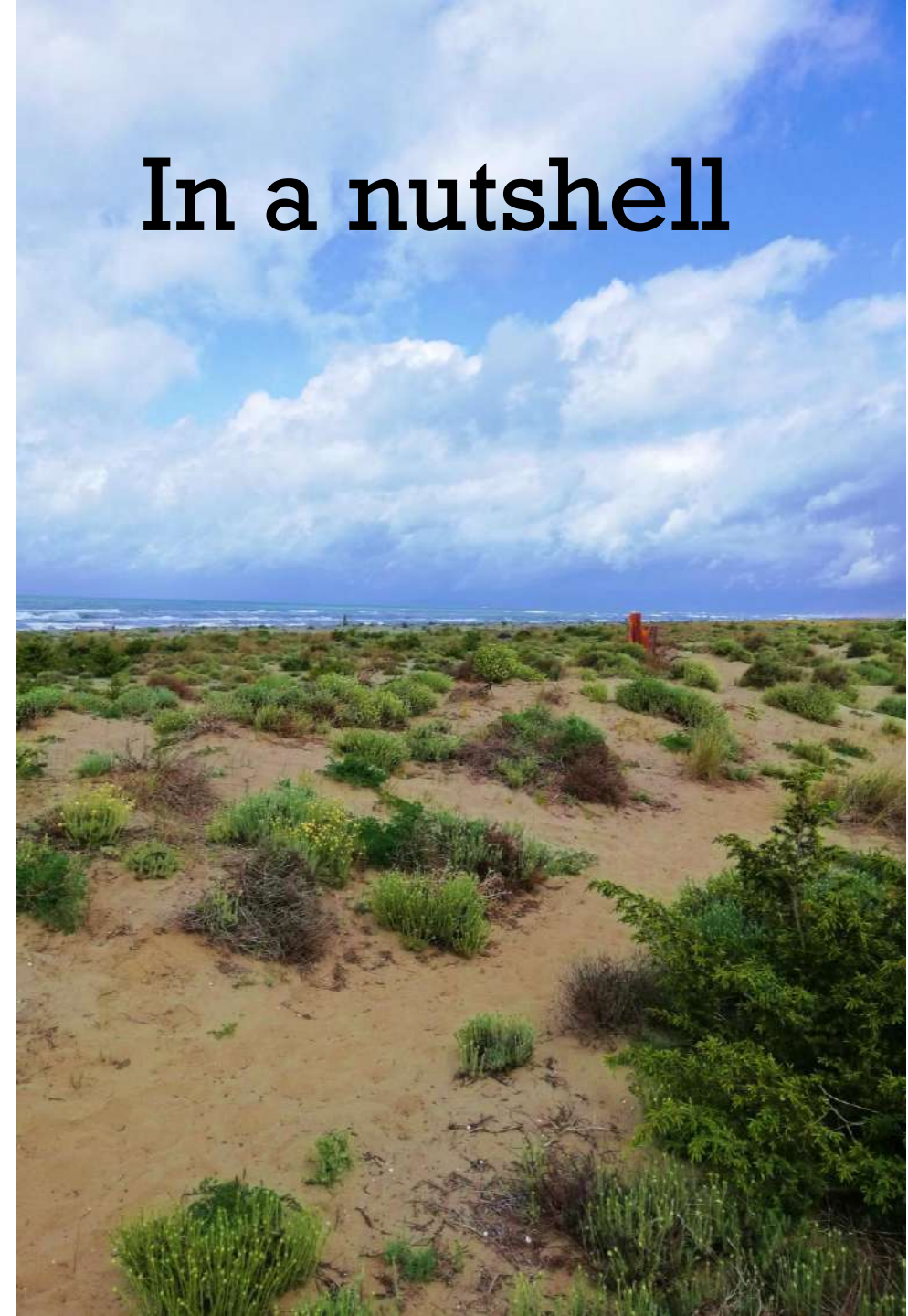
Monitor biodiversity trends and anthropogenic impacts on coastal habitats at different spatial scales



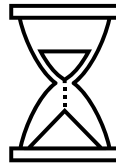
Evaluating the different impacts on the different habitats



Suggest monitoring and management strategies for conserving biodiversity



Time schedule

[illegible]

Thank you for your attention

