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***Ambrosia psilostachya* DC. (Asteraceae):**
the almost unknown ragweed gaining ground

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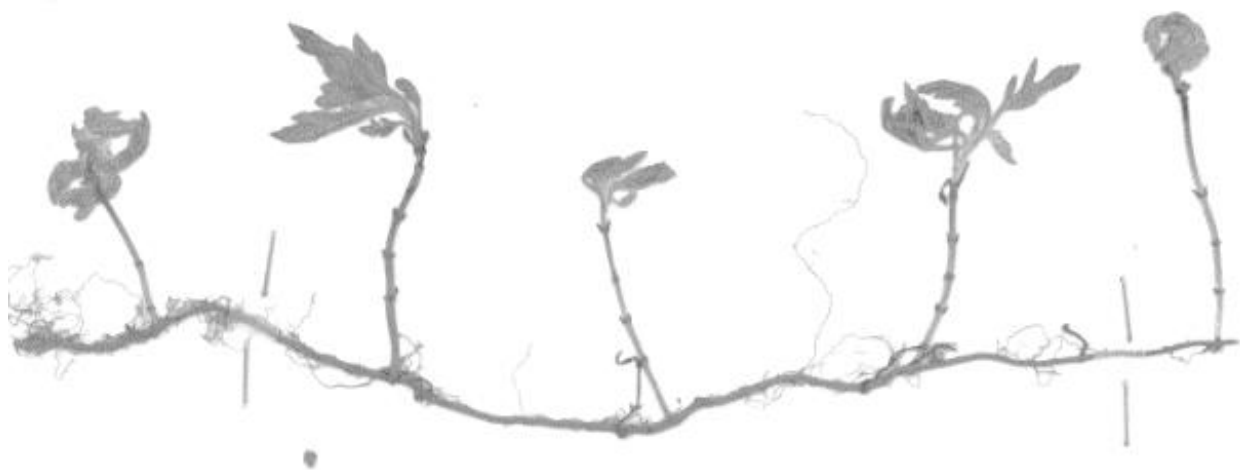


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***Ambrosia psilostachya*:**

- perennial ragweed
- Key to spread and naturalization (invasion): resistant belowground rhizome (→ a very good re-sprouting capacity in case of damages, adverse climatic conditions, etc.) + vegetative propagation



Who ?



Montagnani C. et al., *Ambrosia psilostachya* DC. (Asteraceae): the almost unknown ragweed gaining ground





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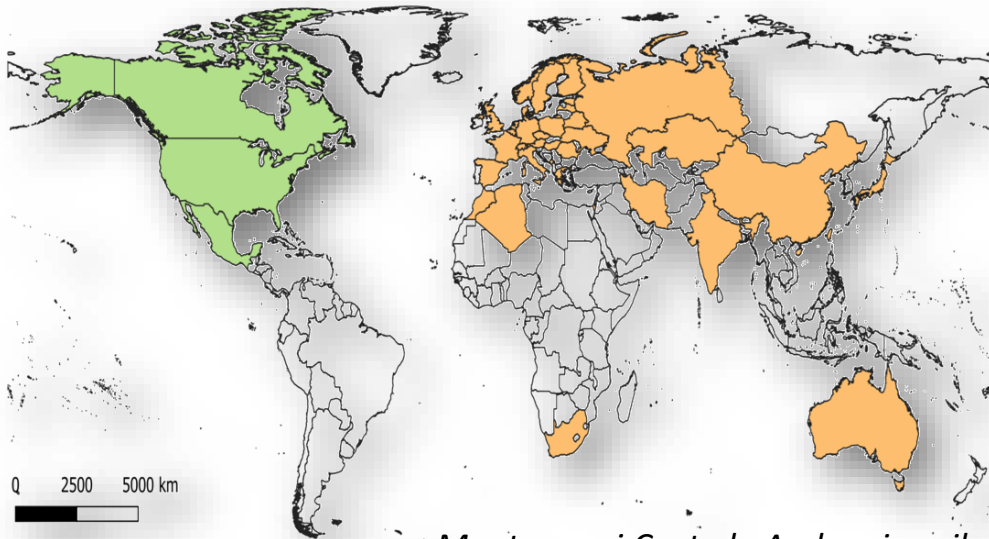
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Where?

A. *psilostachya*:

- Native to Western North America
- occurs in all continents (except Antarctica), listed as exotic species in almost 40 countries in the world
- Habitats in invasive range: dunes, along rivers and roads, open woods, croplands, wastelands
- "sand-loving" and halophytic species



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Relevant impacts also in natural environments

A. *psilostachya*

- great ability to colonize and persist in natural and semi-natural habitats,
- competition with resident species also in phytocoenoses of conservation concern (e.g. coastal sand dune systems)

Revue d'Ecologie (Terre et Vie), Vol. 70 (suppl 12 « Espèces invasives »), 2015 : 53-67

ECOLOGY AND IMPACT OF AN EMERGING INVASIVE SPECIES IN FRANCE:
WESTERN RAGWEED (*AMBROSIA PSILOSTACHYA* DC.)

Guillaume FRIED^{1*}, Aurélien BELAUD¹ & Bruno CHAUVEL^{2,3}

Biol Invasions (2021) 23:2435–2449
<https://doi.org/10.1007/s10530-021-02515-6>



ORIGINAL PAPER

Quantifying the potential impact of alien plants of Iran using the Generic Impact Scoring System (GISS) and Environmental Impact Classification for Alien Taxa (EICAT)

Sima Sohrabi · Jan Pergl · Petr Pyšek · Llewellyn C. Foxcroft · Javid Gharekhloo



AoB PLANTS

The open-access
journal for plant sciences

Research Article

The use of plant community attributes to detect habitat quality in coastal environments

Silvia Del Vecchio,* Antonio Slaviero, Edy Fantinato and Gabriella Buffa
Centre for Estuarine and Marine Studies, DAIS, University Ca' Foscari of Venice, Castello 2737b, 30122 Venice, Italy
Received: 6 August 2015; Accepted: 11 May 2016; Published: 2 June 2016

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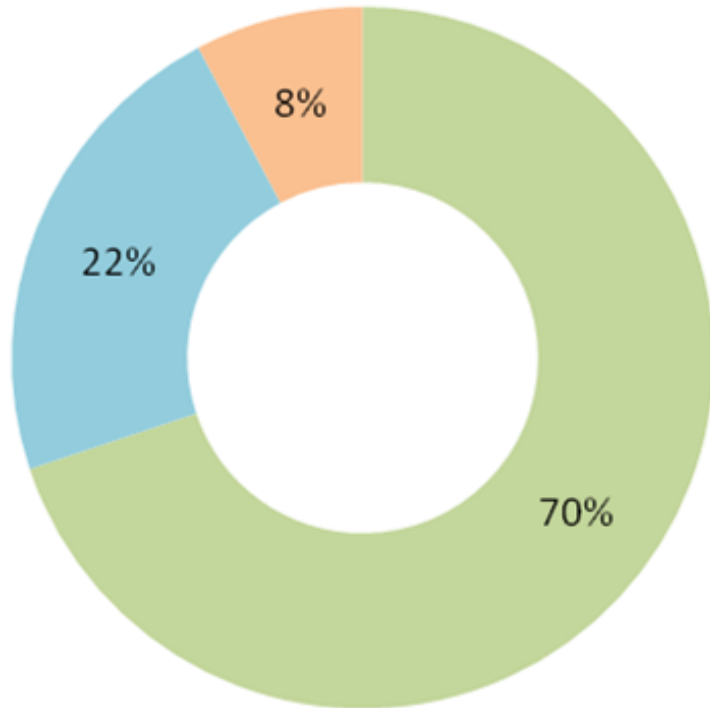
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Overlooked? Maybe misidentified...

Number of studies (2010-2022)

■ *A. artemisiifolia* ■ *A. trifida* ■ *A. psilostachya*



A. artemisiifolia



A. x intergradiens
(*A. artemisiifolia* x *A. psilostachya*)



A. maritima



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Herbarium and field data: revision in Italy and Europe



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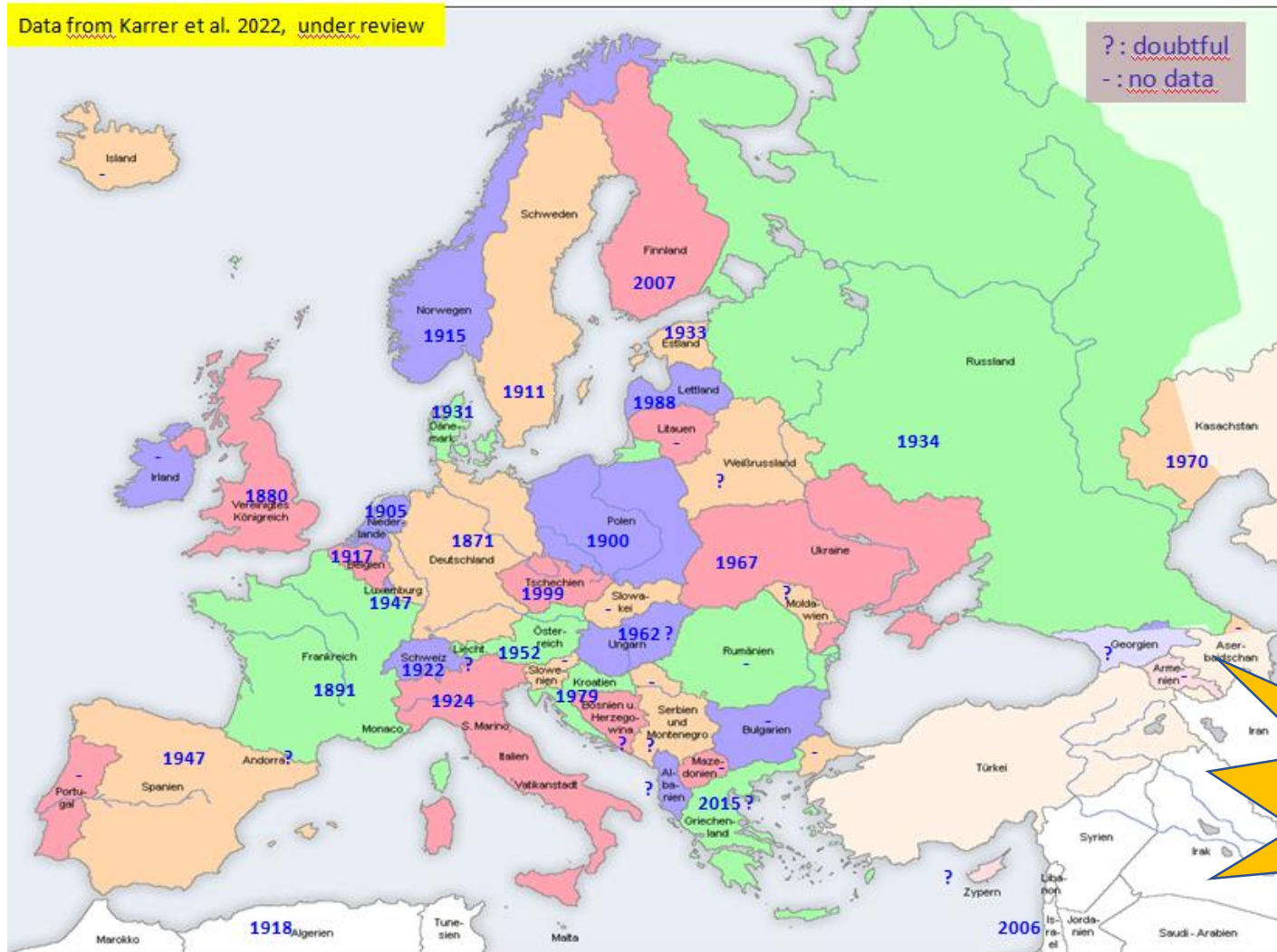
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Genetics of *A. psilostachya* in Europe

POPULATION GENETICS OF THE
INVASIVE *AMBROSIA*
PSILOSTACHYA DC. IN EUROPE

Introduction of *A.*
psilostachya to Europe →



INRAE

TOMORROW

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In Italy

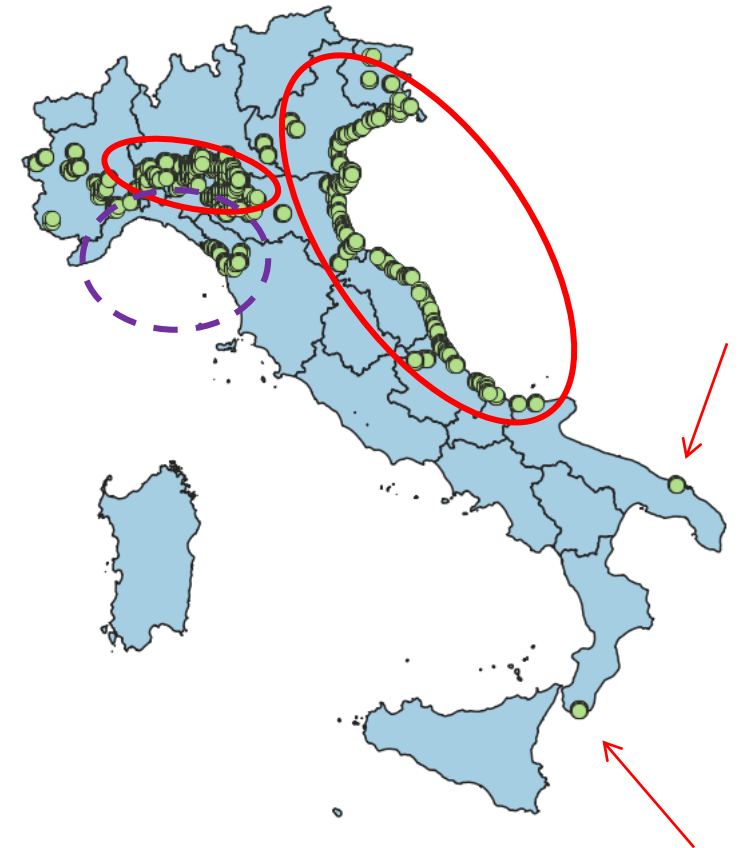


Revised herbarium specimens

Recent field data



UNTIL 1960



TODAY

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Ecological niche dynamics of *A. psilostachya* in Italy at different times



A. Niche dynamics of *A. psilostachya* in Italy before (1900-1960) and after 1960 (1990-2010)

Which factors contributed the most to the distribution of *A. psilostachya* at different times?

Has the niche changed from the beginning of its invasion until today?

B. Habitat suitability of *A. psilostachya* in Italy along the timeline

How habitat suitability of *A. psilostachya* changed at different times?

Montagnani et al., in progress



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Materials and Methods

Land cover (1900 – 1960 – 2010)

Cover of:

- Urban areas
- Croplands
- Natural areas

Land cover heterogeneity:

- Shannon Diversity Index

Geography

- Presence of beaches
- Distance from the coast
- River length
- Elevation

Climate (1900 – 1960 – 2010)

- Maximum temperature
- Minimum temperature
- Precipitation

HILDA data sets



WAGENINGEN
UNIVERSITY & RESEARCH

11 variables

2x2 km grid



Climatologies at high resolution for the earth's land surface areas



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Materials and Methods

A. Niche dynamics of *A. psilostachya* in Italy before (1900-1960) and after 1960 (1990-2010)

To test for differentiation of the niche at different times in E-space:

- **PCA-based method** developed by Broennimann et al. (2012);
- Niche dynamics associated with different time: **Centroid, Overlap, Unfilling, Expansion (COUE) framework** (Guisan et al. 2014, 2017).

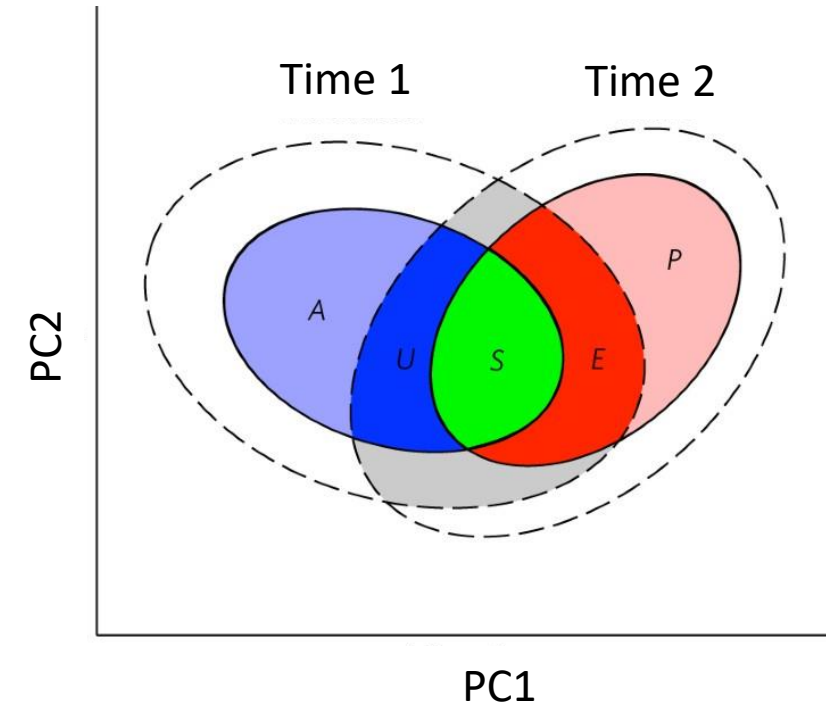
Niche overlap = proportion of niche occupied at T1 and T2.

Schoener's D index [0 to 1 → no to full overlap; Schoener 1970)

Niche stability = proportion of niche occupied at T1 and T2.

Niche expansion = proportion of niche occupied only at T2.

Niche unfilling = proportion of niche occupied only at T1.



Package 'ecospat'





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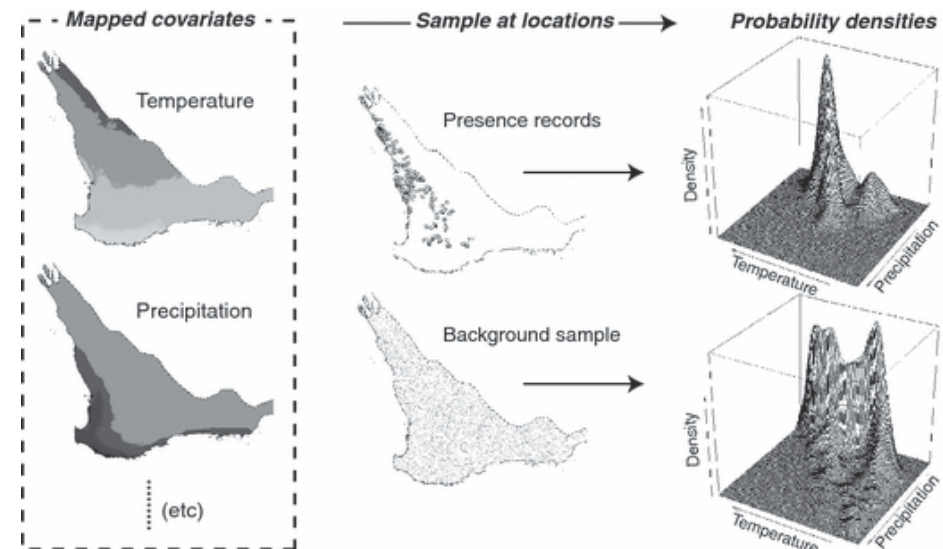
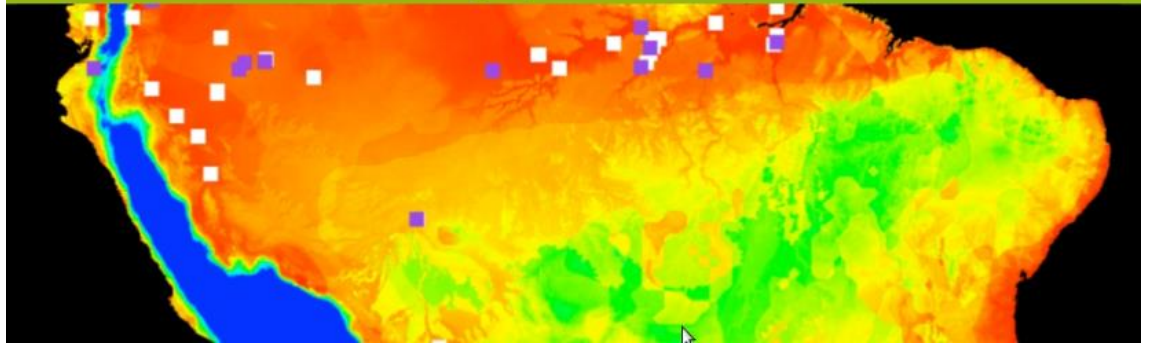
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B.Habitat suitability of *A. psilostachya* in Italy along the timeline

MaxEnt is a software for modeling species niches and distributions by applying a machine-learning technique called Maximum Entropy modeling (Phillips et al., 2006; Merrow et al., 2013; Phillips, 2017)

Materials and Methods

Maxent software for modeling species niches and distributions





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Results: Which factors contributed the most to the distribution of *A. psilostachya* at different times?

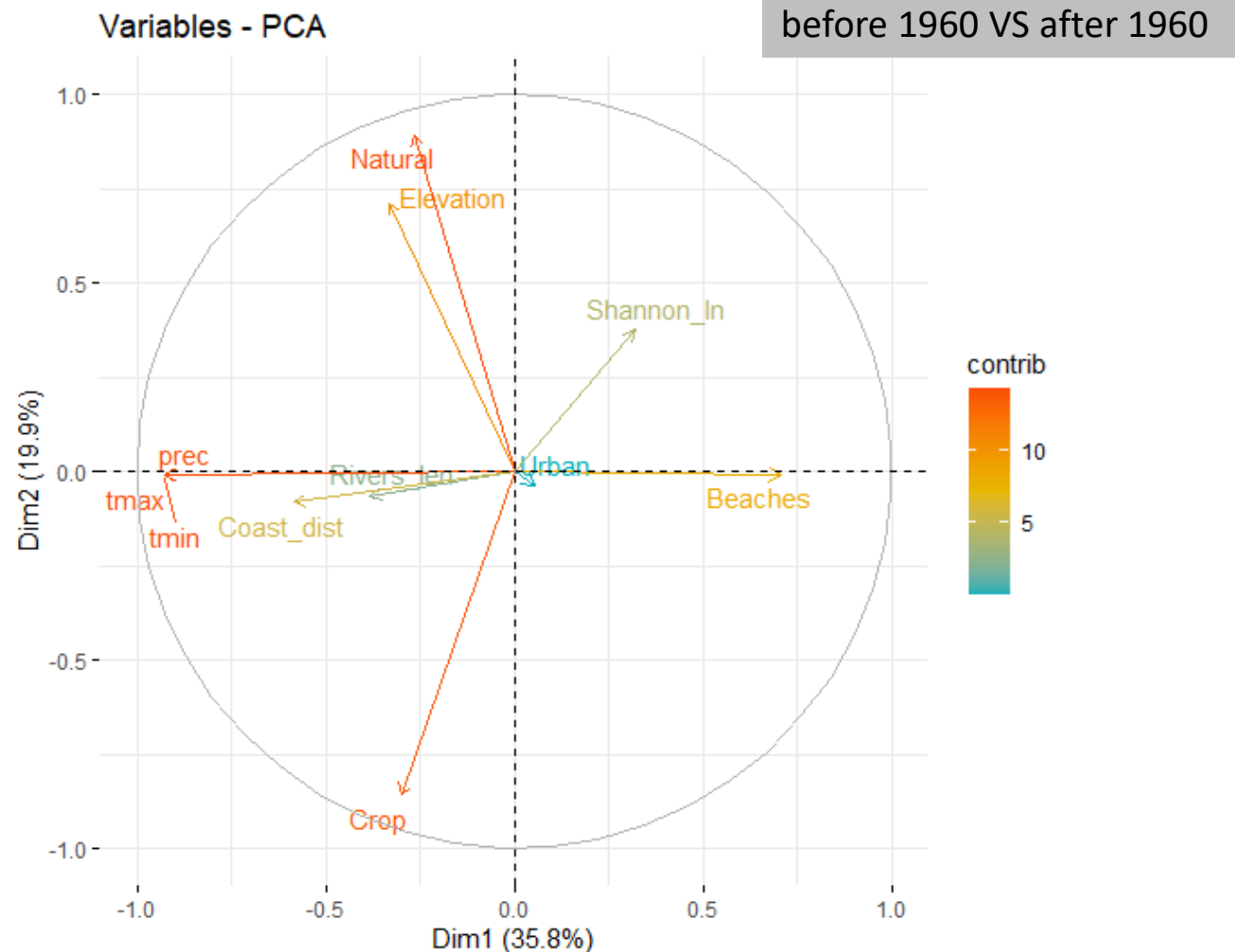
Climate and land cover show the strongest contribution to PC1 and PC2 respectively.

PCA reflects the tendency of the species of colonizing:

-Not extreme climates (too hot, too cold, too wet)

-Natural areas

Croplands avoidance?





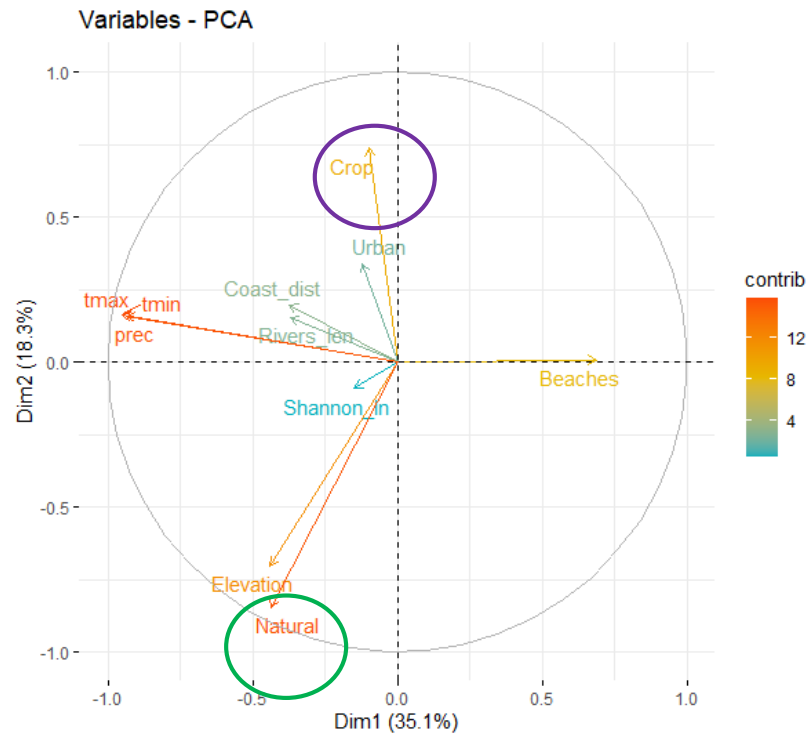
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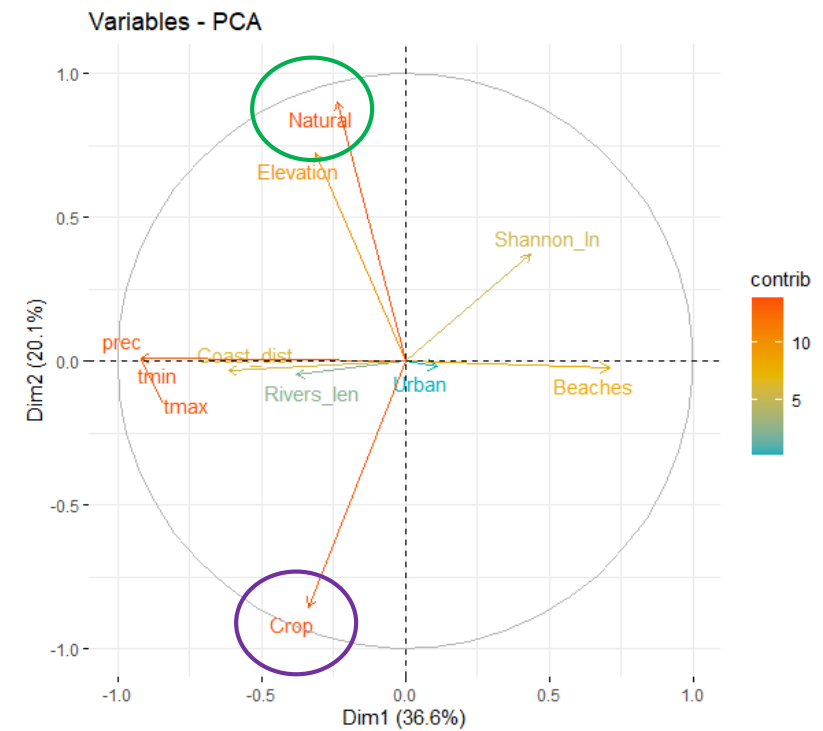
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Results: Variables contribution changed along the timeline

BEFORE 1960



AFTER 1960



The change in contribution of “natural areas” and “croplands” may indicate a gradual shift from anthropized (croplands) to more natural environments.

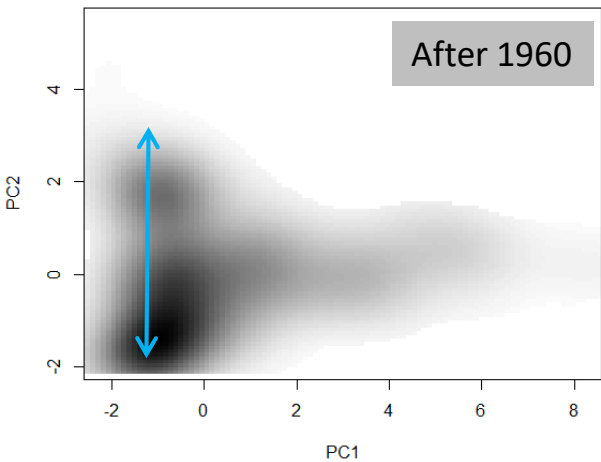
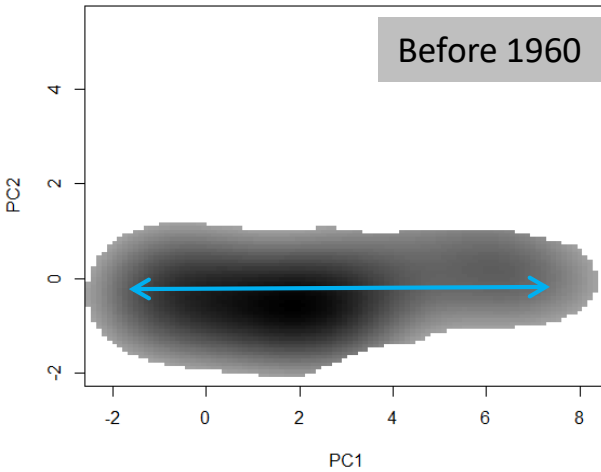


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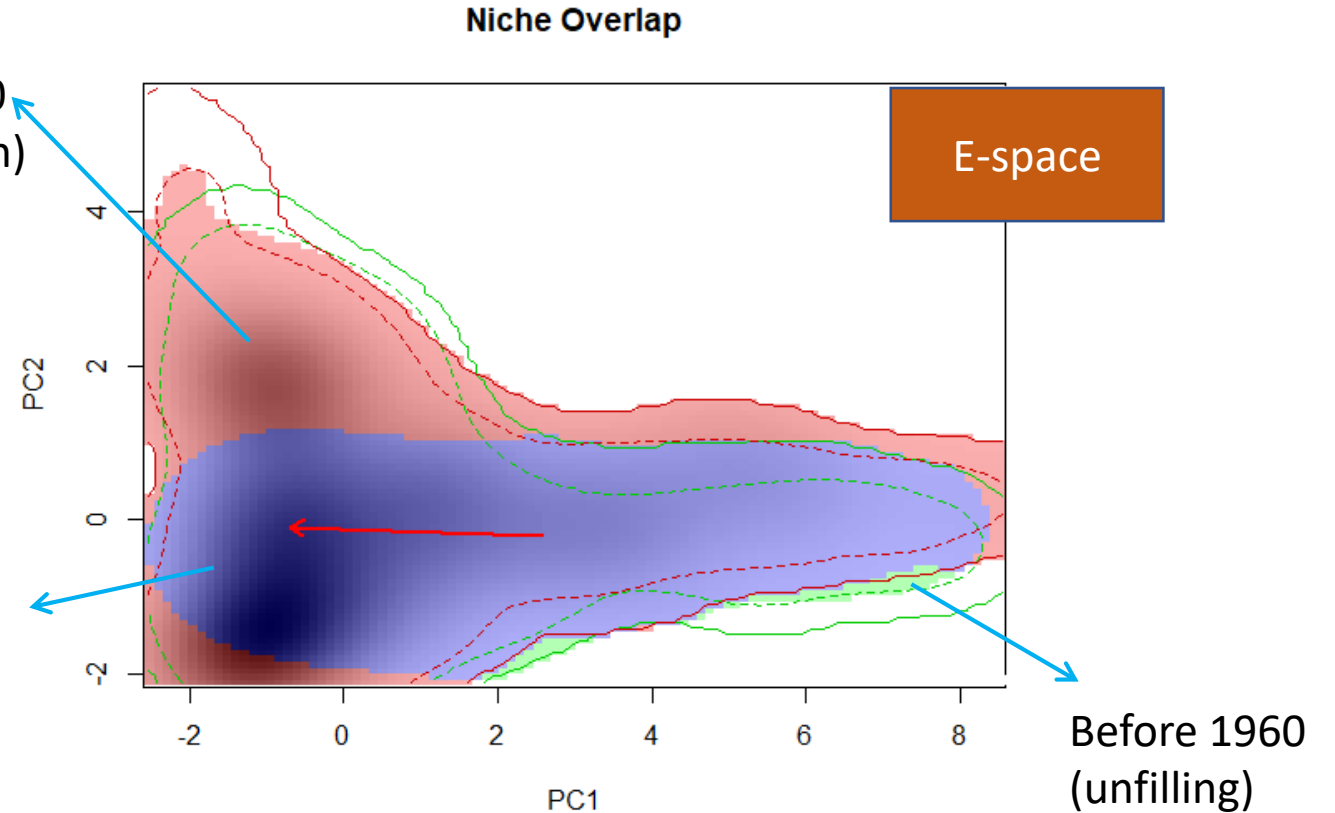
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Results: Has the niche changed from the beginning of its invasion until today? Yes..



After 1960
(expansion)

Before and
After 1960
(stability)



Schoener's D	Expansion	Stability	Unfilling	Niche Similarity Test	
				T1 --> T2	T2 --> T1
0.55483	0.259925	0.740075	0.002731	ns	0.0396*



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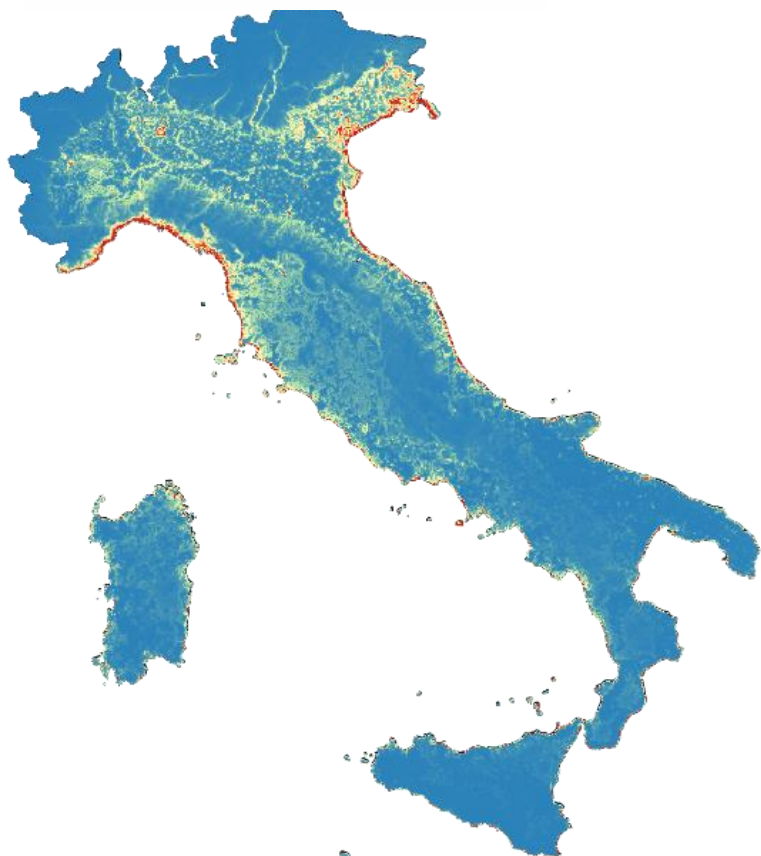
Results: How habitat suitability of *A. psilostachya* changed at different times?

Suitability

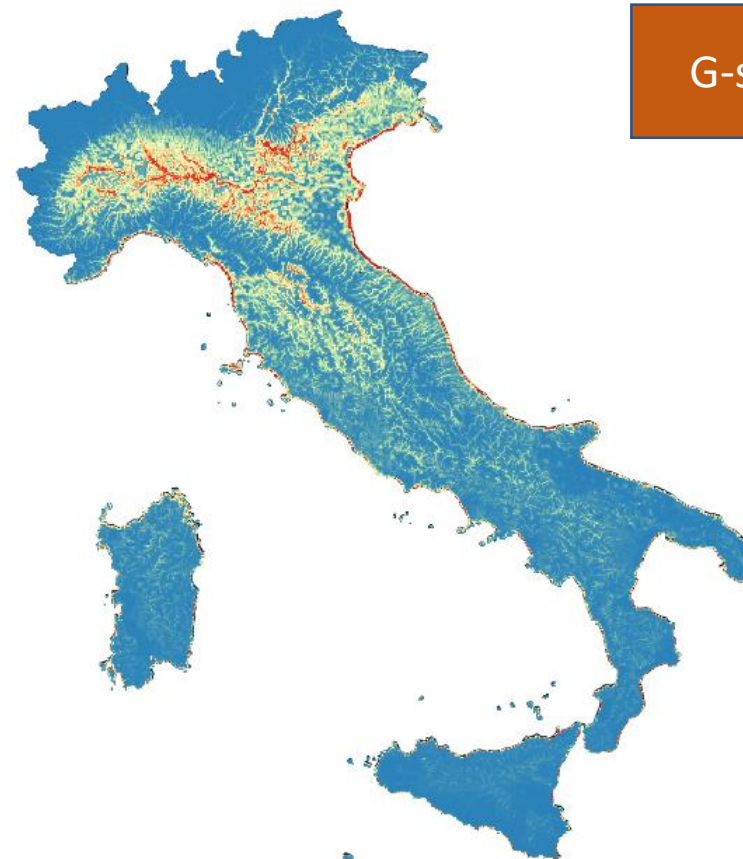


high

low



BEFORE 1960



AFTER 1960

G-space

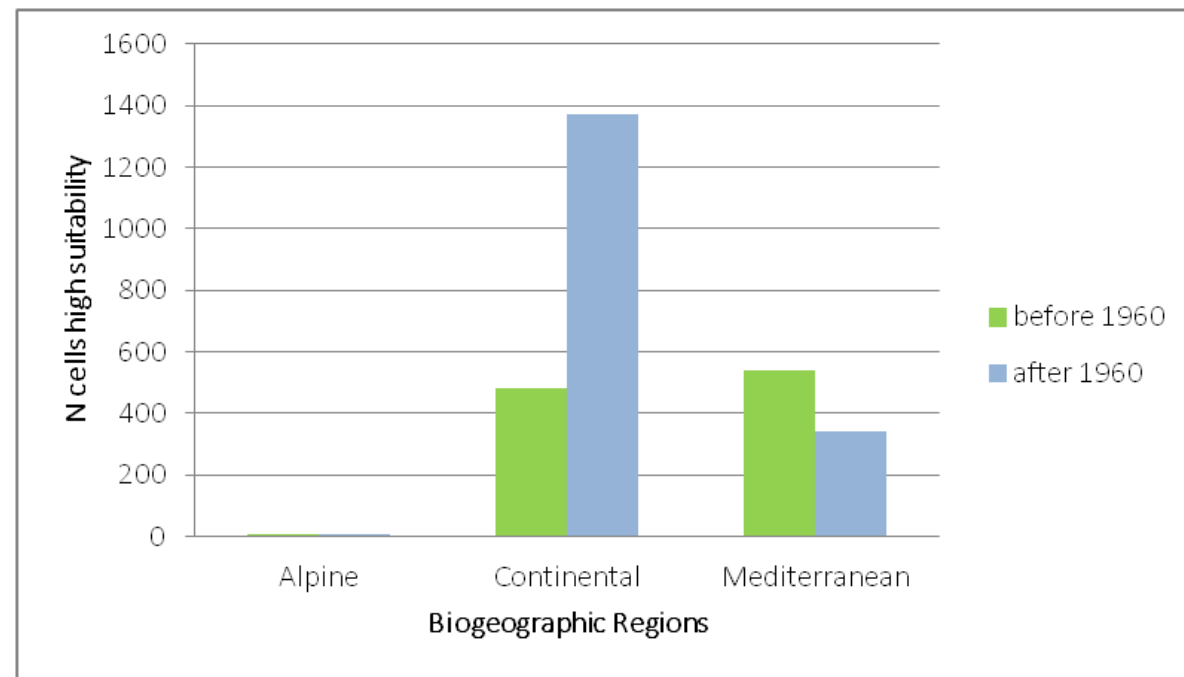
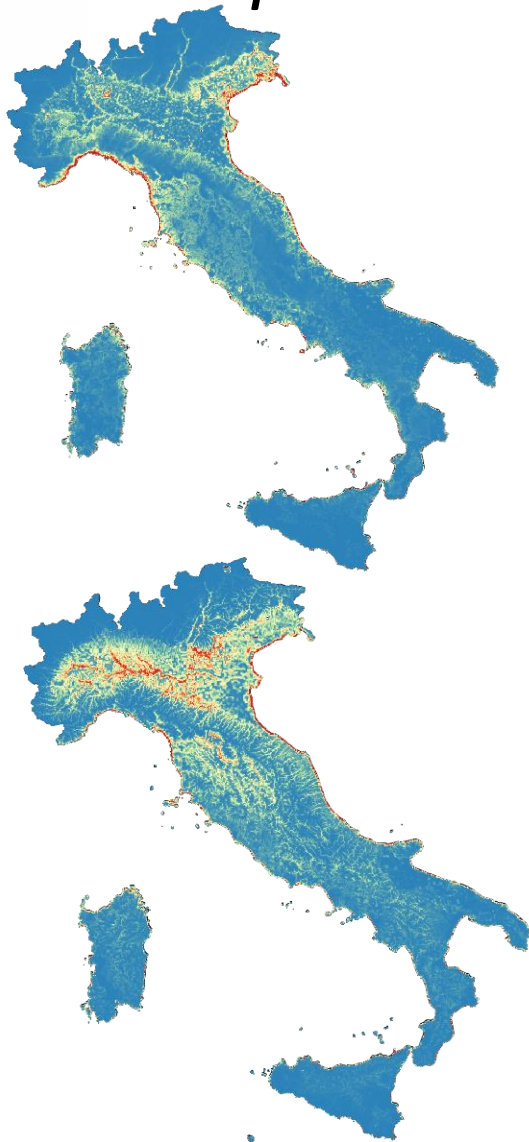
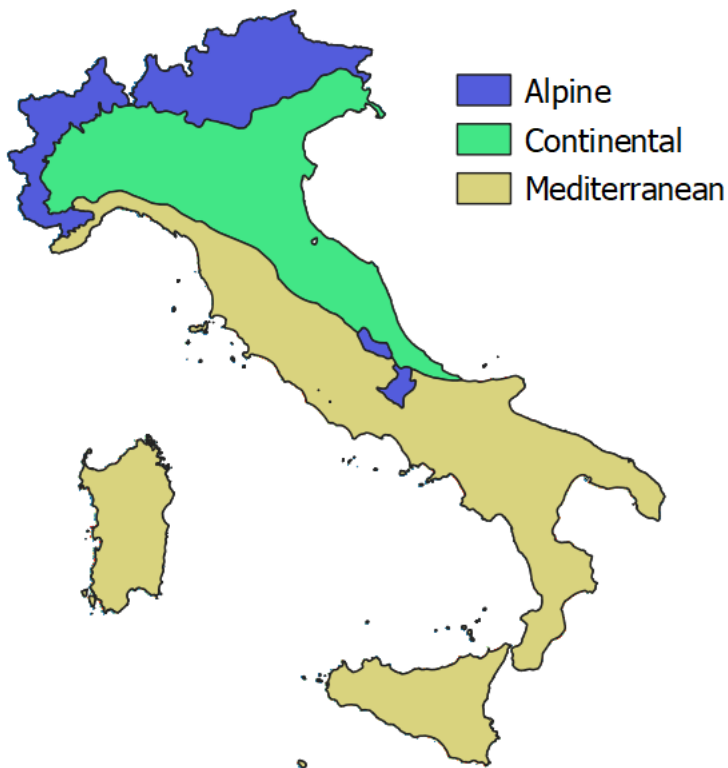
Expansion of *A. psilostachya* to new conditions → increase in suitable areas especially in the continental region (sandy environments)



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Results: How habitat suitability of *A. psilostachya* changed at different times?





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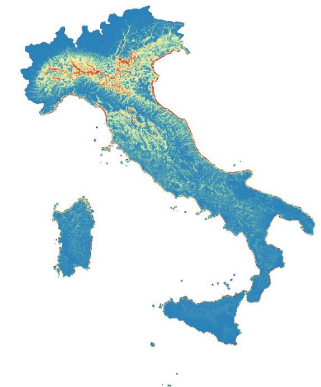
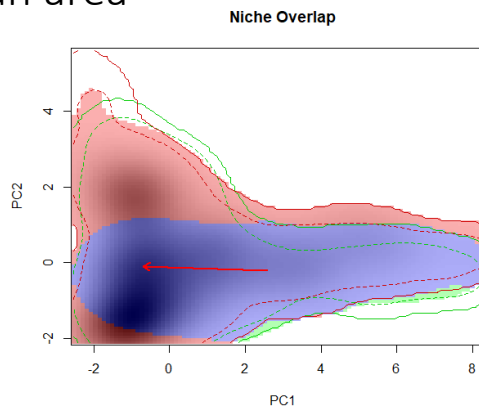
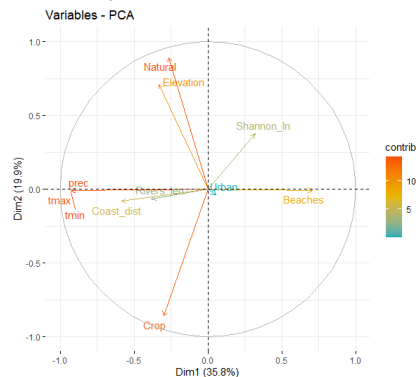
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To sum up:

From the beginning of the XX century until today:

- *A. psilostachya* retained the ecological niche of the first colonization period, but also expanded to new conditions (niche conservatism not fully respected)
- In the recent time its niche seems to be more related to land cover than climate
- Variables contribution to PCs changed along the timeline: this may indicate a gradual shift from anthropized areas (croplands) to more natural environments.
- Available suitable areas in Italy increased for the species along the timeline, especially in the Continental region, but it can persist as well in the Mediterranean area





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Conclusions

During the last century *A. psilostachya* has been able to adapt and find the most suitable conditions

Its spread can represent a threat to habitats and species of conservation concern along coasts and rivers

Pay attention to *A. psilostachya*!

The knowledge about this species should be improved and effective solutions for its management implemented





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THANKS FOR YOUR ATTENTION!

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