Monitoring the occurrence of invasive plants in different types of natural habitats

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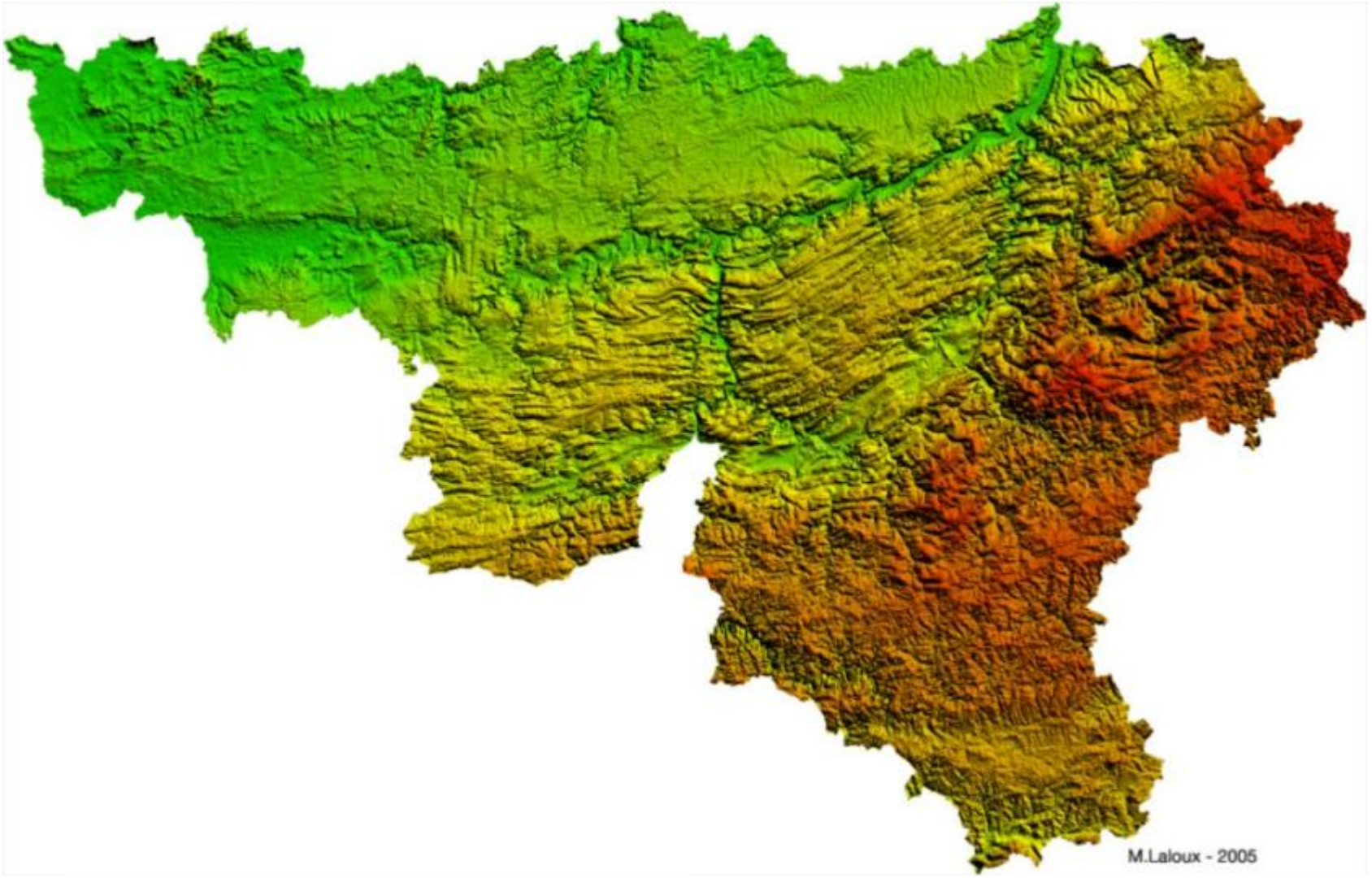
Natura 2000 in Wallonia

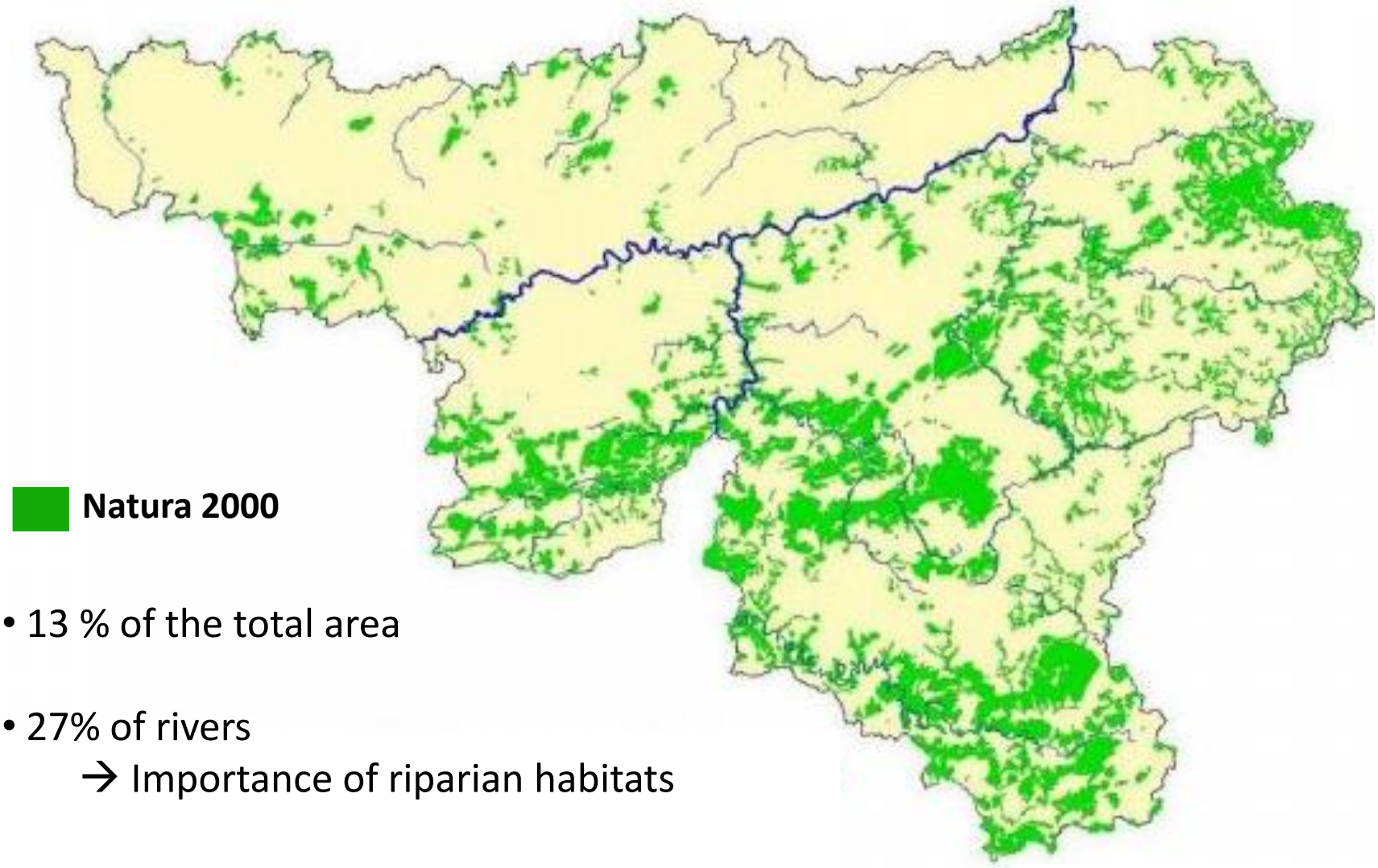
- Natura 2000 is an ecological network of protected areas in the European Union
- Complementary to natural reserves: lower protection, but larger scale (18% area)
- Set up differently in different member states and/or regions

Wallonia
(Southern region of Belgium)

Natura 2000 in Wallonia



Natura 2000 in Wallonia



- 13 % of the total area
- 27% of rivers
  → Importance of riparian habitats

Rivers: the core of Natura 2000 in Wallonia

- Riparian habitats:
  - ➢have high conservation values
  - ➢are rather preserved
  - ➢act as natural corridors for species

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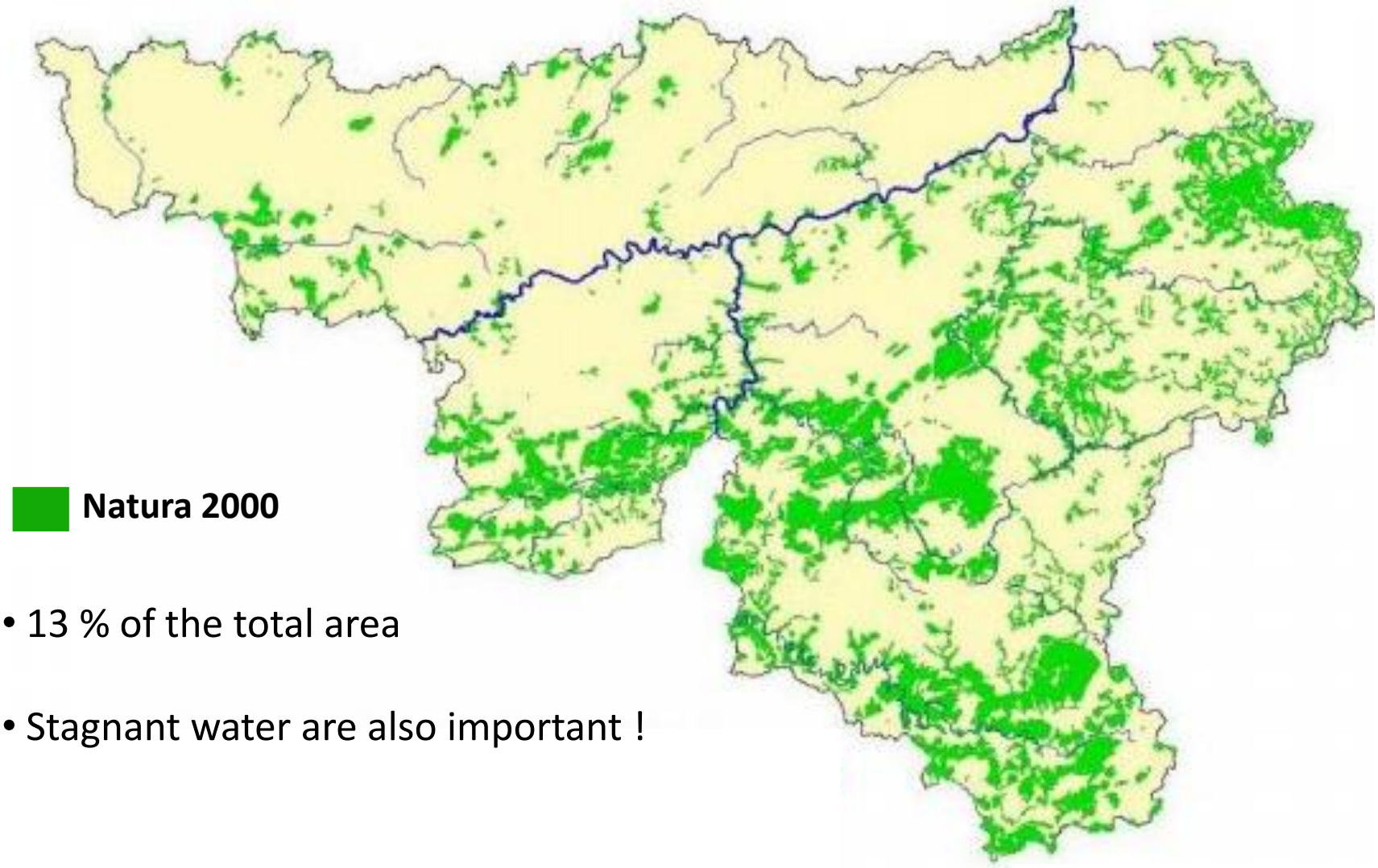
  - ➢are rather preserved
  - ➢act as natural corridors for species
  - ➢**are sensitive to plant invasion….**

✗ *Disturbances* ✗ *Downstream dispersal* ✗ *Gardens and ponds* ✗ *Important human use*




Natura 2000 in Wallonia



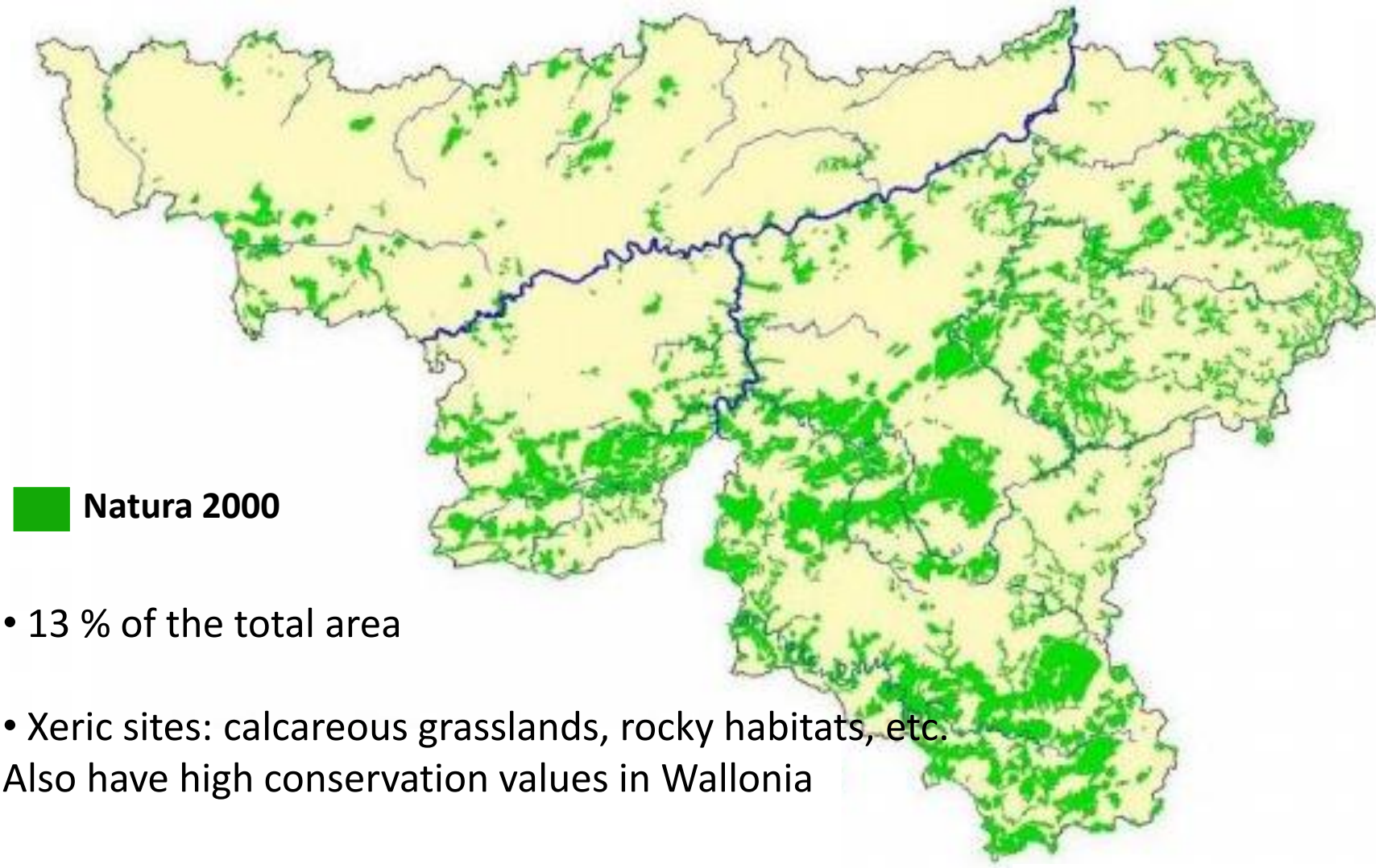
- 13 % of the total area
- Stagnant water are also important !

Stagnant waters: particularly sensitive to aquatic aliens

- Stagnant waters:
  - ➢have relatively high conservation and recreational values
  - ➢ **are extremely sensitive to plant invasion….**
  - ➢**… and control is extremely difficult !**



Natura 2000 in Wallonia



- 13 % of the total area

- Xeric sites: calcareous grasslands, rocky habitats, etc.

Also have high conservation values in Wallonia

Xeric habitats

- Xeric habitats:
  - ➢have high conservation and patrimonial values
  - ➢ **are supposed to be less sensitive to plant invasion…**
  - ➢**…even though cases are recorded!**

Research questions

Is it a big problem? What priority?

✓List all alien species occuring in these habitats

✓Identify the most common species

✓Identify the most problematical species

Case study on rivers : method

Case study on rivers : method - sampling

Sampling method

- Stratefied sampling of 187 units in the N2000 network

- Sampling unit: 150 x 10m of river bank

  ➢*28 km of linear river bank in total*
  (~0.4% of the 6800 km of river in Natura 2000)

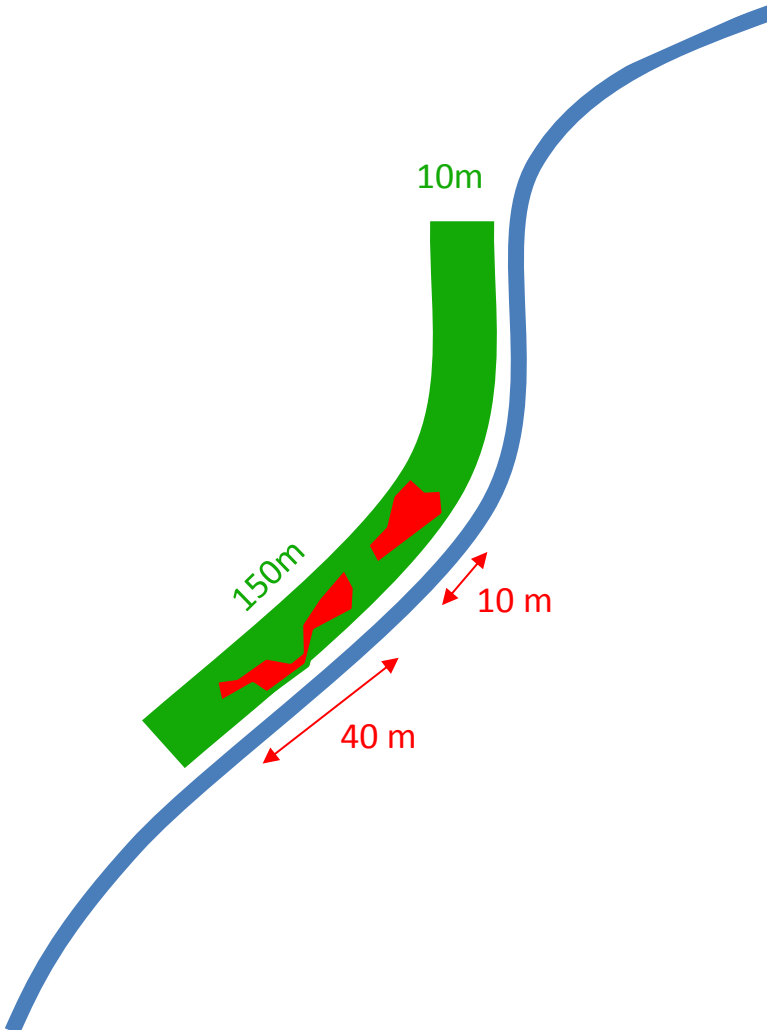
Case study on rivers : method - sampling

Measurements:

- Vegetation relevés from May to September 2013

- For all alien species:
  - ✓ Occurrence
  - ✓Linear proportion of river bank invaded

    Example: (40m + 10m) / 150m



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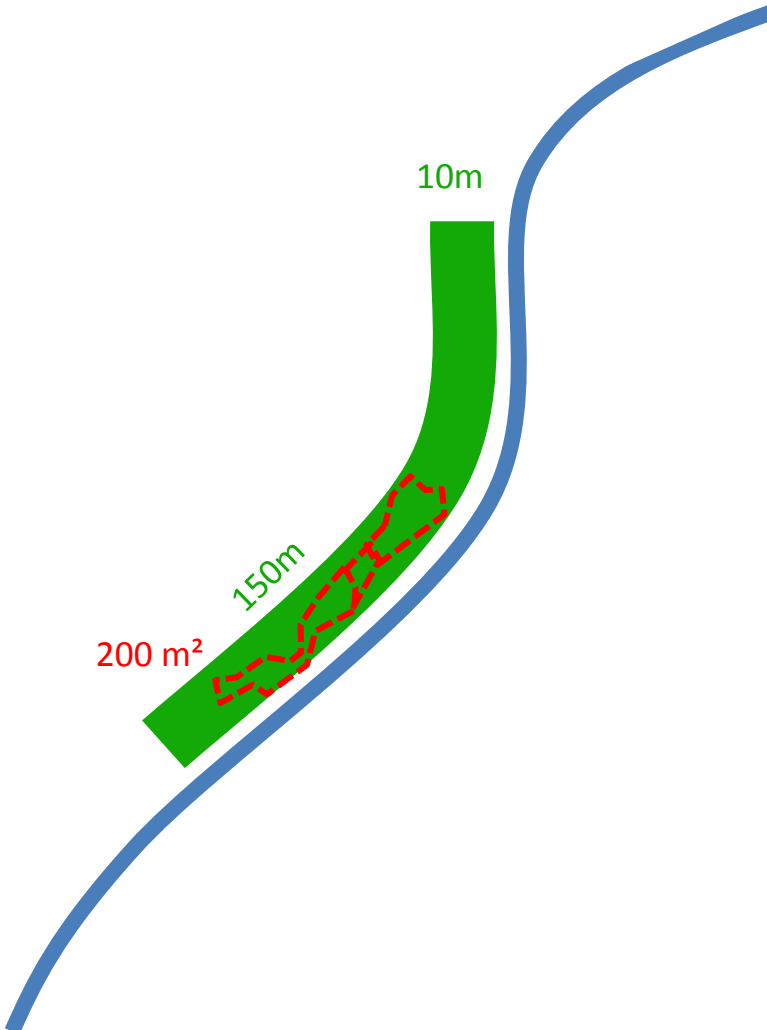

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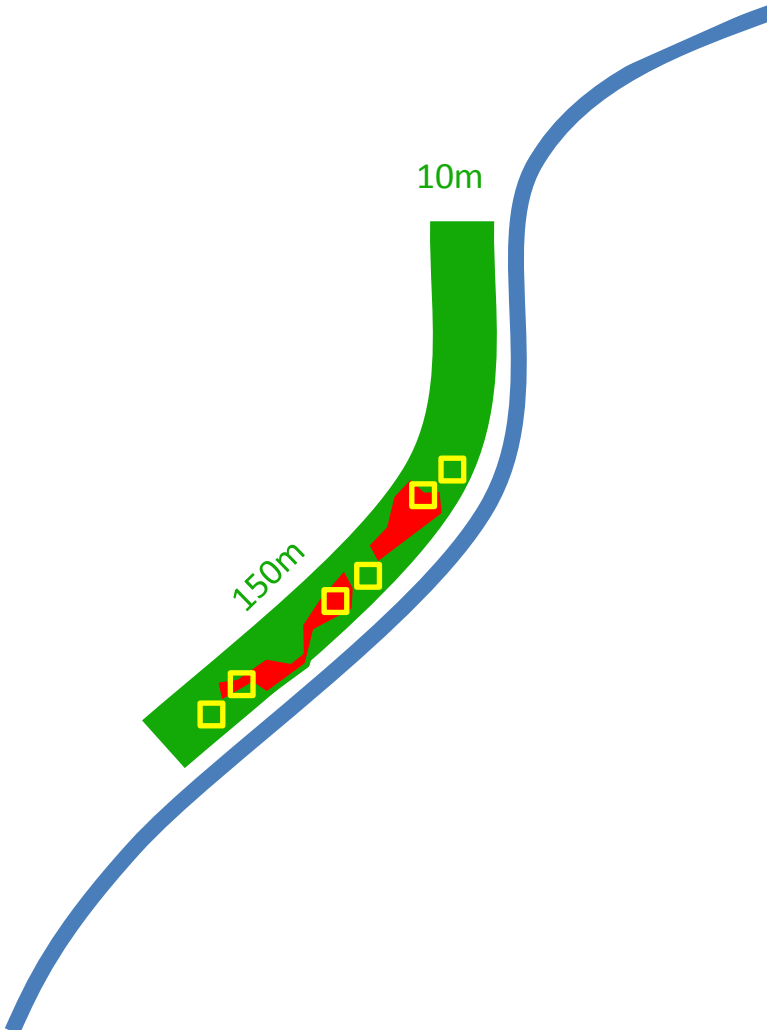
  - ✓Area invaded

- In 3 pairs of quadrats (invaded / non-invaded):
  - ✓ Invasive plant cover
  - ✓ Number of native species



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- 51 exotic species recorded
- 75 % of the sites were invaded by at least one exotic species
- One site with 13 exotic species

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➔ **What are the most common species?**

Case study on rivers : results - most common species

Exotic species	Number of sites	Linear proportion of river bank (%)
Picea abies	76/187	17.1
Impatiens glandulifera	45/187	16.6
Epilobium ciliatum	33/187	4.1
Fallopia spp.	10/187	1.6
Alnus incana	10/187	1.1
Impatiens parviflora	3/187	0.9
Populus x canadensis	13/187	0.7
Prunus serotina	11/187	0.7
Larix kaempferi	5/187	0.4
Solidago gigantea	5/187	0.4
Quercus rubra	3/187	0.3
Hesperis matronalis	4/187	0.2
Bidens frondosa	3/187	0.2
Heracleum mantegazzianum	3/187	0.2
Pseudotsuga menziesii	5/187	0.1

Norway spruce

New plantations forbidden

Only 7.2 % of river bank invaded when excluding plantations

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Giant balsam

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Northern willowherb

Weedy species rapidly increasing in abundance

Identification difficult (possible underestimation)

Hybridization with native willowherbs

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Asian knotweed

Three species altogether

F. japonica/F. sachalinensis/F. x bohemica

Mostly in open habitats

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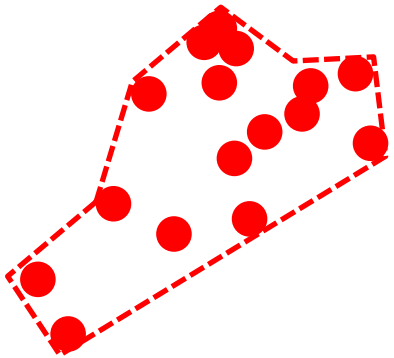
➔ **What are the most problematical species?**

Case study on rivers : results - most problematical species

Quantification of the competitive impact:

Impact = Area invaded x Invasive cover x Delta species



X % x

Sp. richness in **non-invaded**
– Sp. richness in **invaded** quadrats

Area covered by the species

Intrinsic competitive impact

Case study on rivers : results - most problematical species

Exotic species	Area of « pure » invasive population (m^2)	ΔSp (Nb Sp)	Impact (Nb $sp.m^2$)
Fallopia spp.	181,9 ± 107,7	1,1 ± 0,5	554,0 ± 364,6
Picea abies (plantations excluded)	186,1 ± 51,1	1,7 ± 0,3	352,4 ± 112,8
Phyllostachys spp.	158,4	2,0	316,8
Impatiens glandulifera	241,1 ± 49,8	0,8 ± 0,2	280,3 ± 133,3
Alnus incana	139,8 ± 88,3	1,2 ± 0,4	252,5 ± 179,2
Prunus laurocerasus	146,4 ± 106,8	1,5 ± 0,2	237,3 ± 184,5
Quercus rubra	112,5 ± 87,6	2,6 ± 1,2	153,0 ± 115,8
Pseudotsuga menziesii	32,4 ± 27,0	1,9 ± 1,0	140,8 ± 128,4
Spiraea chamaedryfolia	39,0	2,7	103,9
Solidago gigantea	61,9 ± 41,2	0,2 ± 0,8	82,0 ± 93,0

- Well-known blacklisted invasive
- Eradication hardly feasible

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- High impact even when excluding plantations
- Other impacts documented: soil acidification, etc.

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- Bamboo escaped from garden

!! Only one site but extremely abundant and competitive !!

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- Lower intrinsic impact …but very frequent!

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Many ornamentals escaped from gardens

Cherry laurel

Phyllostachys

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… but also several timber production species !

Norway spruce Grey alder Red oak Douglas fir

Stagnant waters

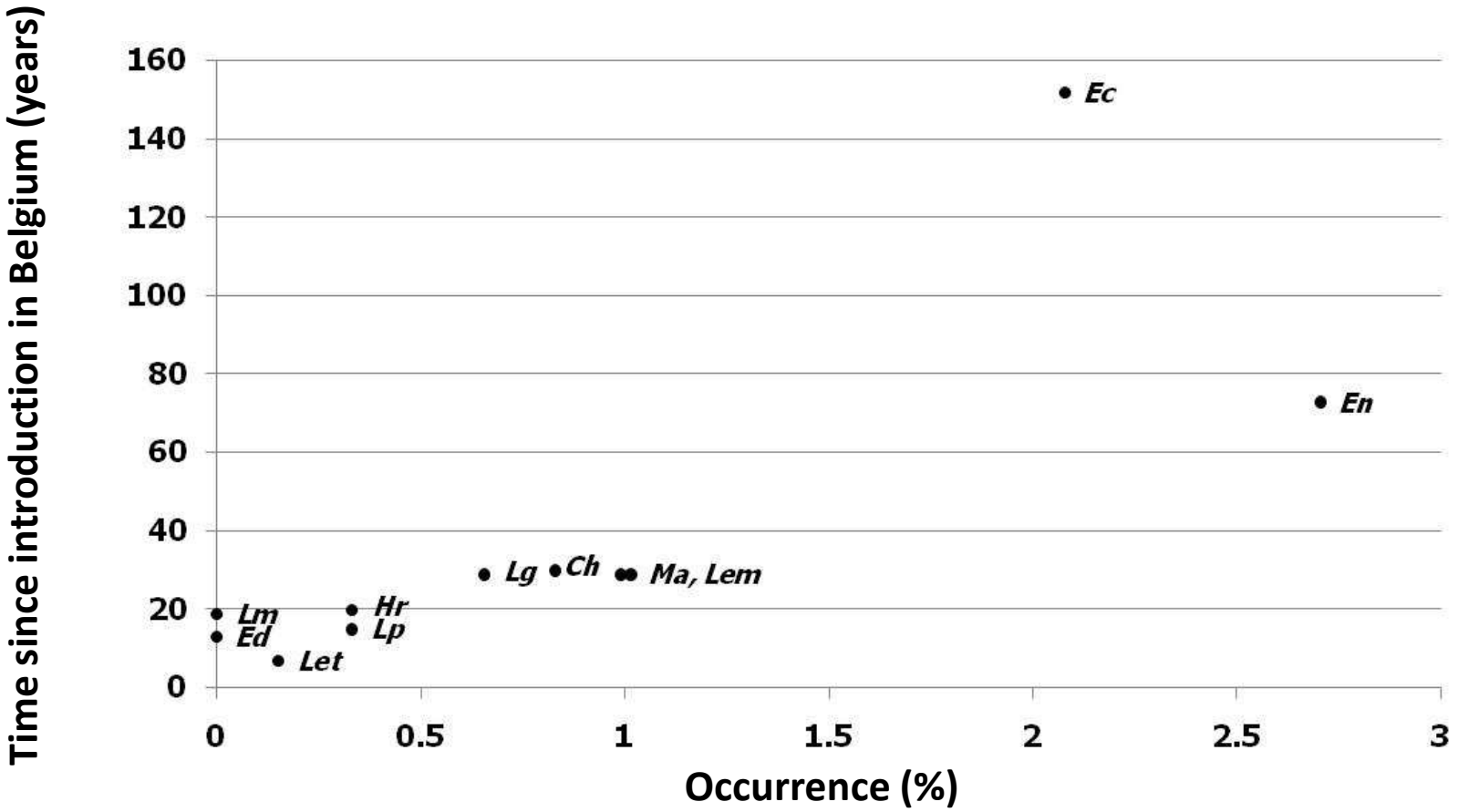
- 400 water bodies sampled (ponds and lakes)
- In and out of the N2000 network
- Extensive search for exotic plants along the bank and in the water
- Focus on aquatic and amphibian plants

Stagnant waters – main results

- 30/400 invaded by one (26), two (2) or three (2) species
- 6/72 in N2000 (roughly same proportion ~ 7%- 8%)

	Nb sites	% occurrence
Elodea nuttallii	12	3
Elodea canadensis	7	1.75
Myriophyllum aquaticum	4	1
Lemna minuta	3	0.75
Crassula helmsii	3	0.75
Ludwigia grandiflora	3	0.75
Lemna turionifera	2	0.5
Ludwigia peploides	1	0.25
Hydrocotyle ranunculoides	1	0.25

Stagnant waters – main results



Xeric habitats

- 86 N2000 sites visited – sandy, rocky and dry habitats
- Extensive search for alien plants

Xeric habitats– main results

- 25 alien plant species observed
- 60 % of the sites with at least one alien plant species
- Different patterns according to the habitats

Xeric habitats– main results

	Nb sites	% occurrence
Juglans regia	13	15.1
Cotoneaster horizontalis	12	14
Prunus serotina	9	10.5
Robinia pseudoacacia	7	8.1
Buddleja davidii	6	7
Hieracium bauhinii	6	7
Quercus rubra	5	5.8
Senecio inaequidens	5	5.8
Oenothera deflexa	4	4.7
Cerastium tomentosum	3	3.5
Epilobium ciliatum	**3**	**3.5**
Syringa vulgaris	3	3.5
Campylopus introflexus	2	2.3
Erigeron annuus	2	2.3
Juncus tenuis	2	2.3
Laburnum anagyroides	2	2.3
Sedum spurium	2	2.3
Amelanchier lamarckii	1	1.2
Fallopia japonica	1	1.2
Ficus carica	1	1.2
Oenothera glazioviana	**1**	**1.2**
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Relatively low abundance within the sites

Take-home message

Rivers ➔ particularly invaded (many species, high abundance)

Water bodies ➔invasions are less frequent… but problematical!

Dry habitats ➔ alien plants are frequent… but low invasion dynamics

Quantitative field surveys are complementary to the information found in databases and the literature

- **Major well-known invasive plants: low interest**

- **BUT major interest for:**
  - **emerging species**
  - **overlooked invasions !**
  - **Check the invasive behavior of exotic trees**

Thank you for your attention !

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