Analysis of risk potentials due to agricultural land use for nature protection areas

Investigation area: valley of the Peene River in Western Pomerania

21.06.2011

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4 Conclusion

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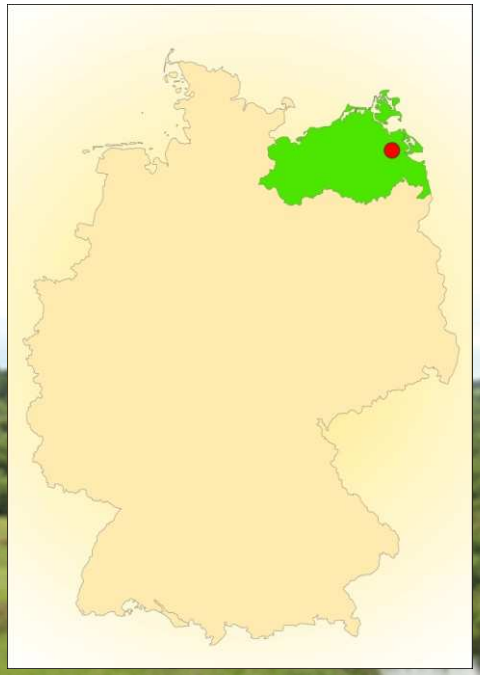
6 Results of diffuse nutrient input



Location of investigation area

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1 Investigation area

The Peene River is one of the last relatively intact rivers in Germany and one of the biggest linked lowland fens of Europe.

Project site

Length of project site: about 25 km

44 fields of cropland (mean size: 63 ha)

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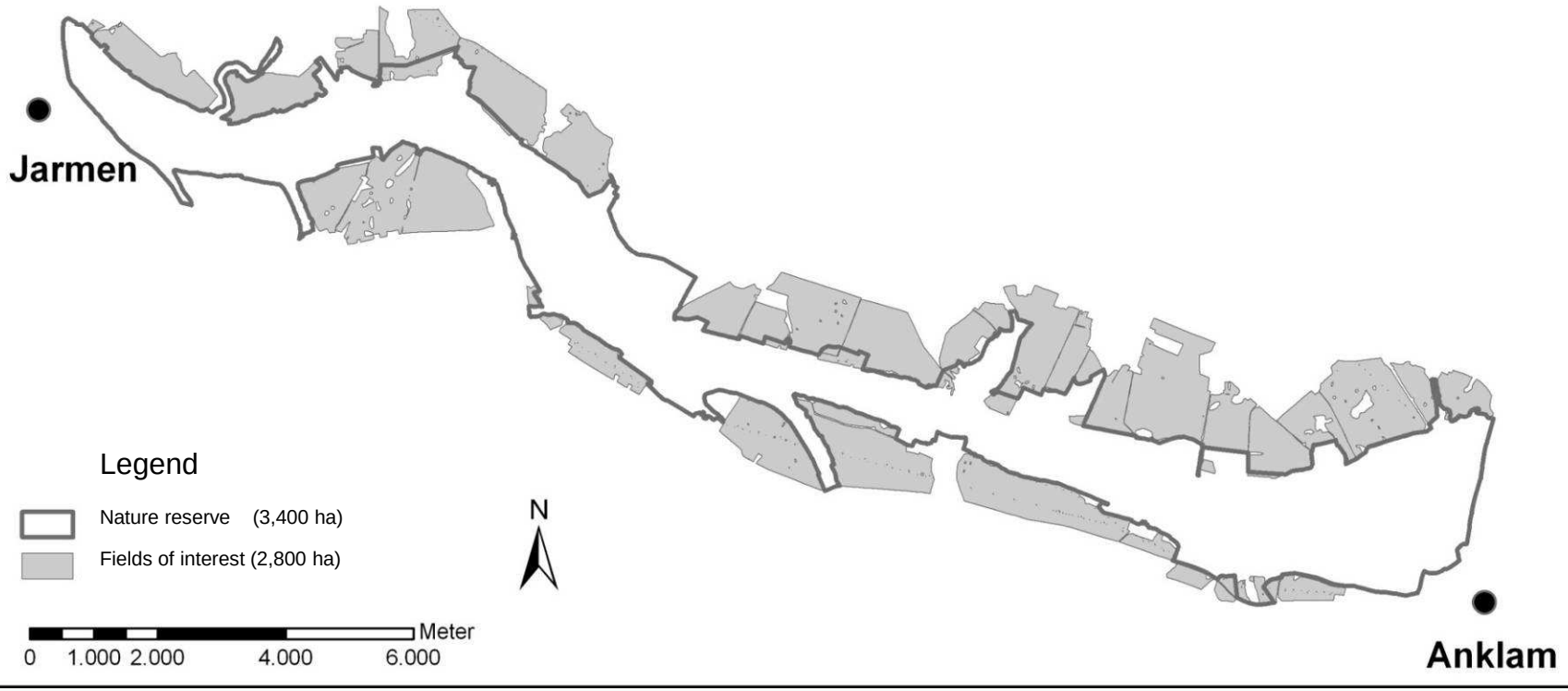

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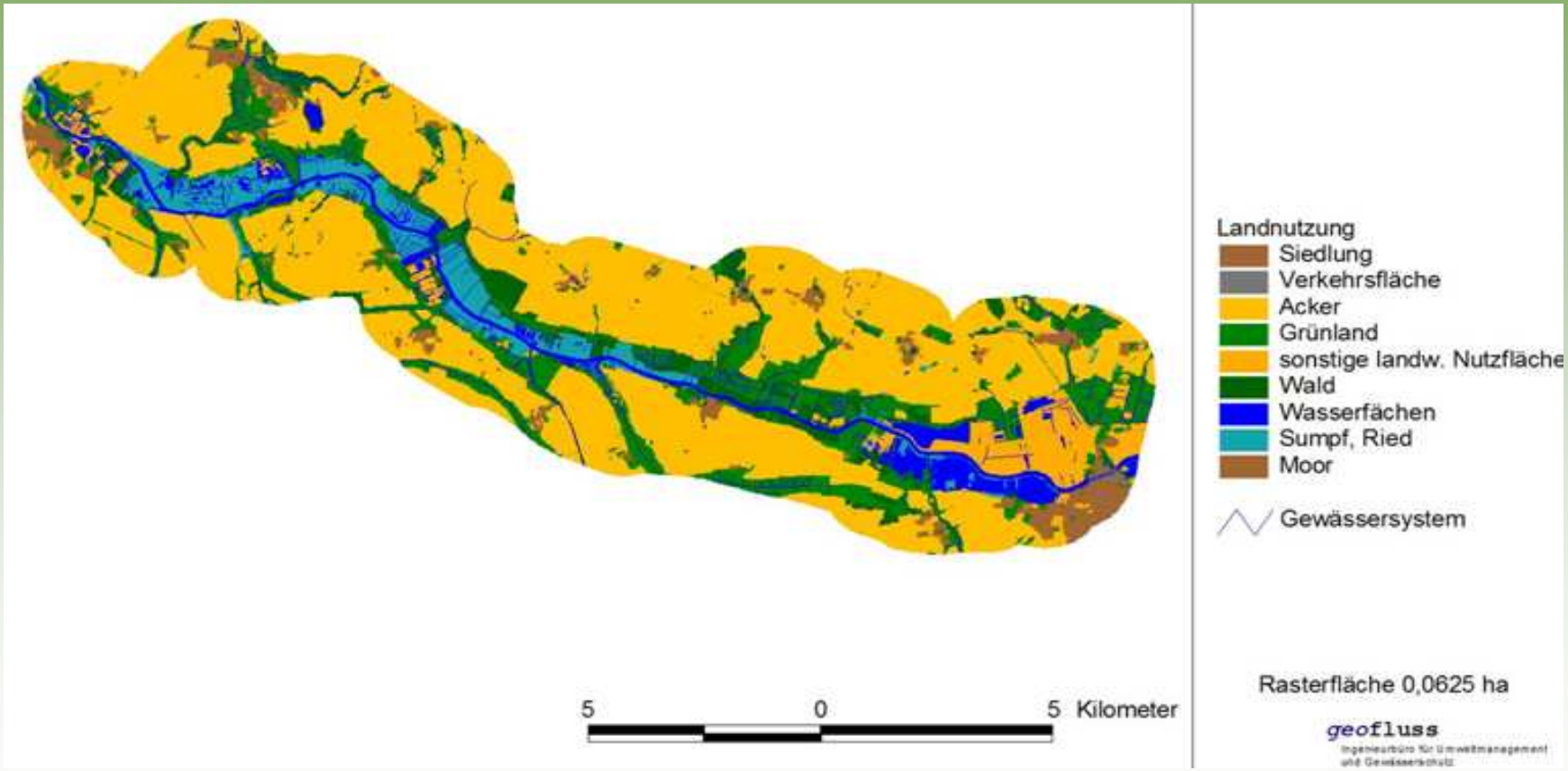
1 Investigation area

Landuse



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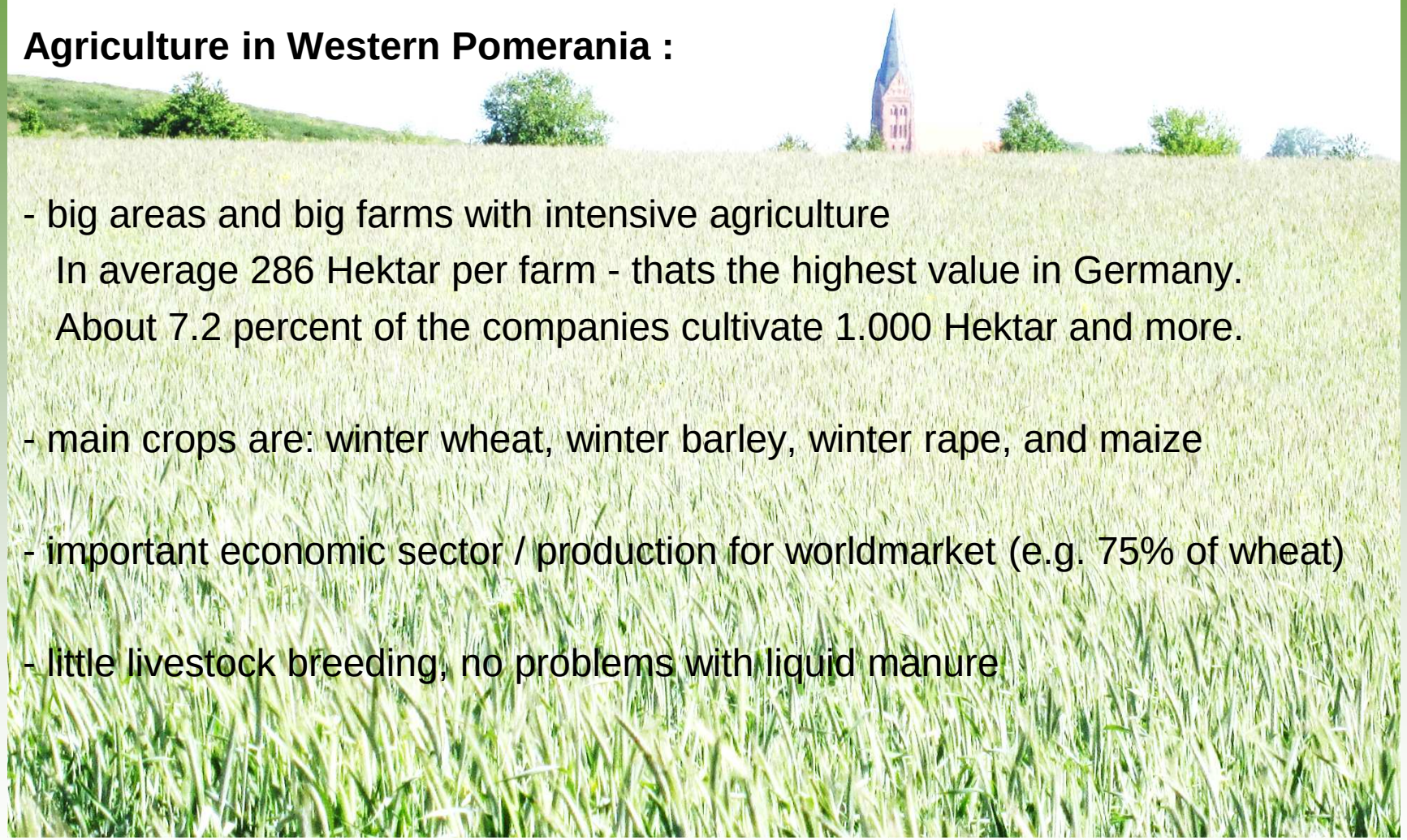
1 Investigation area

Agriculture in Western Pomerania :



- big areas and big farms with intensive agriculture
  In average 286 Hektar per farm - thats the highest value in Germany.
  About 7.2 percent of the companies cultivate 1.000 Hektar and more.

- main crops are: winter wheat, winter barley, winter rape, and maize

- important economic sector / production for worldmarket (e.g. 75% of wheat)

- little livestock breeding, no problems with liquid manure

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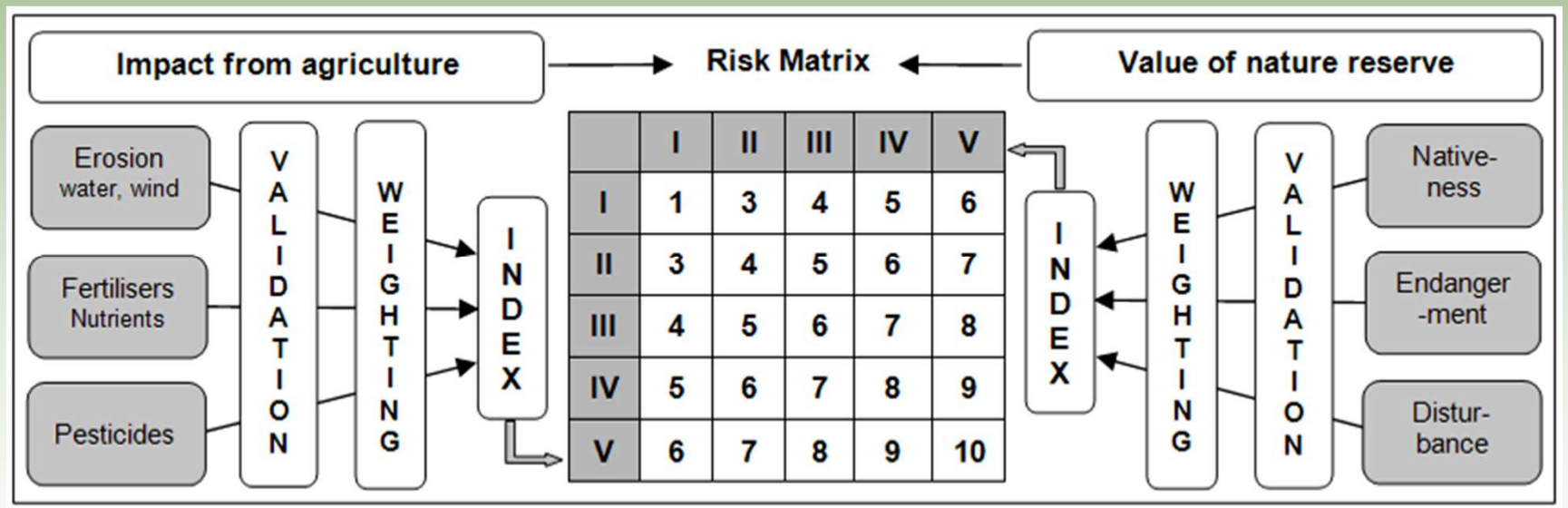
2 Methods & Data

Aim of the project:
GIS-based analysis of risk potentials. The preselection and designation of risk areas for the realization of specific measures.

The risk potential is deduced from the following criteria:
water and wind erosion, impact by fertilisers and pesticides;
degree of nativeness, endangerment of habitats and degree of disturbance[1]
All criteria were valued, weighted, classified and calculated in a risk matrix.



[1] BERG, C. et al. (2004): Die Pflanzengesellschaften Mecklenburg-Vorpommerns und ihre Gefährdung; Weissdorn-Verlag, Jena.

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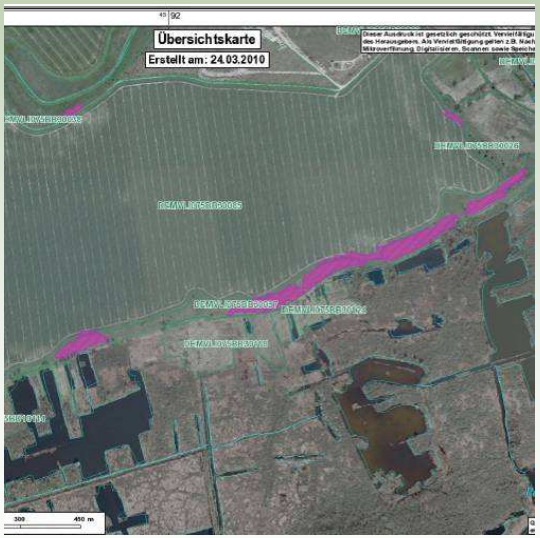
2 Methods & Data

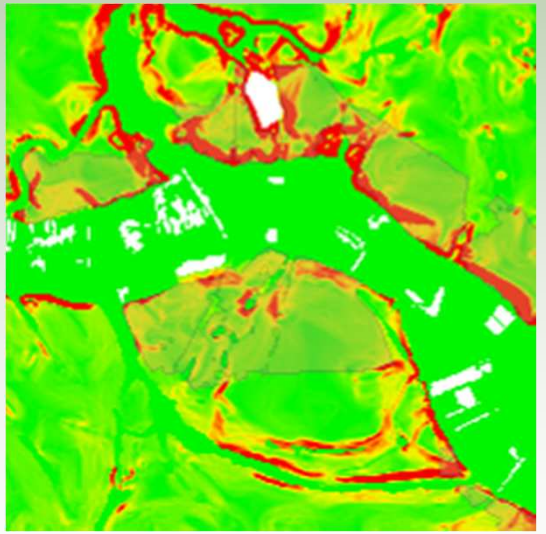
The specific preselection of affected areas is based mainly on available and official digital data like aerial pictures, elevation models, biotope maps and administrative data used for agricultural subsidies. Thus the method:

- is transferable to other regions and

- can be realised by a relative low effort - time / money (no fieldwork),

- increases the efficiency of financial means.





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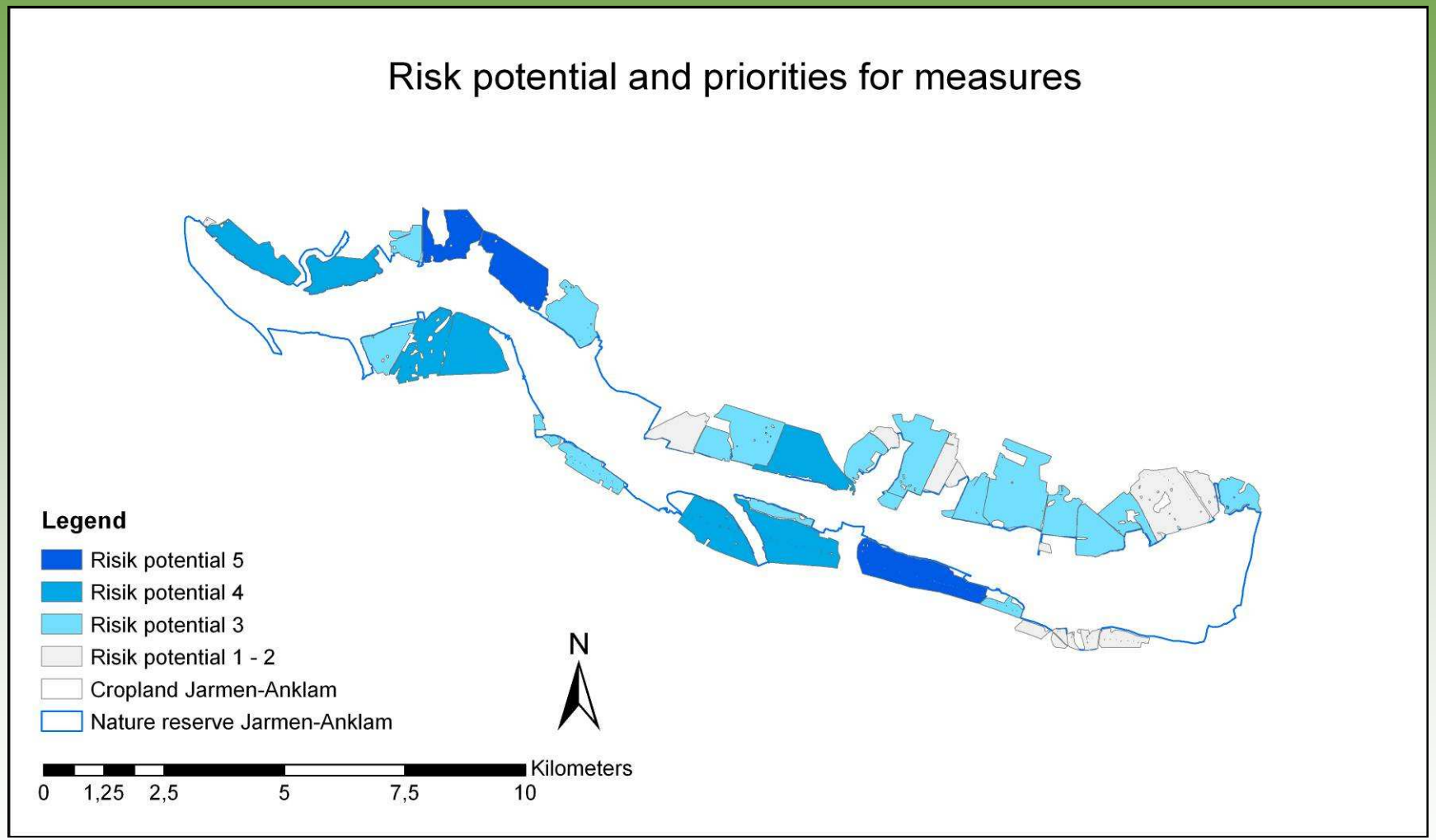
3 Results & Measures



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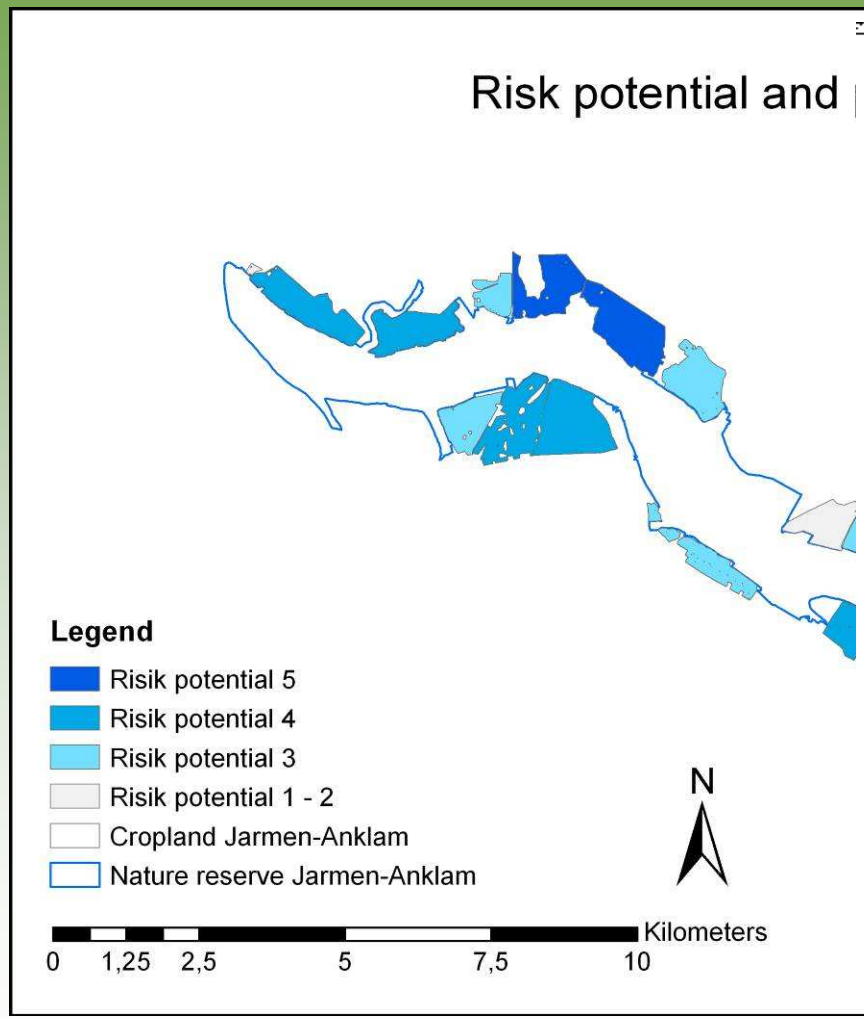

UG-Nr.	summ fakt. 0,5*	impact from agriculture	summ fakt. 1,2*	value of nature reserve	summ of classes	risik potential
1	5,0	1	6,6	2	3	2
2	18,0	4	9,1	3	7	4
3	15,5	3	15,6	5	8	4
4	10,5	2	9,3	3	5	3
5	17,0	4	19	5	9	5
6	21,0	5	15,8	5	10	5
7	11,0	3	5,6	2	5	3
8	3,5	1	6,6	2	3	2
9	10,0	2	9,3	3	5	3
10	9,5	2	9,3	3	5	3
11	18,0	4	7,6	3	7	4
12	13,0	3	5,6	2	5	3
13	8,5	2	5,6	2	4	2
14	12,5	3	9	3	6	3
15	10,0	2	9	3	5	3
16	3,5	1	9,6	3	4	2
17	4,5	1	7,3	3	4	2
18	2,5	1	13	5	6	3
19	4,5	1	13	5	6	3
20	11,0	3	9,3	3	6	3
21	2,5	1	8,1	3	4	2
22	9,0	2	8,1	3	5	3
23	7,5	2	11,4	4	6	3
24	6,5	2	11	4	6	3
25	7,5	2	5,4	2	4	2
26	9,0	2	6,6	2	4	2
27	13,5	3	6,6	2	5	3
28	3,5	1	5,4	2	3	2
29	6,5	2	5,4	2	4	2
30	4,5	1	5,4	2	3	2
31	4,5	1	9,3	3	4	2
32	4,5	1	9,3	3	4	2
33	4,5	1	9,3	3	4	2
34	5,5	1	6,6	2	3	2
35	2,0	1	17,5	5	6	3
36	21,0	5	17,5	5	10	5
37	20,0	4	11,4	4	8	4

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3 Results & Measures

For the realization of measures the following examples are taken into consideration:

Hedge stripes

Quelle: DBU (Hrsg.) KUP, Projekt NOVALIS 2010

Merging of biotopes

Greening of slopes

Flowering stripes

Quelle: DVL & NABU (Hrsg.) BIOENERGIE? – ABER NATÜRLICH! 2007

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3 Results & Measures

<u>Demonstration area 2011:</u>
different flowering and hedge stripes were tested

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3 Results & Measures

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4 Conclusions

Advantages of method:

- Practical and consistent results by incomplete information
  acceptable effort with available and official data,
- The realization of measures is accurate in area and is deduced from risk criteria, thus there is an increase of efficiency.
- The method is transferable to other regions. At the moment we implement it in the “Sternberger Endmoränengebiet“ in cooperation with the ministry of agriculture, environment and consumer protection (MLUV).

however: The quantification of the real effort is not possible yet.

The final risk potential has to be validated in nature.

5 Method of modeling diffuse nutrient input

Aim: quantification of diffuse nutrient inputs from arable land and analysis of risks for bordering nature protection areas

Background: analysis for the years 2007 – 2009 (water- and winderosion), quantification with an pathspecific balance model

The following pathways were investigatet:

- groundwater
- drainage
- surface wasch
- interflow
- erosion
- direct inputs

5 Method of modeling diffuse nutrient input

- stinging nettle (*urtica dioica*) at the edge of cropland

5 Method of modeling diffuse nutrient input

The quantification of inputs is basis for the risikanalysis in the investigation area.

Validation kriteria were:

- the summ of N- and P- inputs of investigated cropland,
- the main pathway of nutrients and
- the ammount of nutrient inputs in kg/ha/a for each field.

5 Method of modeling diffuse nutrient input

Correlation of crops to each field via InVeKoS-data (administrative data used for agricultural subsidies)

The derivation of connection of erosive areas for the relevant fields was an result of these parameters:

- gradient of slope
- direction of slope
- barrieres (like ways, streets, ditches, …)
- distance to nature reserve

6 Results of diffuse nutrient input

Important crops in the investigation area (in %).

(winter wheat, winter barley, winter rye, winter rape, root crops, fodder plants, uncultivated land)

Valuation of annual yealds in proportion to expected yealds.

	2007	2008	2009
Winterweizen	**50,4**	**29,8**	**34,6**
Wintergerste	**11,5**	**23,6**	**10,7**
Winterroggen	3,1	5,5	0,5
Winterraps	**18,0**	**23,2**	**31,2**
Hackfrüchte	1,5	6,8	10,1
Futterpflanzen	4,7	6,7	8,3
Brache	9,3	1,9	1,8

Erträge

- hoch
- normal
- gering
- sehr gering

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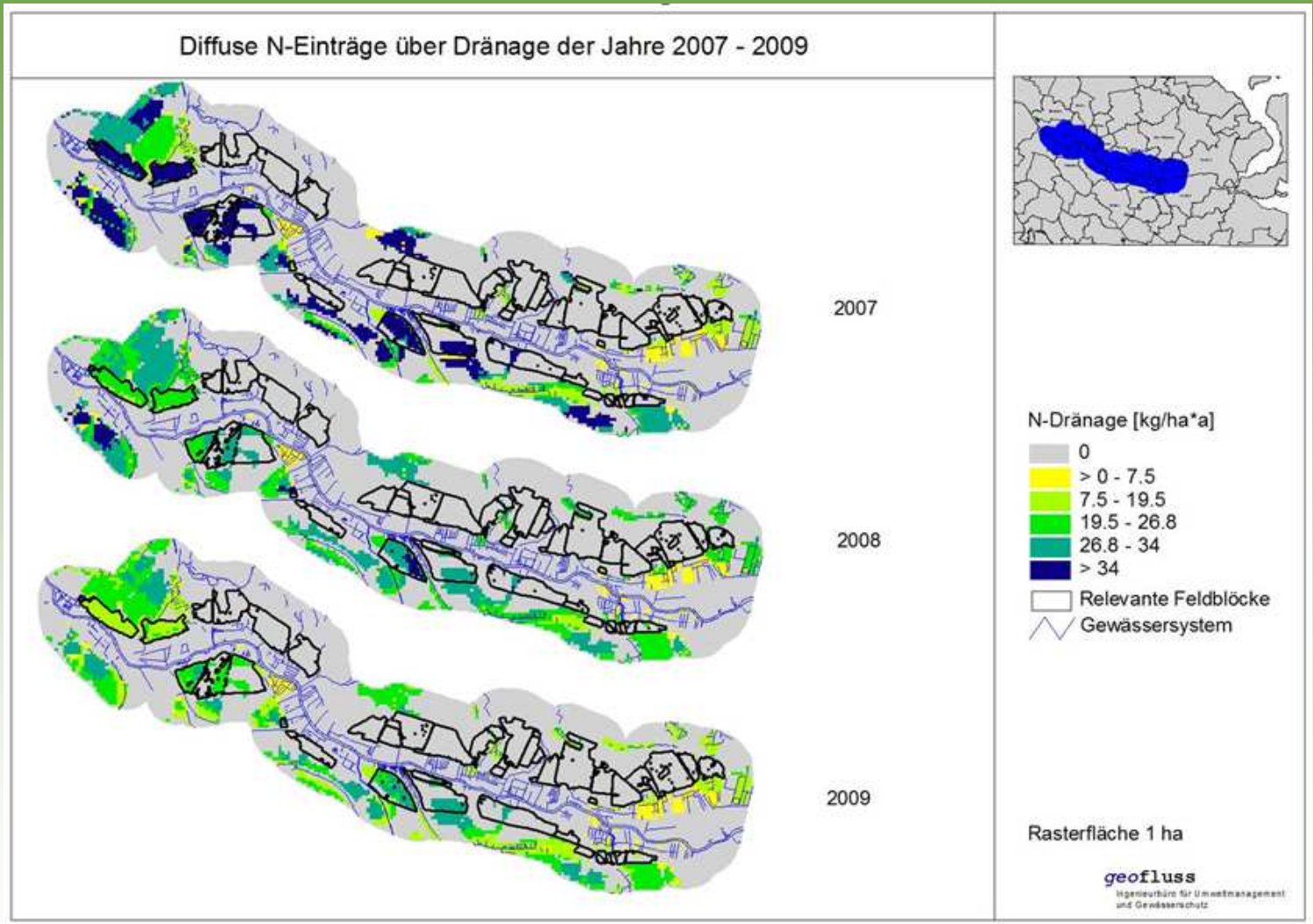
6 Results of diffuse nutrient input (Nitrogen)

Diffuse N-input per pathway (in t/a) from 2007 to 2009 and the average.

Eintragspfad	2007	2008	2009	Mittelwert
Grundwasser	40,8	51,7	46,6	46,4
Zwischenabfluss	69,1	74,8	48,2	64,0
Dränage	81,0	72,0	57,9	70,3
Erosion	3,5	3,0	2,9	3,1
Abschwemmung	0,8	1,0	0,7	0,8
Direkteinträge	0,1	0,1	0,1	0,1
Summe	195	203	156	185

6 Results of diffuse nutrient input (Nitrogen)



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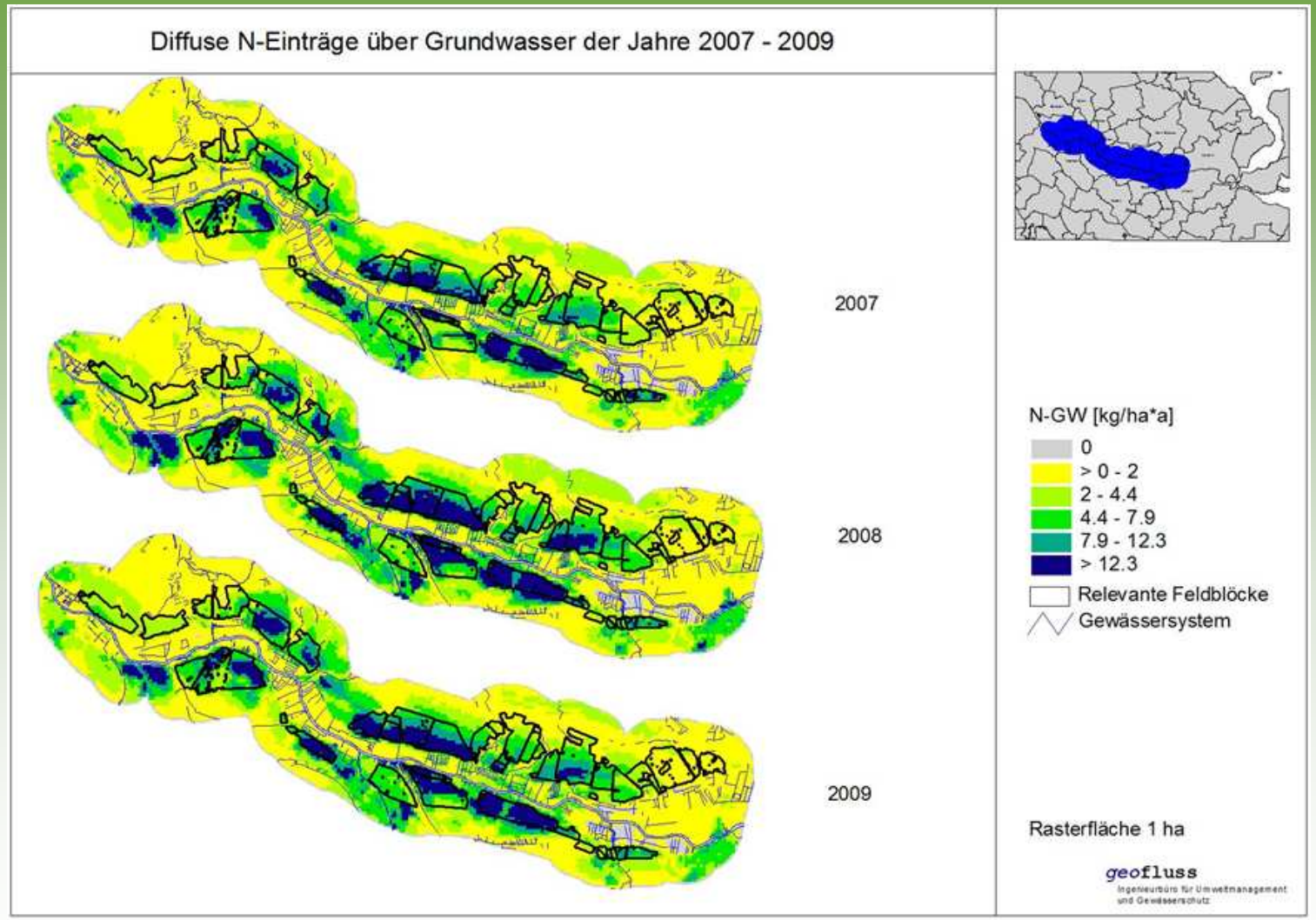

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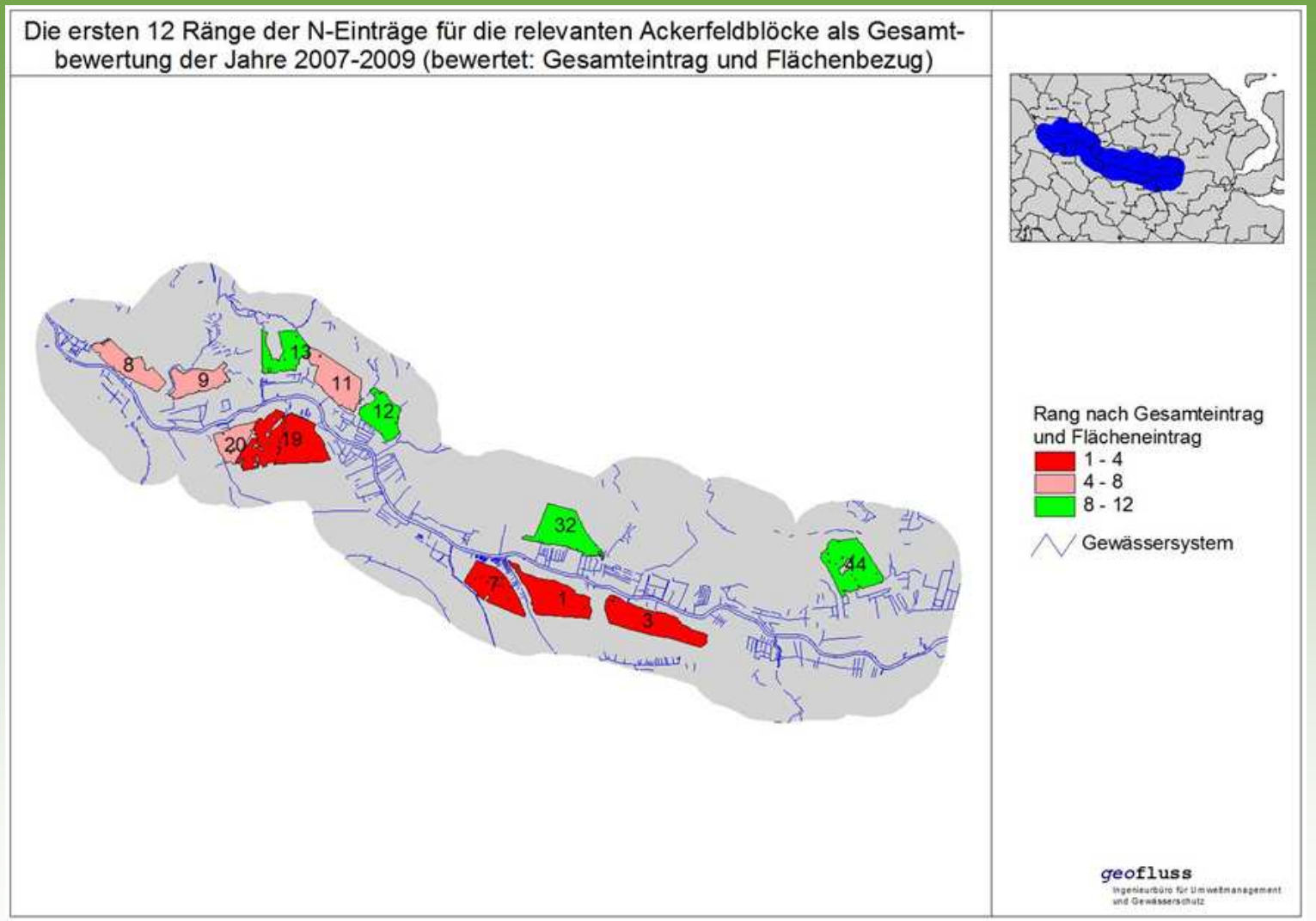

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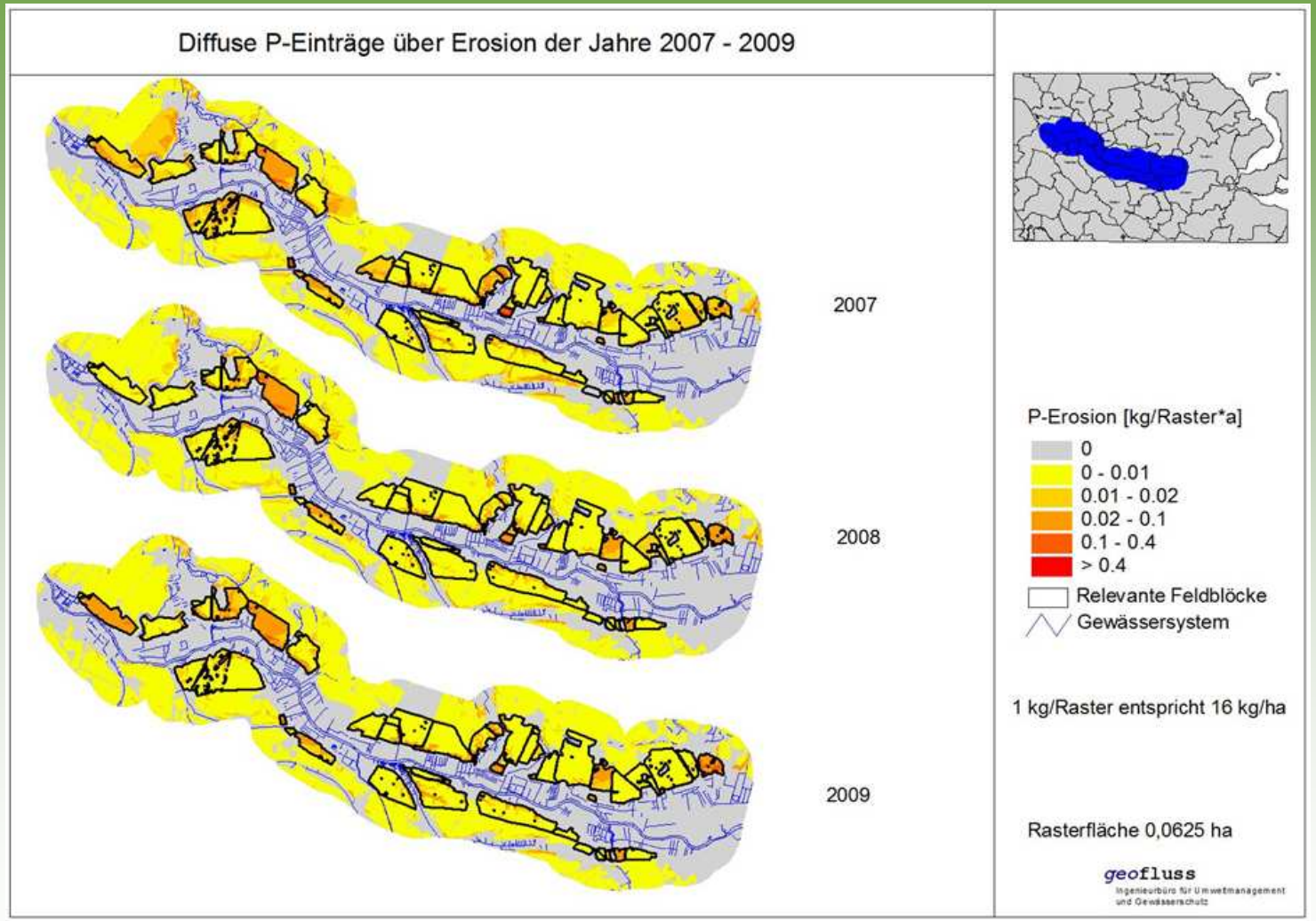
6 Results of diffuse nutrient input (Phosphorus)

Diffuse P-inputs per pathway (in kg/a) from 2007 to 2009 and the average.

Eintragspfad	2007	2008	2009	Mittelwert
Grundwasser	870	904	869	881
Zwischenabfluss	844	927	796	856
Dränage	1.096	1.154	1.135	1.128
Erosion	1.639	1.440	1.383	1.487
Abschwemmung	212	257	187	219
Direkteinträge	13	13	13	13
Summe	4.674	4.695	4.456	4.608

6 Results of diffuse nutrient input (Phosphorus)



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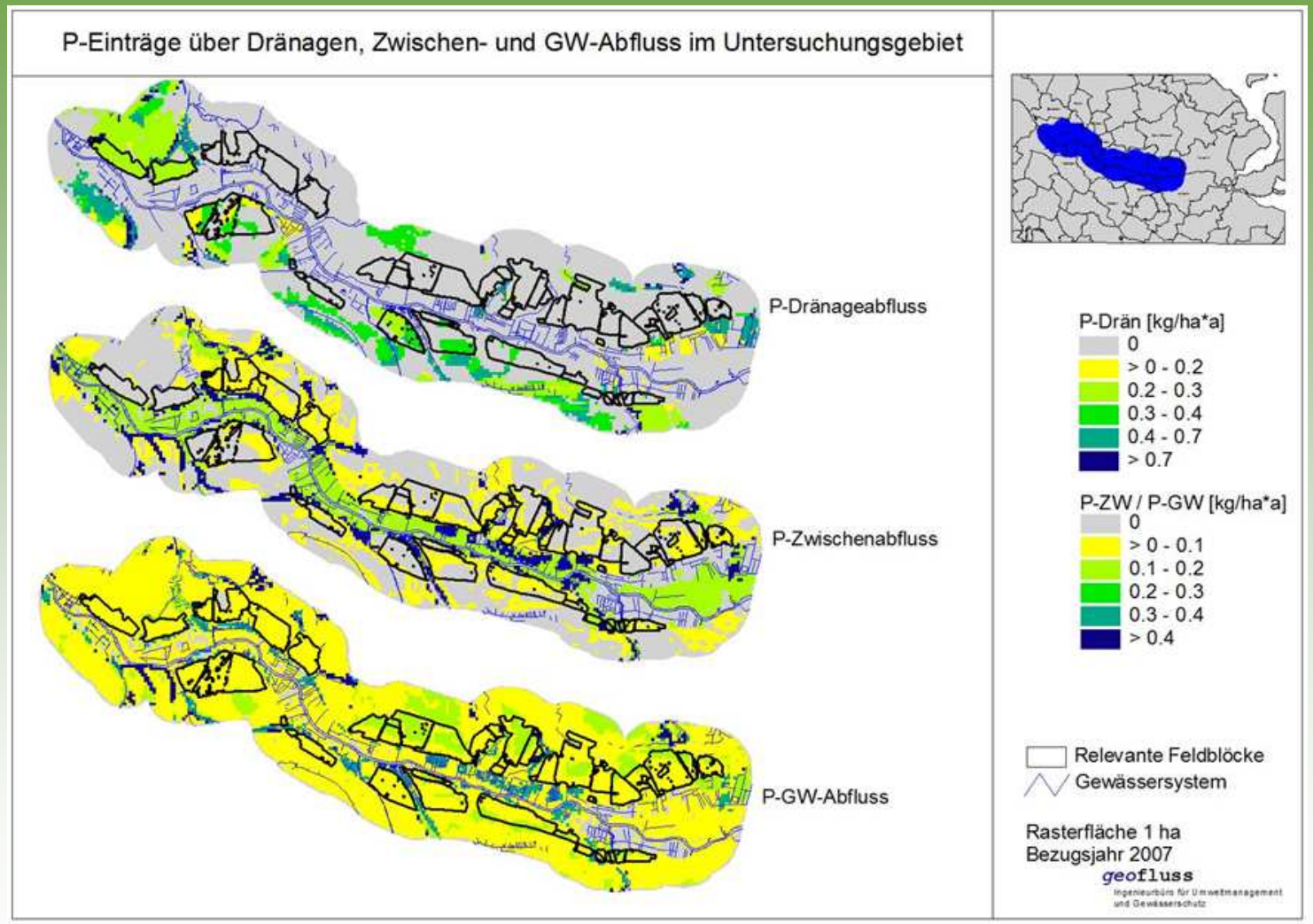

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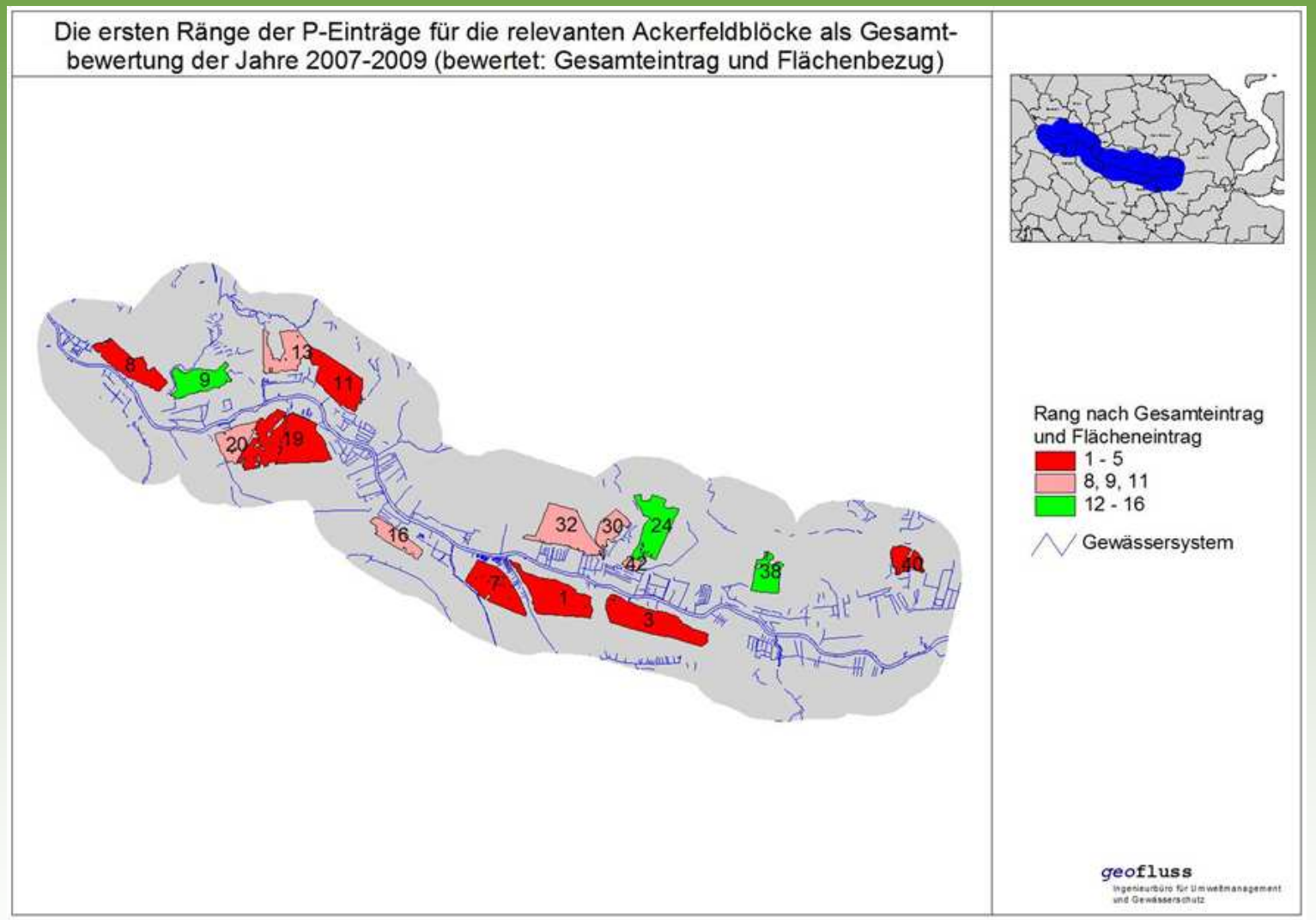

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6 Conclusion

- areas were identified, which has an particular high risk potential for the bordering nature protection area
- an efficient assignment of financial means for the mitigation of nutrient inputs is possible
- measures can be deduced from the main pathways of nutrient input
- method is also transferable to other regions (with adaptions)
- but: analysis of nutrient inputs is difficult and expensive

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