Crop wild relatives, a conservation priority for Jordan

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ENHANCED GENEPOOL UTILIZATION – Capturing wild relative and landrace diversity for crop improvement, Cambridge, 16-20 June 2014

SEVENTH FRAMEWORK PROGRAMME

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Contents

- Jordan – context
- National Plant Conservation Strategy for Jordan
- Prioritizing for conservation
- Ecogeographic survey and analysis
- Gap analysis
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- Establishing conservation priorities
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- Conclusions

Jordan - context

ASIAN MINOR
wheat, barley, rye, oat, chickpea, lentil, lupine, alfafa, clover, vetch, fig, pomegranate, apple, pear, etc...

MEDITERRANEAN
wheat , oat, grasspea, pea, lupine , clover, flax, brassicas, olive, beet, lettuce, asparagus, faba bean, celery, parsnip, thyme, sage, hop, etc....

- Fertile Crescent – the cradle of agriculture origin
- 2 Vavilov centres of crop origin (Asian Minor + Mediterranean)

Jordan - context

Very high concentration of CWR per unit area!

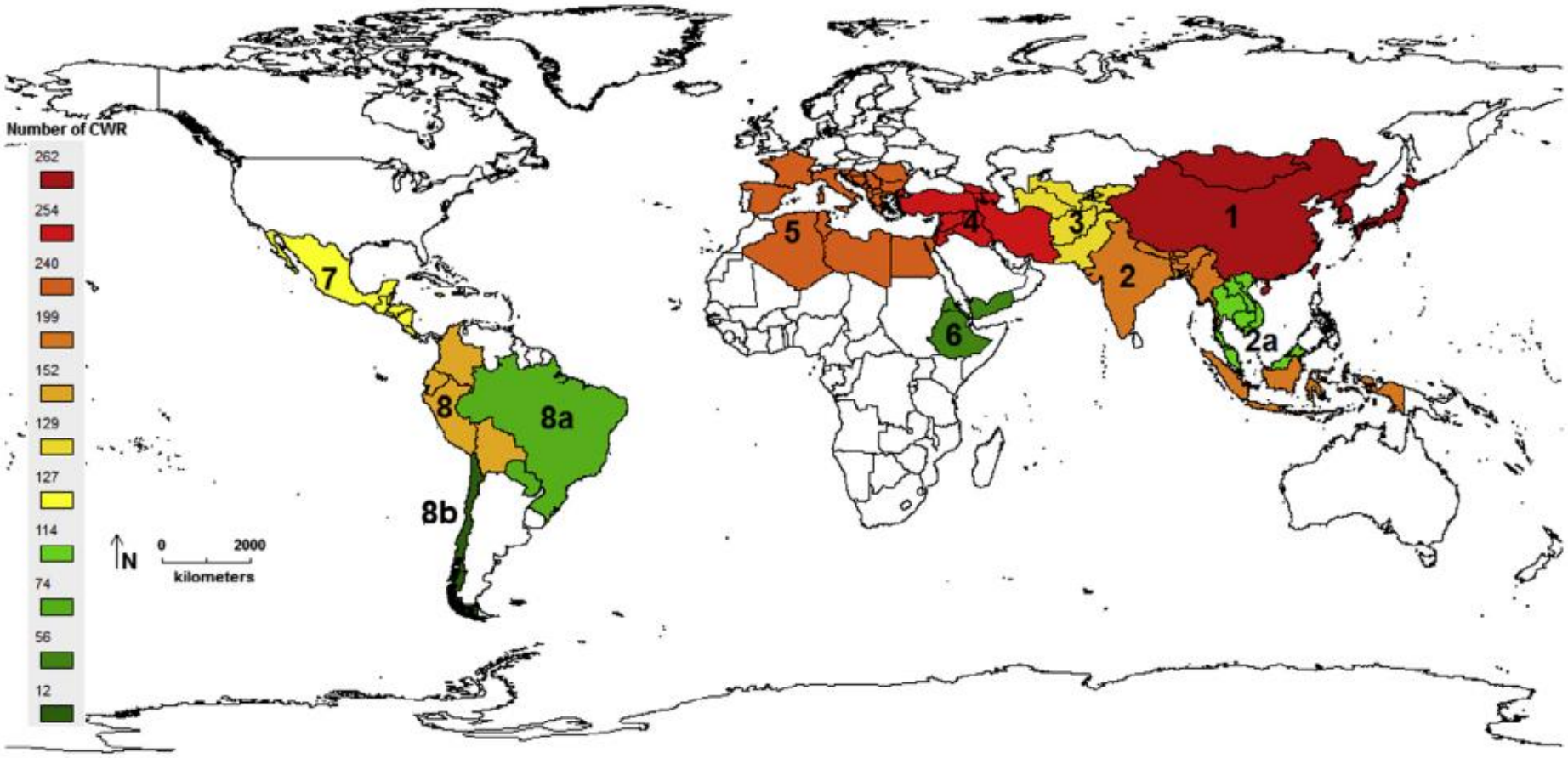


Fig. 2. Number of priority crop wild relatives (CWR) per Vavilov Centre of Diversity.

(Vincent *et al.* 2013)

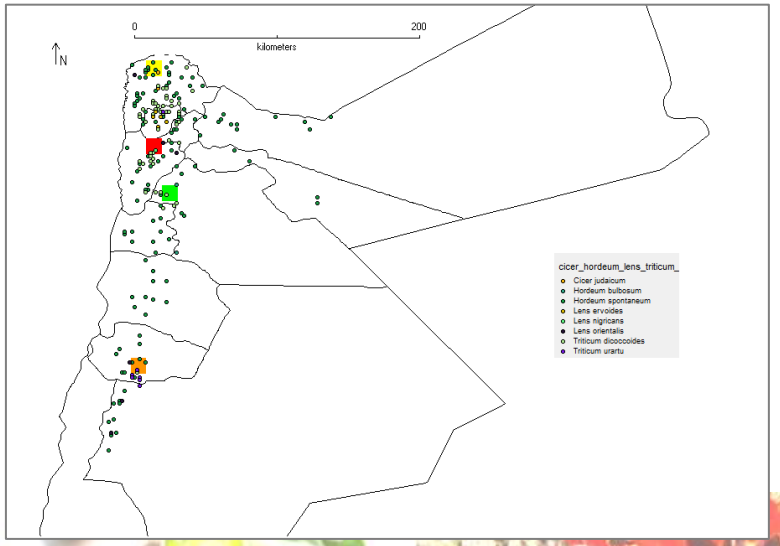
Plant diversity is threatened in Jordan

- population pressure
- water extraction
- use of agrochemicals
- development and urbanization
- invasive species
- overgrazing
- land use legislations
- climate change

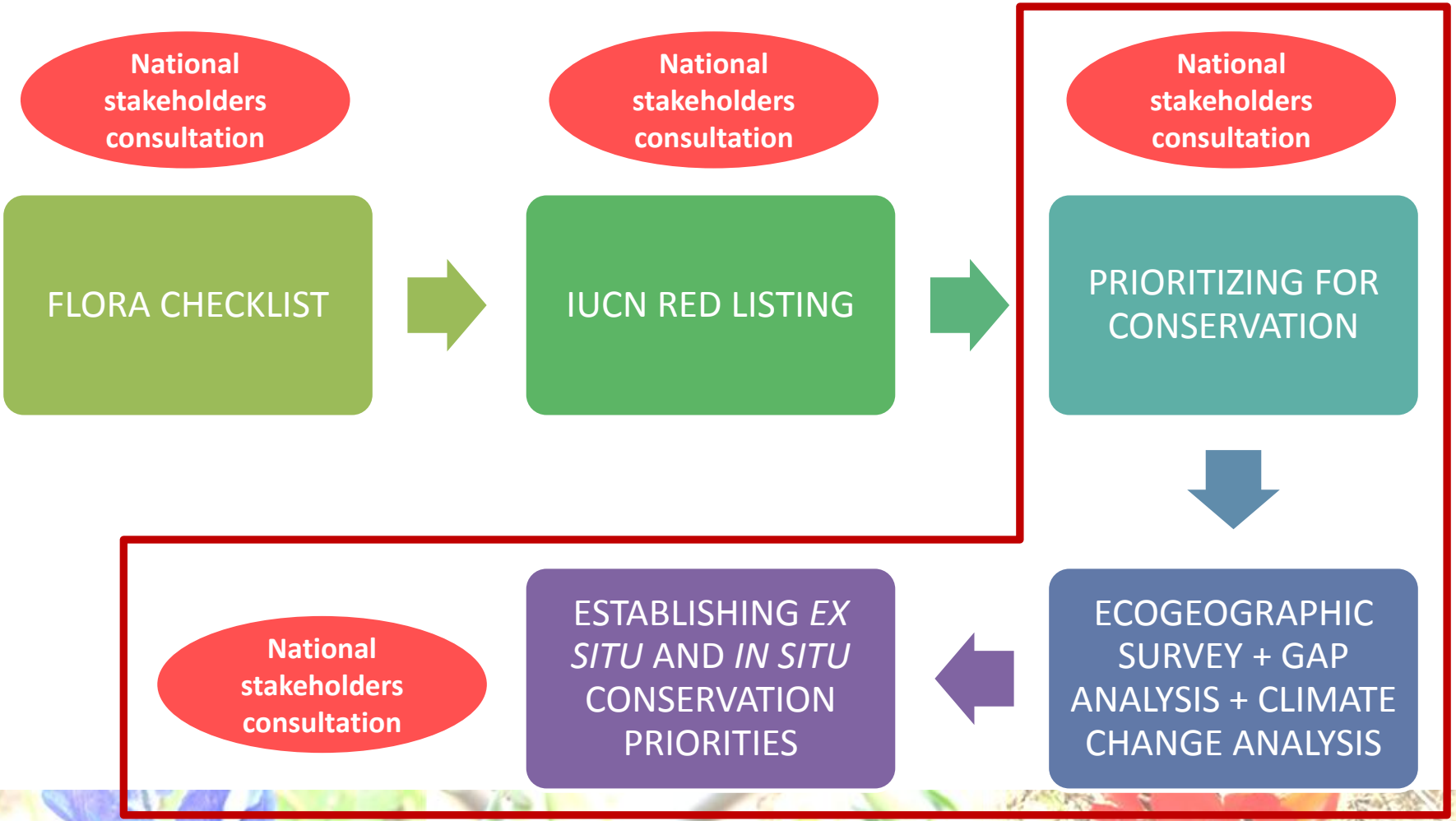
Genetic erosion

Developing a National Plant Conservation Strategy for Jordan

- To establish *ex situ* conservation priorities (which taxa to collect and where?)
- To recommend a network of conservation areas (*in situ*) that conserve Jordanian taxa



Developing a National Plant Conservation Strategy for Jordan



Prioritizing for conservation

FLORA CHECKLIST

(in prep)

2625 spp!!!

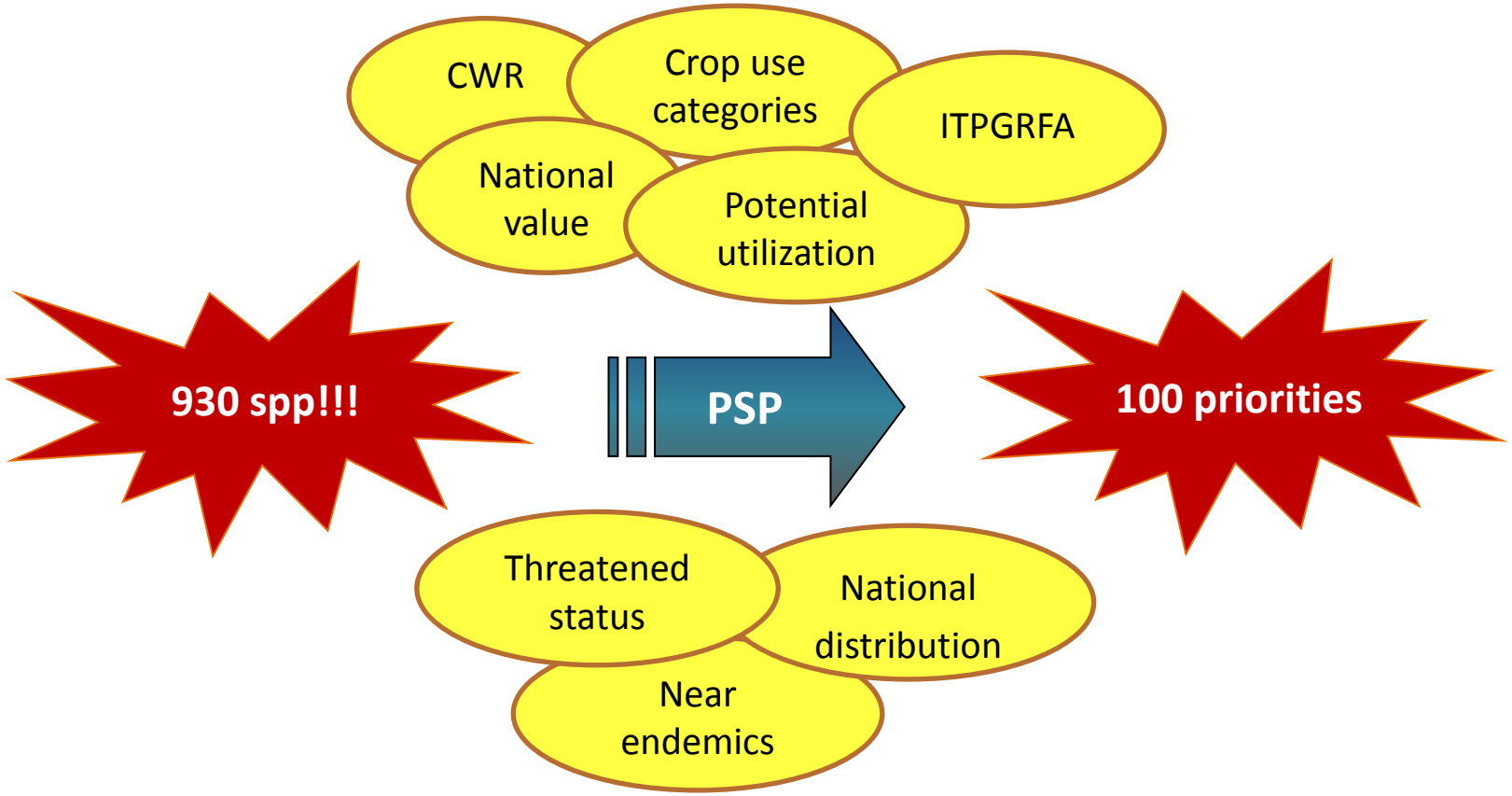
SETTING SPECIES PRIORITIES FOR CONSERVATION

-step 1-

Data availability

PRIORITY	EXPLANATION	NUMBER OF TAXA
Group 1	taxa with available data	930
Group 2	taxa with partially available data	889
Group 3	taxa that need further information collection	804

Prioritizing for conservation



SETTING SPECIES PRIORITIES FOR CONSERVATION

-step 2-

Prioritizing for conservation

Triticum dicoccoides	*Trifolium lappaceum*
Vicia galilaea	*Trifolium micranthum*
Vicia ervilia	*Trifolium boissieri*
Pisum sativum	*Vicia sericocarpa*
Sorghum halepense	*Trifolium cherleri*
Vicia sativa	*Pistacia lentiscus*
Vicia lutea	*Trifolium argutum*
Vicia galeata	*Trifolium arvense*
Astragalus eremophilus	*Trifolium fragiferum*

100 priorities CWR!!

Ecogeographic survey and analysis

Herbaria, genebank, literature survey

- 23 sources

Data formatting, verification and quality control

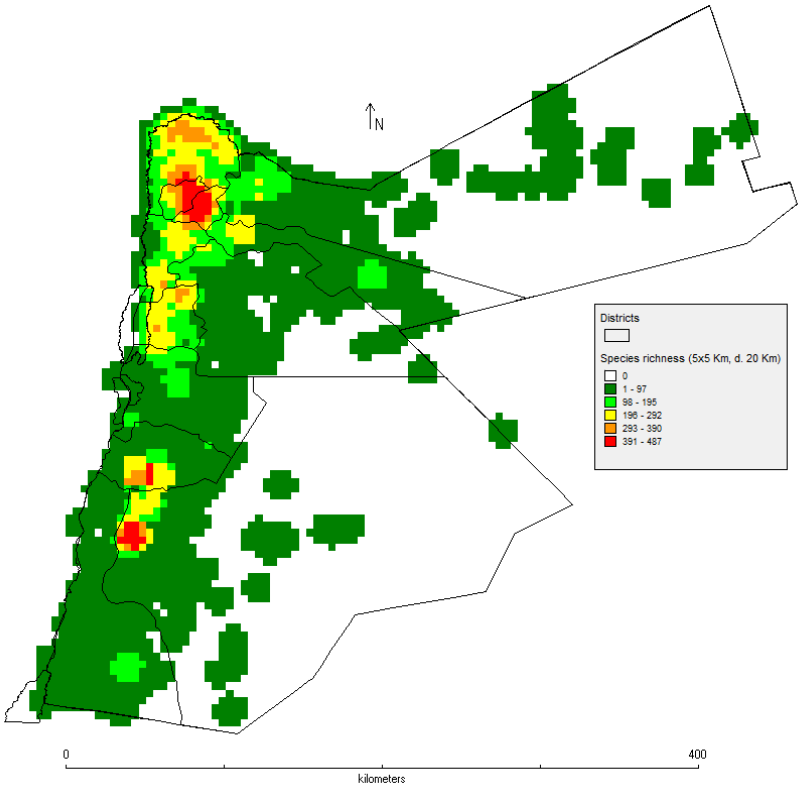
- Spelling errors
- Georeferencing
- Coordinate conversion
- Outlier localities
- Wrong coordinates
- Duplicates
- Standardization
- Selection of records with ≥ 2 decimals in one of the coordinates

Data analysis

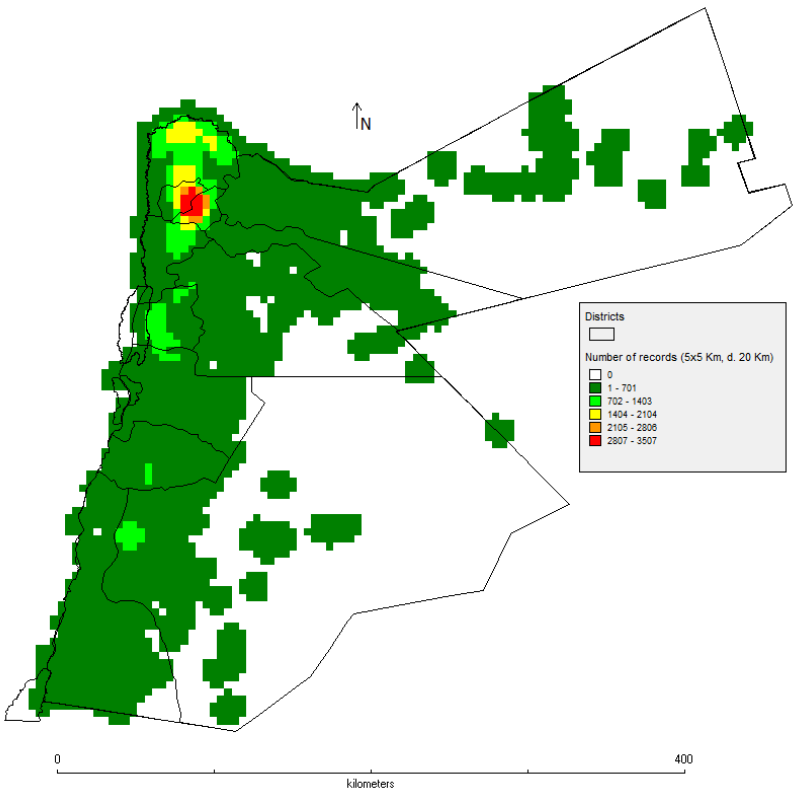
- Species richness
- Assessing sampling bias
- Species distribution maps
- Predicted species distribution maps (MaxEnt v. 3.3.3k) (top 20, only 6 spp.)

Ecogeographic survey and analysis

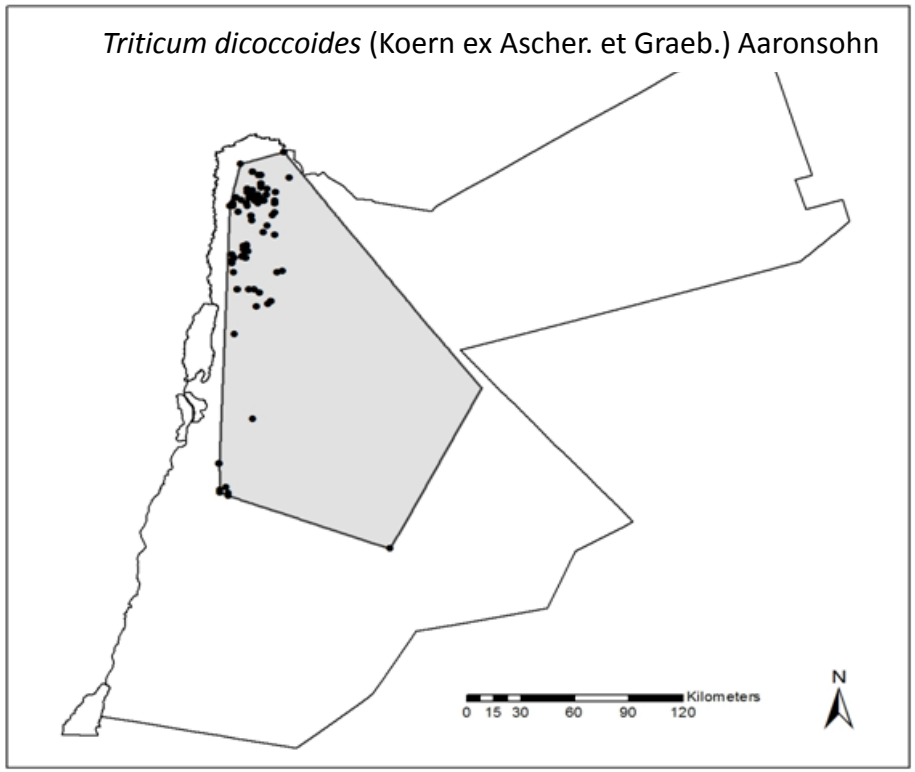
Species richness

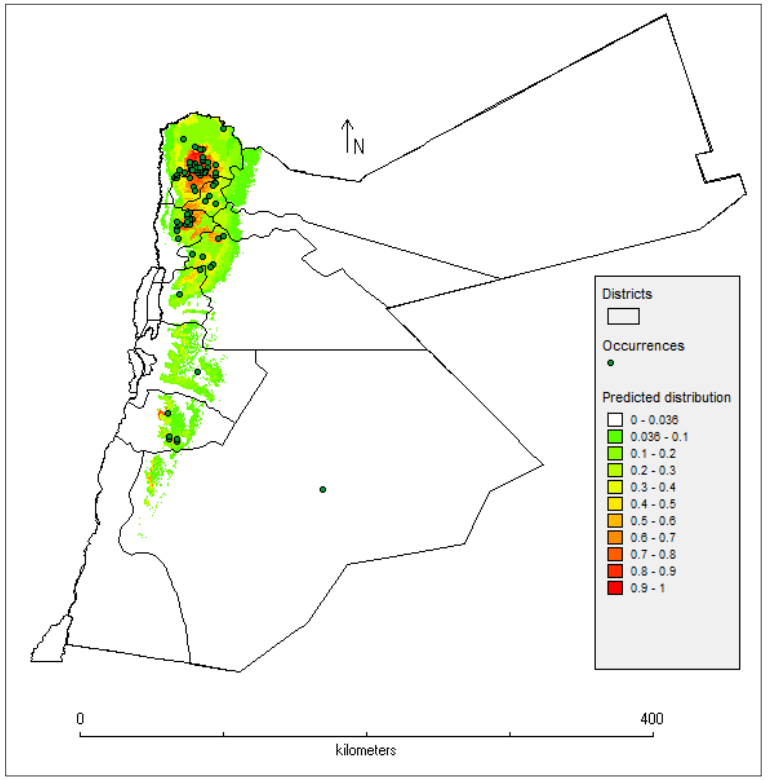


Number of records



Ecogeographic survey and analysis





Gap analysis

INDIVIDUAL TAXA – SPP NOT CONSERVED *EX SITU*

- 20% of top 100 priorities not conserved *ex situ*

INDIVIDUAL TAXA –SPP NOT CONSERVED *IN SITU*

- No active *in situ* conservation!
- 56% of top 100 occur within existing PA – passive conservation
- 44% of top 100 do not occur within PA

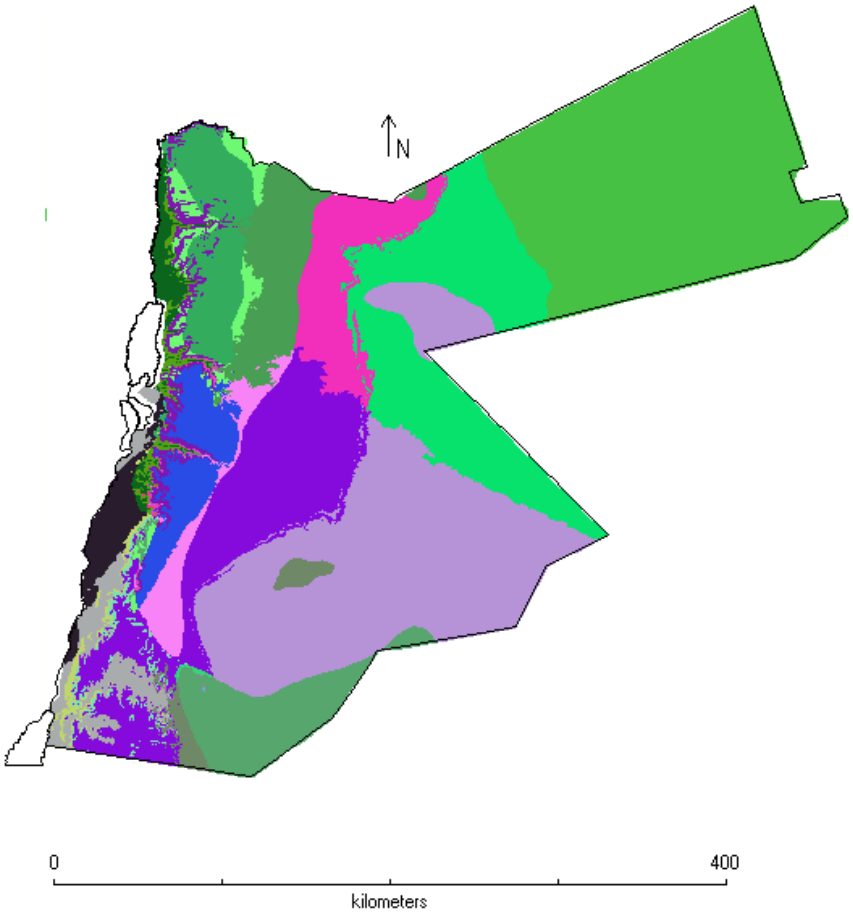
Gap analysis

ECOGEOGRAPHIC LEVEL

Ecogeographic land characterization map

(Parra-Quijano *et al.* 2012a, 2012b)

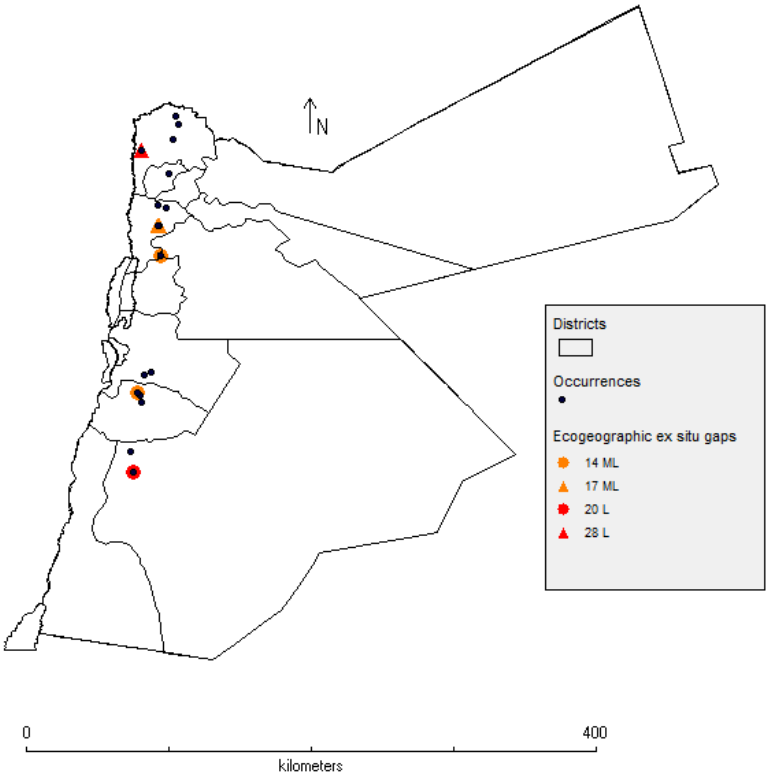
- 26 variables (11 bioclimatic, 11 edaphic, and 4 geophysic) – consultation with experts
- 47 ecogeographic categories (EC)



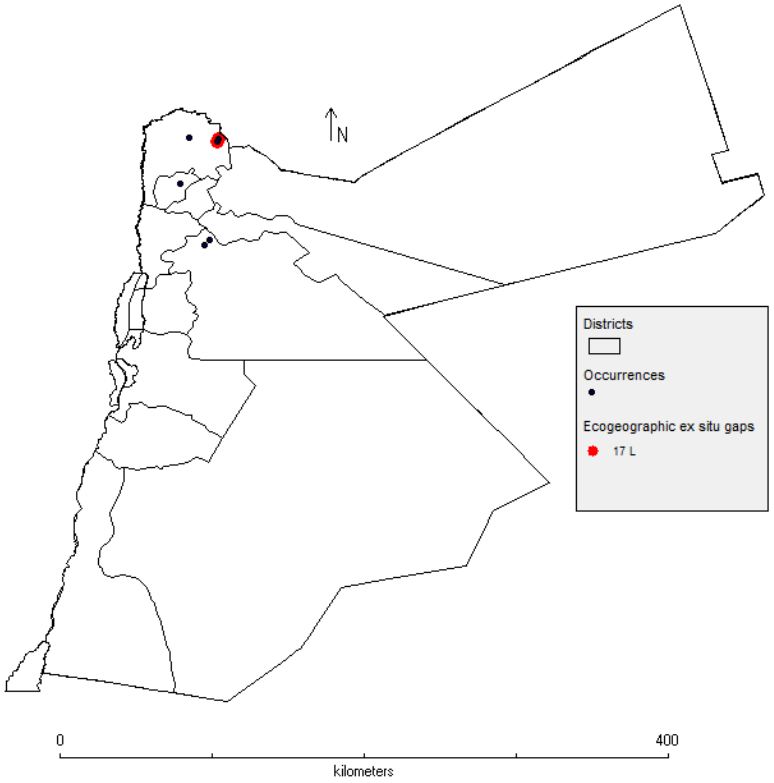
(produced by Mauricio Parra-Quijano, Universidad Politécnica de Madrid, Spain and consultant for FAO-ITPGRFA)

Gap analysis

Vicia ervilia



Trifolium arvense



Climate change analysis

- To pre
  - M
  - 20
  - CO_2 emissions scenarios: A2 (extreme) and B1 (moderate)
  - gl (cooler) ar
  - 4

To detect priority spp. most affected by climate change:

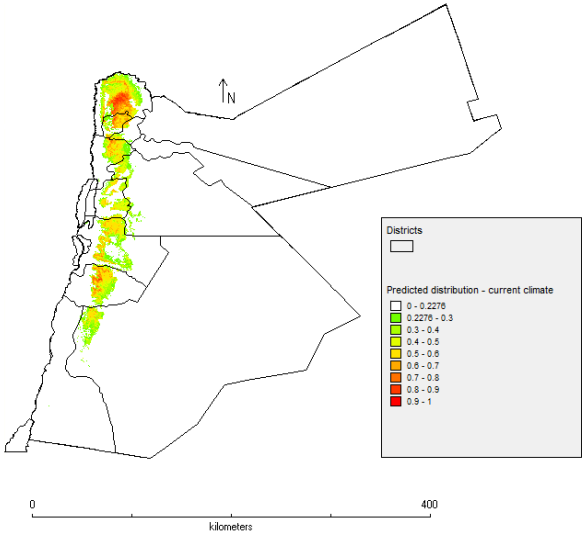
- based on species range change (SRG)
- SRC < 0 → negative impact on species

To select populations for:

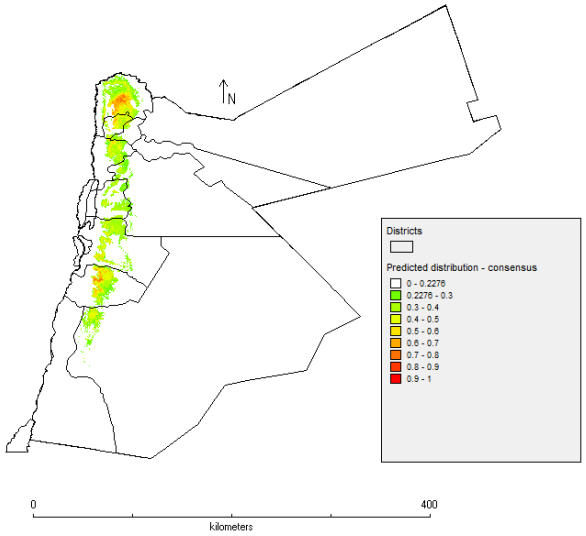
- *ex situ* – <u>negatively impacted</u> by climate change
- *in situ* – <u>not impacted</u> by climate change

Climate change analysis

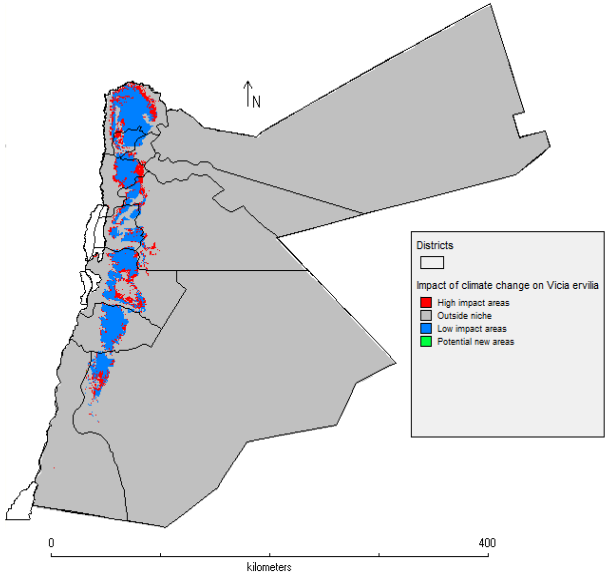
Current climate



2080 climate



Predicted change



VICIA ERVILIA

Establishing *ex situ* conservation priorities

PRIORITY SPECIES FOR *EX SITU* CONSERVATION

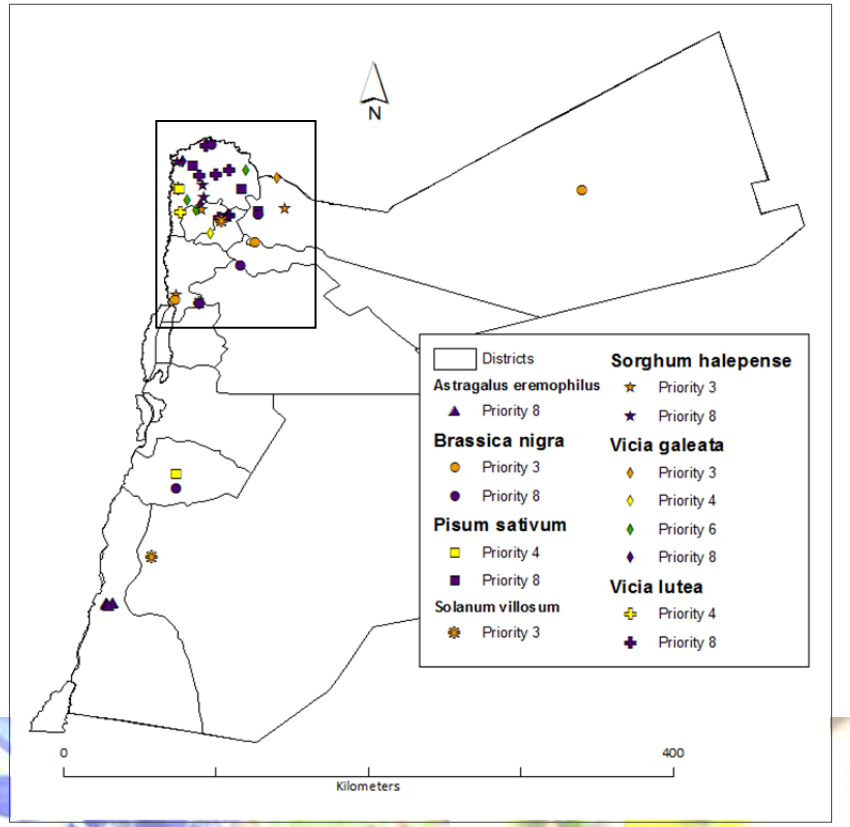
Not already conserved *ex situ* + with *ex situ* ecogeographic gaps + negatively impacted by climate change (top 20 spp)

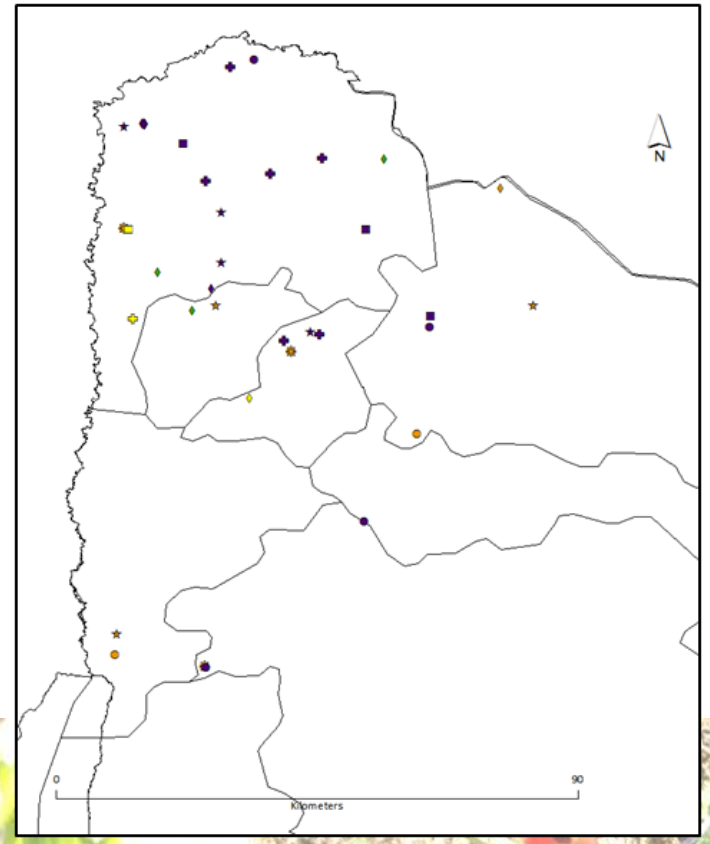
SPECIES NAME	SRG	*EX SITU* (# accessions)	*EX SITU* ECOGEOGRAPHIC AND/OR SPATIAL GAPS
Vicia galilaea	-0.20	3	y
V. ervilia	-0.26	10	y
V. sativa	-0.11	37	y
V. sericocarpa	-0.54	1	y

Establishing *ex situ* conservation priorities

PRIORITY <u>LOCALITIES</u> FOR *EX SITU* CONSERVATION

Not already conserved *ex situ* + high priority EC + negatively impacted by climate change (top 20 spp.)





Establishing *in situ* conservation priorities

PRIORITY SPECIES FOR *IN SITU* CONSERVATION

Do not occur within existing PA + negative impact of climate change (for the top 20)

PRIORITY	SPECIES NAME	SRG	*In situ* conservation (passive/no)*
1	*Vicia sericocarpa*	-0.54	No
1	*V. ervilia*	-0.26	No
1	*V. galilaea*	-0.20	No
2	*V. sativa*	-0.11	Passive

Establishing *in situ* conservation priorities

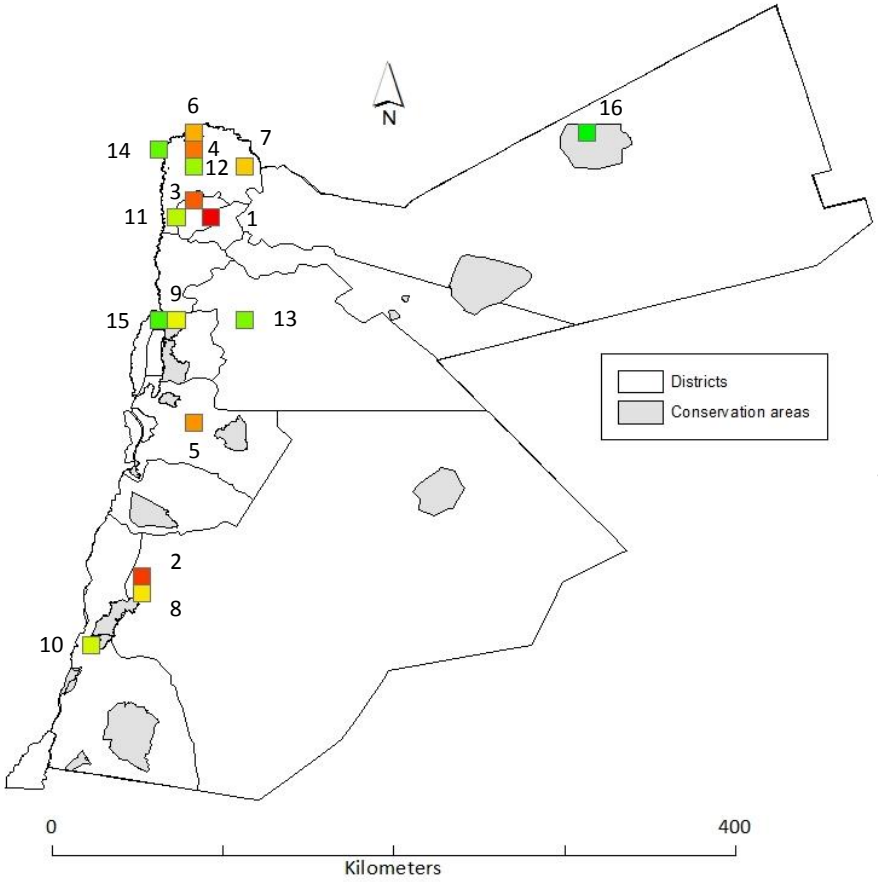
PRIORITY LOCALITIES FOR *IN SITU* CONSERVATION

Simple complementarity

Combination of complementarity analysis at existing PA and outside PA

Establishing *in situ* conservation priorities

SIMPLE COMPLEMENTARITY ANALYSIS (10 x 10 Km)



16 grids

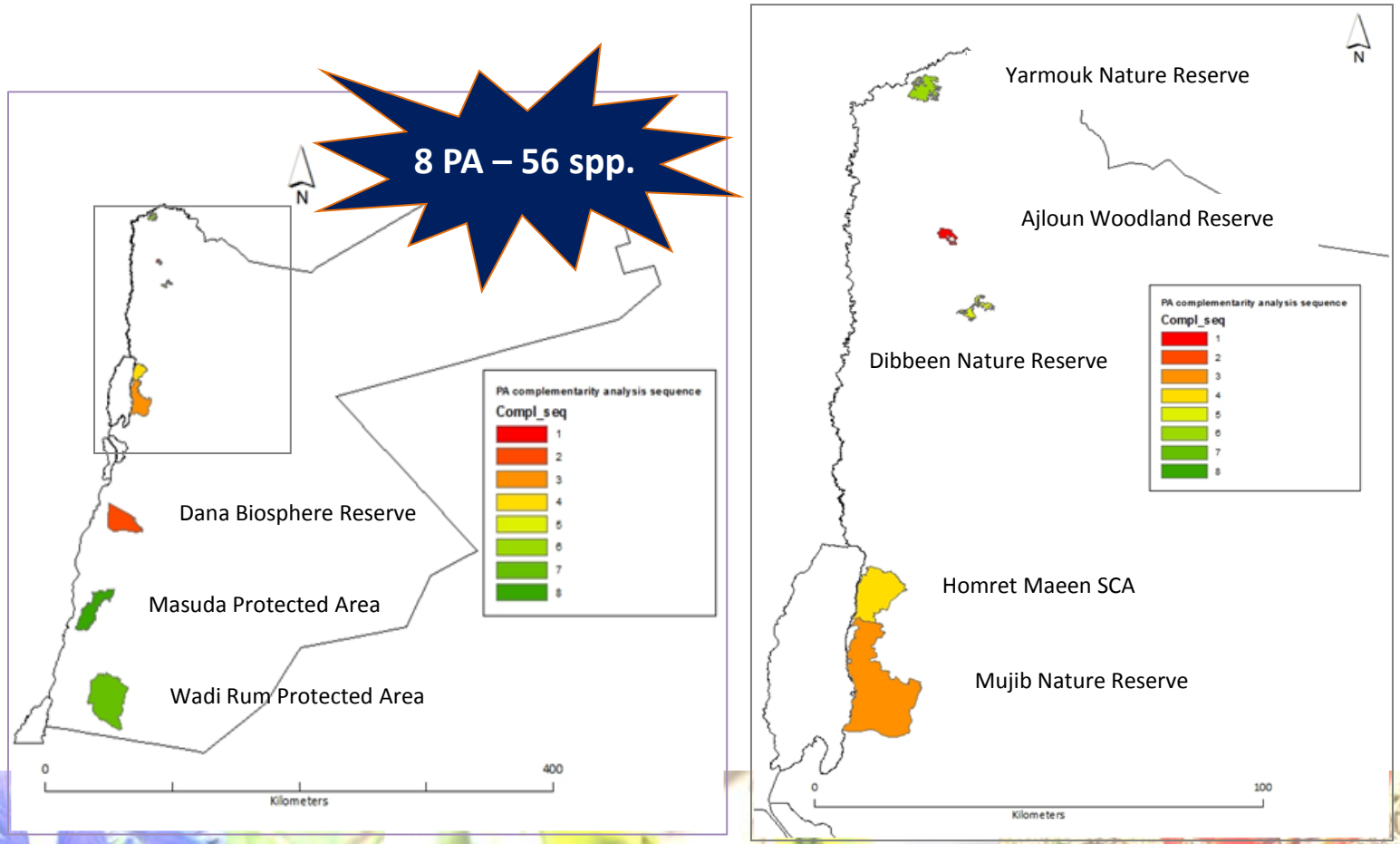
Within existing PA - 1

Extend borders of existing PA - 9

New conservation areas - 6

Establishing *in situ* conservation priorities

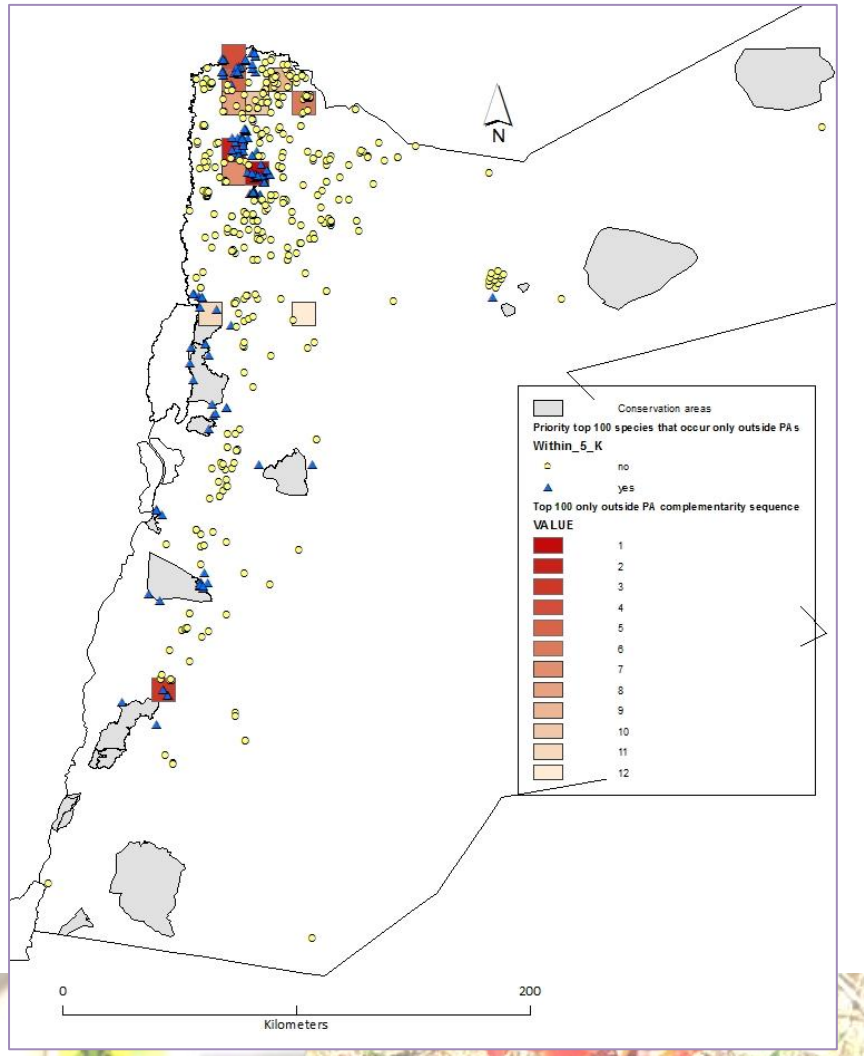
COMBINATION OF COMPLEMENTARITY AT EXISTING PAs AND OUTSIDE PAs



Establishing *in situ* conservation priorities

COMBINATION OF COMPLEMENTARITY AT EXISTING PAs AND OUTSIDE PAs

12 grids – 44 spp.



Key messages

- Jordan - high plant diversity, namely of CWR, but threatened!
- A national plant conservation strategy was developed and involved national stakeholders in every step
- Top 100 priority species – all CWR!
- Ecogeographic + gap + climate change analyses used to further prioritise species and select populations for conservation
  - Species: the more threatened by climate change + ecogeographic gaps
  - Populations: ecogeographic gaps + negatively/positivelly affected by climate change

Key messages

- Some of the priority species are negatively impacted by climate change (e.g. *Vicia ervilia*, *V. galilaea*, *V. sativa* , *V. sericocarpa*)
- 22 spp of the top 100 that are not conserved *ex situ* → need to conserve them!
- *In situ* conservation sites were selected via 2 different approaches

Simple complementarity analysis	16 grids (10 x 10 Km)	-
Combination of complementarity analysis at existing PA and outside PA	8 existing PAs (56 spp.)	12 grids (10 x 10 Km) (44 spp.)

CWR in Jordan for global food security

- Jordanian flora ≅ 2625 spp → 2005 are CWR (483 genera, 100 families)
- Of 254 global priority CWR, 97 are native to Jordan!
- Jordanian plant diversity may hold the key to survival...
- Incorporate CWR conservation into National Biodiversity Strategy, National Agenda...
- Implementation of National Plant Conservation Strategy!
- Utilization of conserved diversity – ITPGRFA

FAMILY	# GENERA	# TAXA
Papilionaceae	38	306
Gramineae	63	199
Asteraceae	44	178
Lamiaceae	25	107
Liliaceae	18	94
Caryophyllaceae	15	85
Cruciferae	28	74
Chenopodiaceae	11	70
Scrophulariaceae	6	65
Apiaceae	23	60

Acknowledgements

- IUCN - Regional Office of West Asia
- Curators of herbaria and genebanks (JUST, Al Albait University, Yarmuk University, Badia Research and Development Program, Royal Botanic Garden – Edinburgh, Hebrew University of Jerusalem, NCARE)
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- BOT-ERA partners

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