

A population approach to evaluate grassland restoration - a systematic review

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CONTEXT

Restoration Success: How Is It Being Measured?

Maria C. Ruiz-Jaen^{1,2} and T. Mitchell Aide²

CONTEXT

To evaluate restoration success...

Individual



Population



Community



Ecosystem



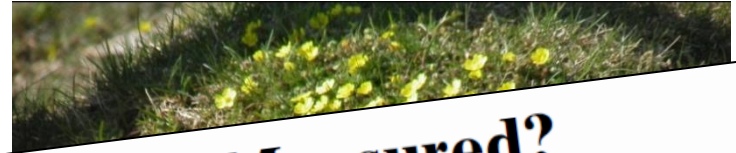
CONTEXT

To evaluate restoration success...

Individual



Population



Restoration Success: How Is It Being Measured?

Maria C. Ruiz-Jaen^{1,2} and T. Mitchell Aide²



Community



Ecosystem



3 majors attributes :

Species diversity

Vegetation structure

Ecosystem processes

CONTEXT

Restoration Biology: A Population Biology Perspective

Arlee M. Montalvo^{1,10,11}

Susan L. Williams²

Kevin J. Rice³

Stephen L. Buchmann⁴

Coleen Cory⁵

Steven N. Handel⁶

Gary P. Nabhan⁷

Richard Primack⁸

Robert H. Robichaux⁹

“The discipline of population biology provides one perspective on what might be considered a successful restoration.”

“Restored populations must possess attributes necessary for reproduction, growth, migration, and adaptive evolutionary change.”

AIMS

To assess the current use of population biology to evaluate restoration success.

Focus on grassland

Focus on plant species

To determine which population attributes were most regarded and which one were ignored.

METHOD

In the electronic database “ Scopus ”

Search terms: “grassland* AND (restoration OR reclamation OR rehabilitation)”

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3133 papers

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1. Do paper evaluate the results of active grassland restoration?

METHOD

In the electronic database “ Scopus ”
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1. Do paper evaluate the results of active grassland restoration?

NO

Not grassland
restoration

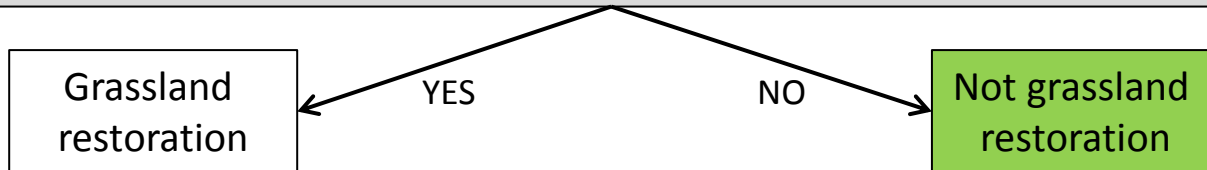
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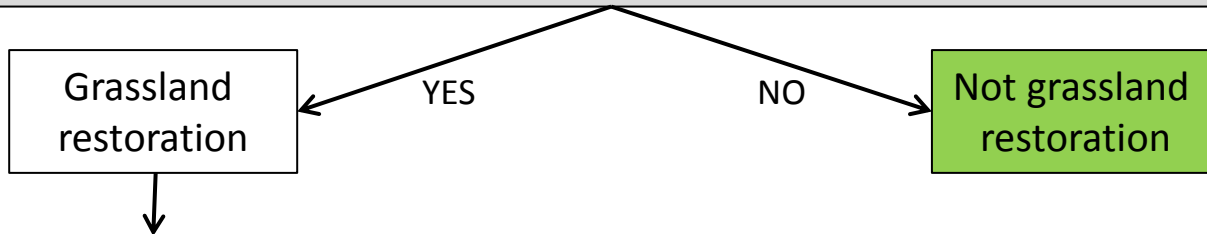
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1. Do paper evaluate the results of active grassland restoration?



2. Do the evaluation of grassland restoration success concern plant species?

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1. Do paper evaluate the results of active grassland restoration?

Grassland
restoration

YES

NO

Not grassland
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1. Do paper evaluate the results of active grassland restoration?



2. Do the evaluation of grassland restoration success concern plant species?



3. Do the evaluation of grassland restoration success concern a population approach?

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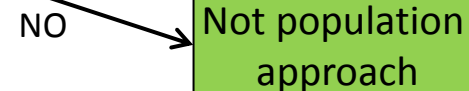
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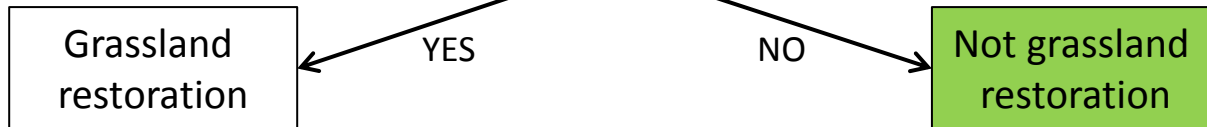
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3133 papers

1. Do paper evaluate the results of active grassland restoration?



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METHOD

Selected
paper

- On selected papers :
 - Species addition method (hay transfer, seeding, transplant or no species addition)
 - Species of concern (number and kind of species)
 - Time since restoration
 - Number of year of monitoring
 - **Population attributes** used to evaluate restoration success

RESULTS

Current use of population biology to evaluate grassland restoration success

RESULTS

0.9%

28 papers

Current use of population biology to evaluate grassland restoration success

100%

3133 papers

RESULTS

0.9% 28 papers

Current use of population biology to evaluate grassland restoration success

100% 3133 papers

1. Do paper evaluate the results of active grassland restoration?

Grassland restoration

YES
33.7%

NO
65.4%

Not grassland restoration

2049 papers
65.4%

RESULTS

0.9% 28 papers

Current use of population biology to evaluate grassland restoration success

100% 3133 papers

1. Do paper evaluate the results of active grassland restoration?

Grassland restoration

YES
33.7%

NO
65.4%

Not grassland restoration

2049 papers
65.4%

2. Do the evaluation of grassland restoration success concern plant species?

Plant species

YES
66.3%

NO
33.7%

Not plant species

356 papers
11.4%

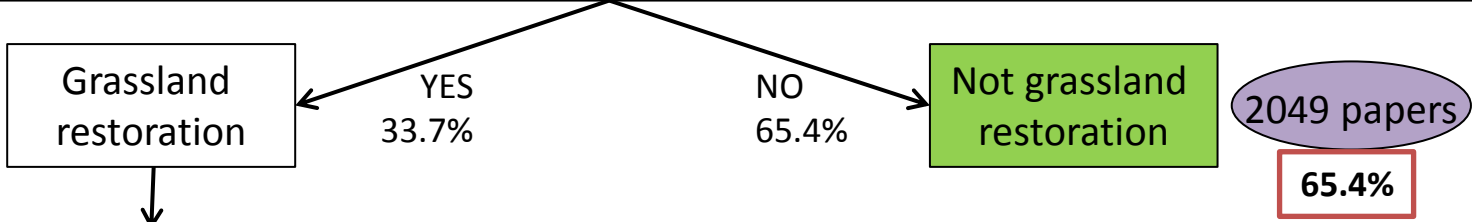
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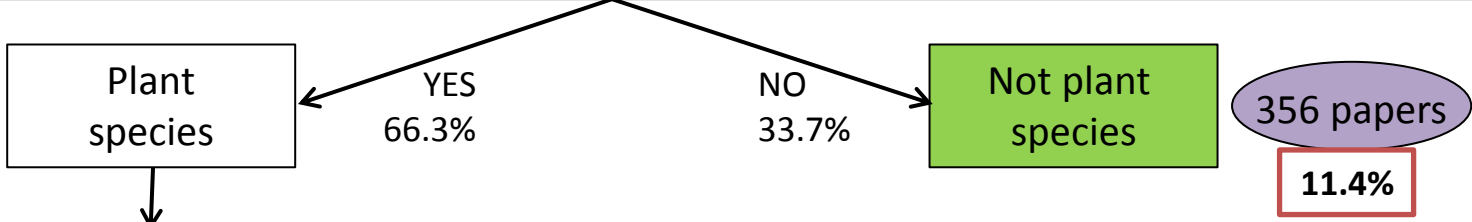
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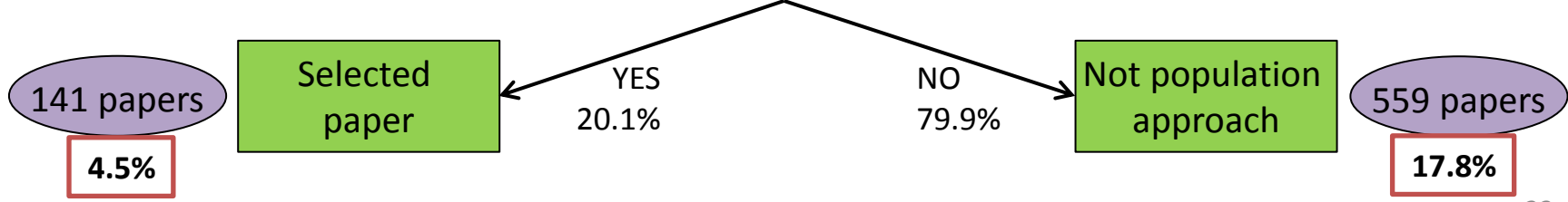
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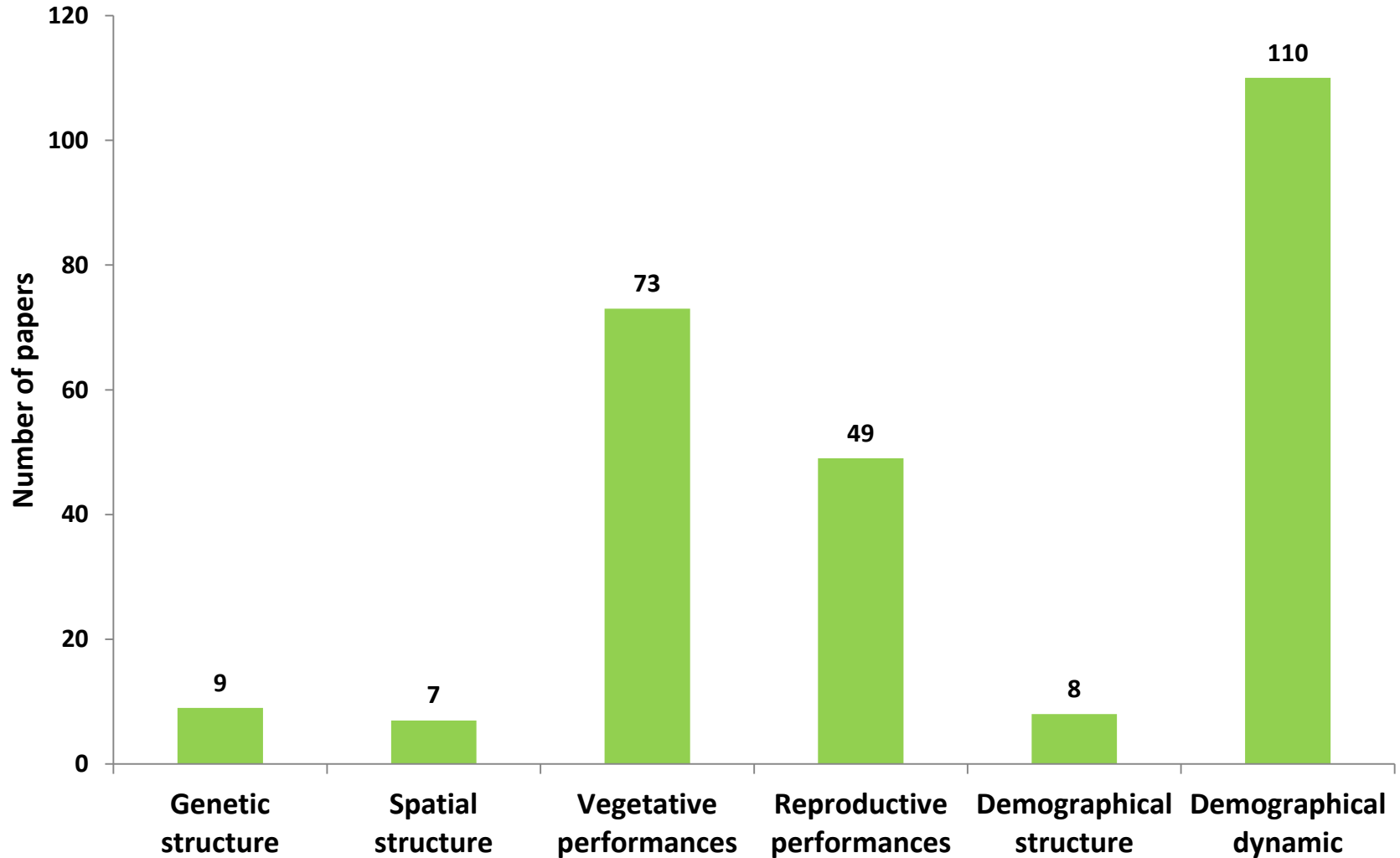
Selected
paper

Which populations attributes were most used and which one were ignored?

RESULTS

Selected
paper

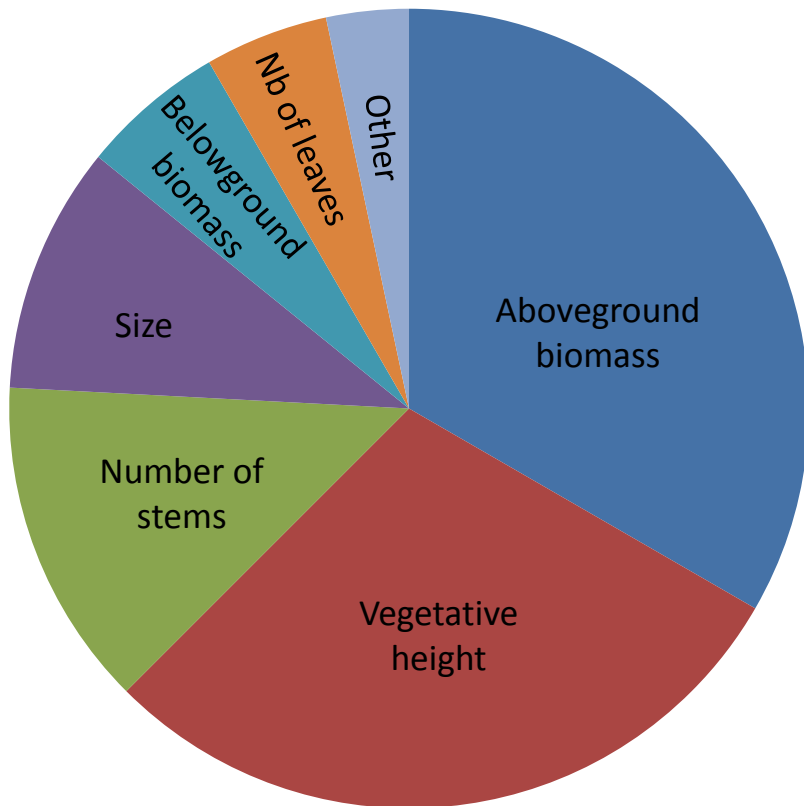
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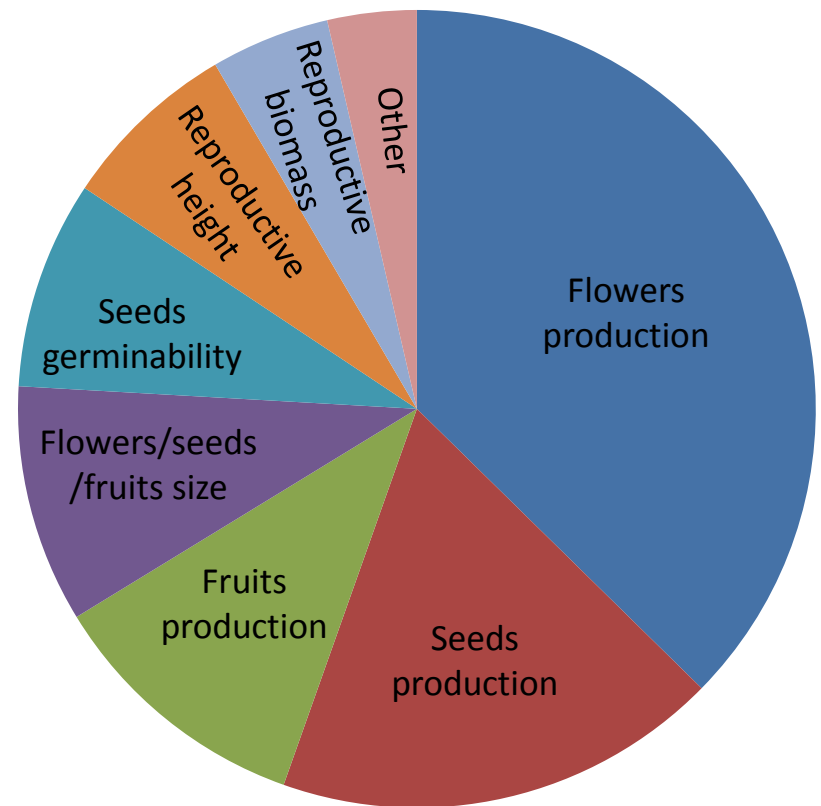
RESULTS

Which populations attributes were most used and which one were ignored?

Vegetative performances



Reproductive performances



RESULTS

Which populations attributes were most used and which one were ignored?

- Monitoring :

When?

- in the first 2 years = 76.5 % of selected papers
- 3-10 years = 16 %
- 11-30 years = 6 %
- ? = 1.5 %

How long?

- 1-2 years = 68 % of selected papers
- > 10 years = 4 %

RESULTS

Which populations attributes were most used and which one have been ignored?

- Species :

How many species?

- 1-2 species = 59 % of selected papers

Which species?

- Local species = 86.5 % of selected papers

- Common = 23 %

- Dominant = 23 %

- Typical = 18 %

- Rare = 11 %

- Invasive/weeds = 29 %

TAKE HOME MESSAGE

- 20% of papers evaluating grassland restoration success with plant taxa as indicators did use population attributes
- Among those, only 11% concerned rare species

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TAKE HOME MESSAGE

- **Reproductive performances** were assessed by 1/3 of selected papers, seeds production = 10%
- **Population growth** was assessed by 2/3 of selected papers
 - Mainly changes in the number of individuals through time (78%)
 - Nearly no detailed population dynamic with λ (3%)
- Monitoring during ≤ 2 years (70%)

TAKE HOME MESSAGE

→ Population persistence in the long term in restored area ???

Thank you !

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