Case study 4: Estimating dispersal routes for IAS

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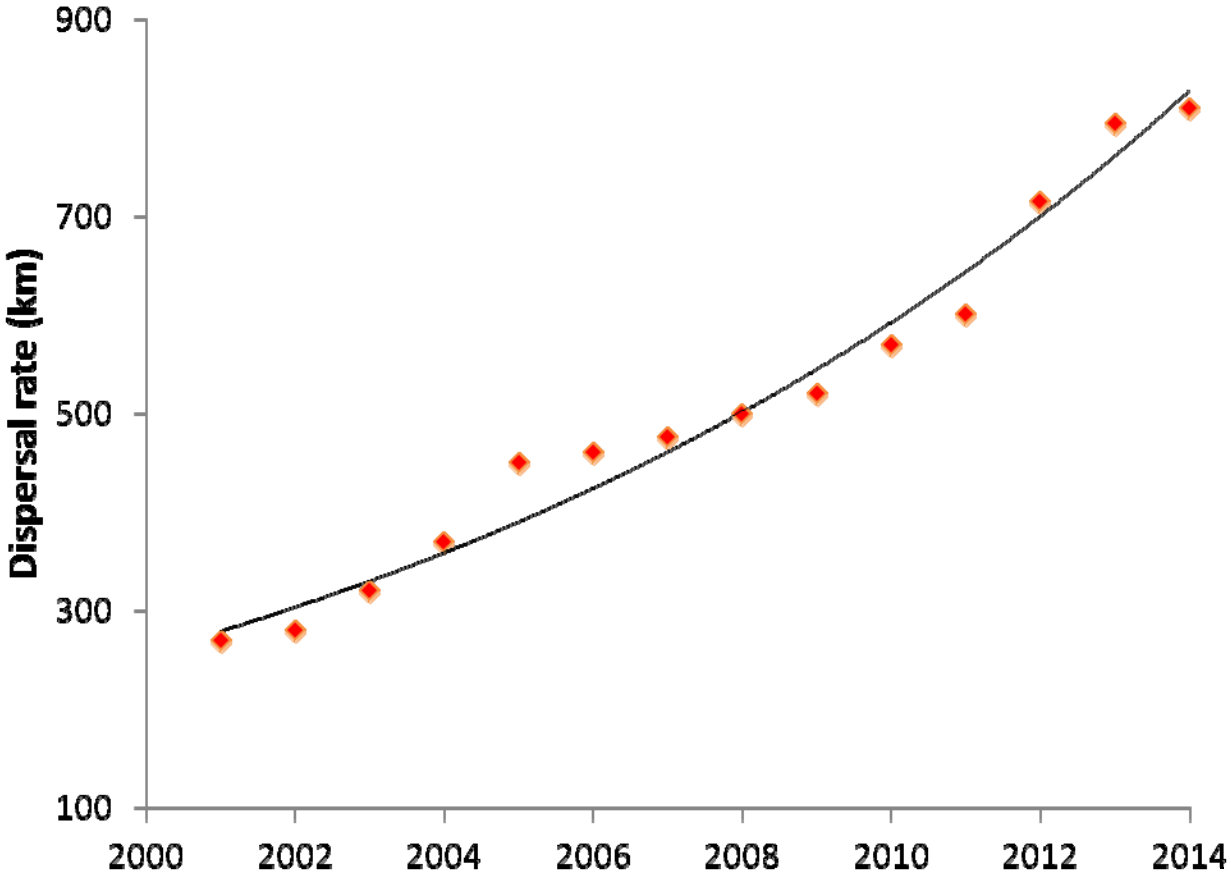
ESENIAS-TOOLS WG3 Kick-off meeting, 5 August 2015, Sofia

Aims of the action

1. to estimate dispersal rates in time: *how fast the IAS are colonizing the new environment?*



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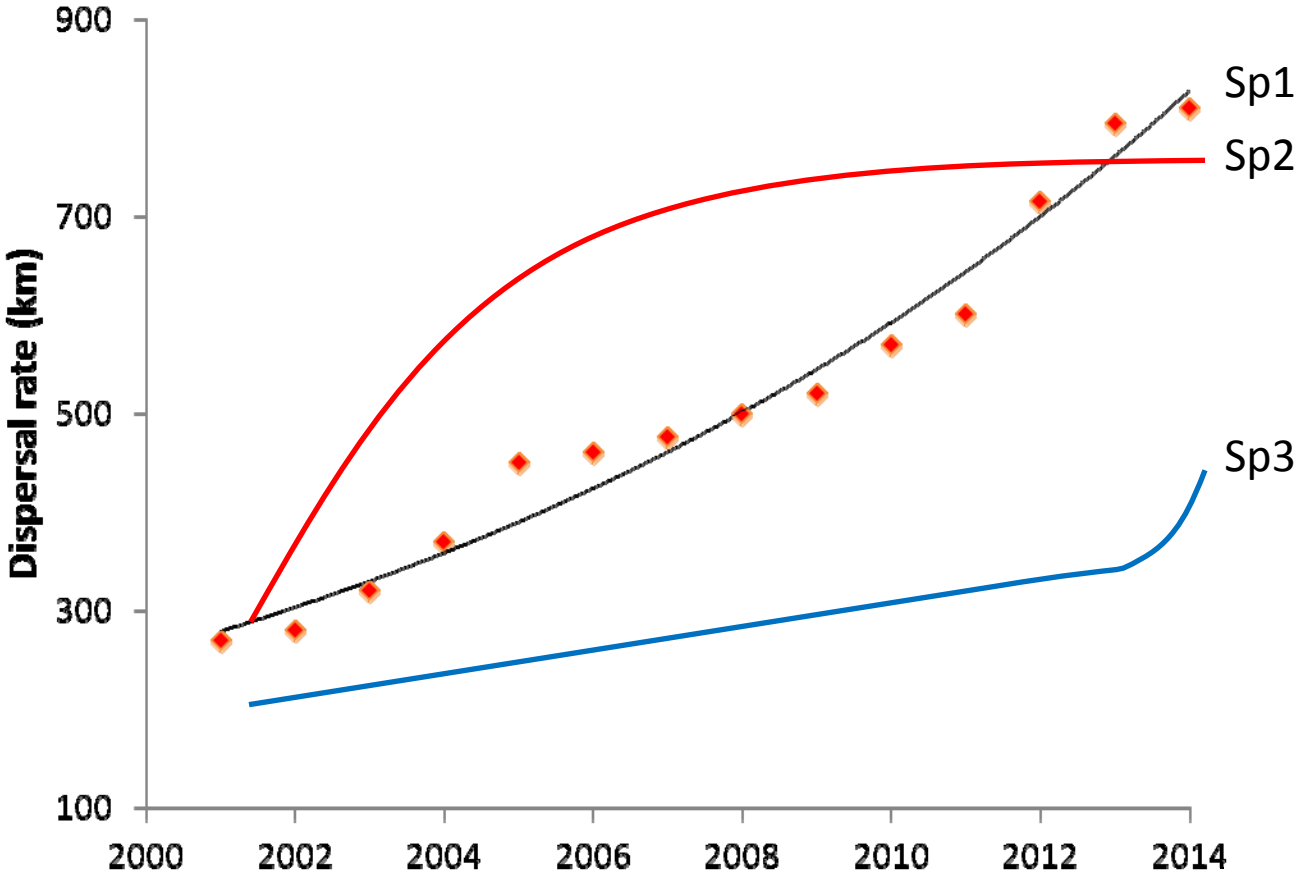
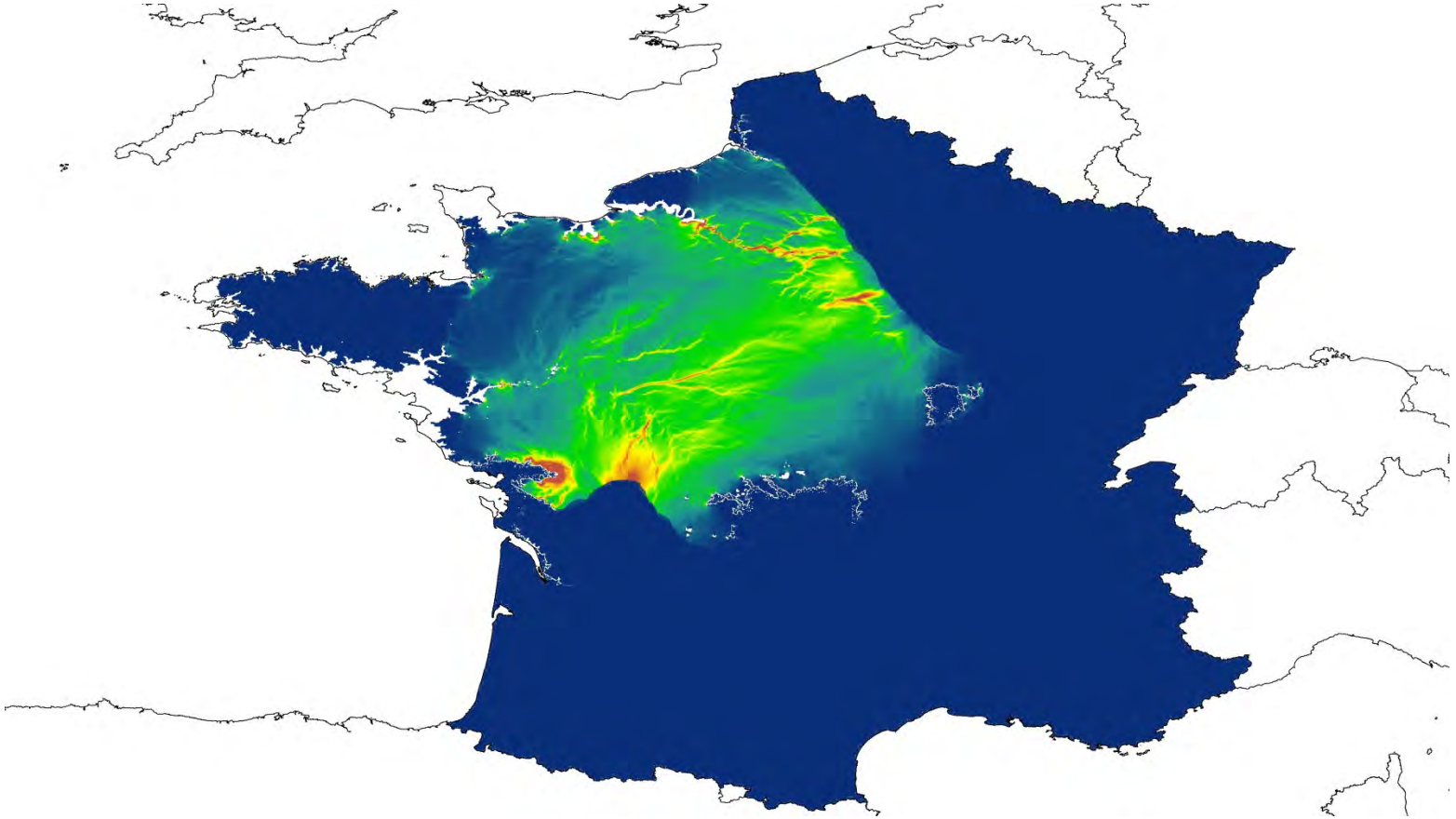


Aims of the action

1. to estimate dispersal rates in time: *how fast the IAS are colonizing the new environment?*

2. to delineate the dispersal routes in space: *what routes they use to disperse?*



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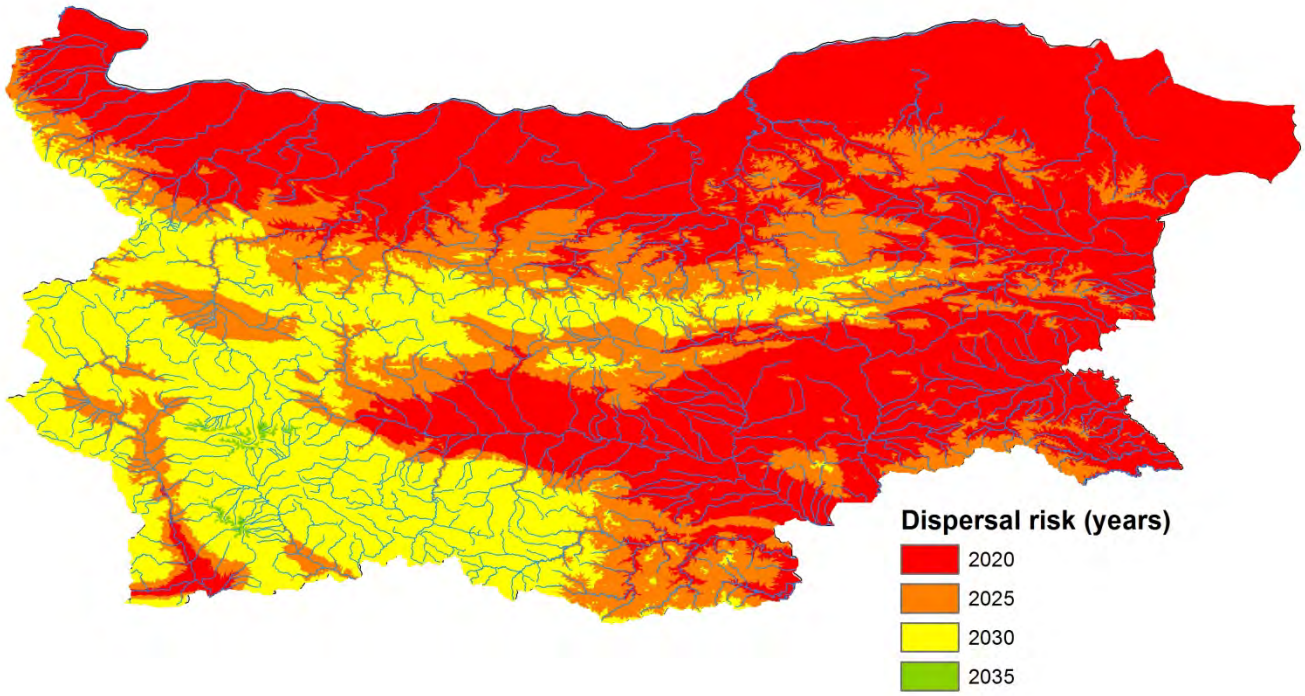
1. to estimate dispersal rates in time: *how fast the IAS are colonizing the new environment?*
2. to delineate the dispersal routes in space: *what routes they use to disperse?*

3. to project the dispersal in the near future: *risk map creation*



1. Estimate dispersal rates in time: *how fast the IAS are colonizing the new environment?*

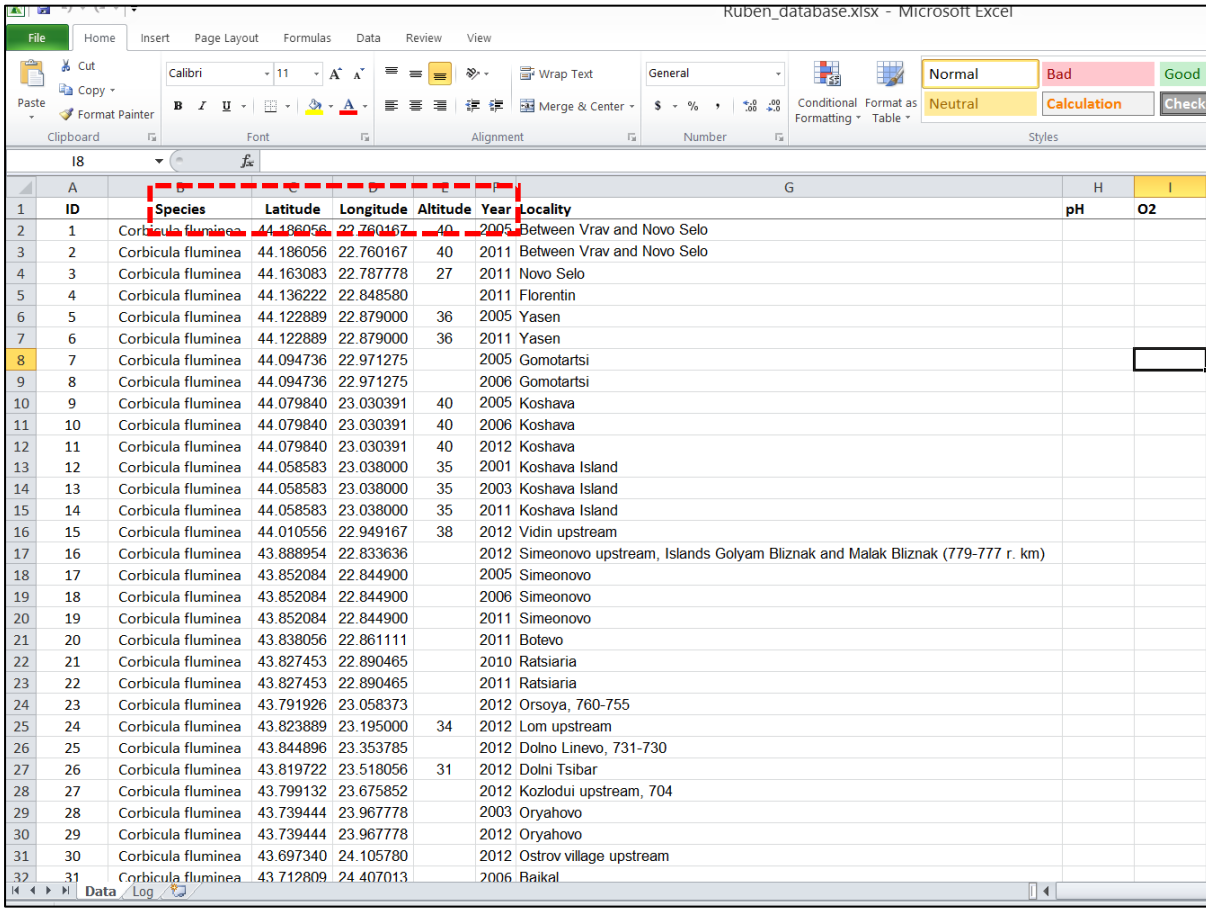
Methods to be used

Graph modeling will be used to recreate the dispersal front at certain moments. Every year records of IAS will be linked in a network. Finally, the networks will describe the rate of dispersal.

1. Estimate dispersal rates in time: *how fast the IAS are colonizing the new environment?*

Data needed

- **Records: Every year sampling**
- **Links: e.g. river segments**

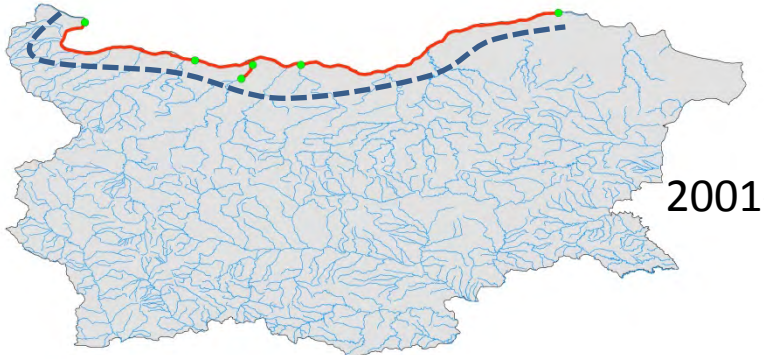


ID	Species	Latitude	Longitude	Altitude	Year	Locality	pH	O2
1	Corbicula fluminea	44.186056	22.760167	40	2005	Between Vrav and Novo Selo		
2	Corbicula fluminea	44.186056	22.760167	40	2011	Between Vrav and Novo Selo		
3	Corbicula fluminea	44.163083	22.787778	27	2011	Novo Selo		
4	Corbicula fluminea	44.136222	22.848580		2011	Florentin		
5	Corbicula fluminea	44.122889	22.879000	36	2005	Yasen		
6	Corbicula fluminea	44.122889	22.879000	36	2011	Yasen		
7	Corbicula fluminea	44.094736	22.971275		2005	Gomotartsi		
8	Corbicula fluminea	44.094736	22.971275		2006	Gomotartsi		
9	Corbicula fluminea	44.079840	23.030391	40	2005	Koshava		
10	Corbicula fluminea	44.079840	23.030391	40	2006	Koshava		
11	Corbicula fluminea	44.079840	23.030391	40	2012	Koshava		
12	Corbicula fluminea	44.058583	23.038000	35	2001	Koshava Island		
13	Corbicula fluminea	44.058583	23.038000	35	2003	Koshava Island		
14	Corbicula fluminea	44.058583	23.038000	35	2011	Koshava Island		
15	Corbicula fluminea	44.010556	22.949167	38	2012	Vidin upstream		
16	Corbicula fluminea	43.888954	22.833636		2012	Simeonovo upstream, Islands Golyam Bliznak and Malak Bliznak (779-777 r. km)		
17	Corbicula fluminea	43.852084	22.844900		2005	Simeonovo		
18	Corbicula fluminea	43.852084	22.844900		2006	Simeonovo		
19	Corbicula fluminea	43.852084	22.844900		2011	Simeonovo		
20	Corbicula fluminea	43.838056	22.861111		2011	Botevo		
21	Corbicula fluminea	43.827453	22.890465		2010	Ratsiaria		
22	Corbicula fluminea	43.827453	22.890465		2011	Ratsiaria		
23	Corbicula fluminea	43.791926	23.058373		2012	Orsoya, 760-755		
24	Corbicula fluminea	43.823889	23.195000	34	2012	Lom upstream		
25	Corbicula fluminea	43.844896	23.353785		2012	Dolno Linevo, 731-730		
26	Corbicula fluminea	43.819722	23.518056	31	2012	Dolni Tsibar		
27	Corbicula fluminea	43.799132	23.675852		2012	Kozlodui upstream, 704		
28	Corbicula fluminea	43.739444	23.967778		2003	Oryahovo		
29	Corbicula fluminea	43.739444	23.967778		2012	Oryahovo		
30	Corbicula fluminea	43.697340	24.105780		2012	Ostrov village upstream		
31	Corbicula fluminea	43.712809	24.407013		2006	Baikal		

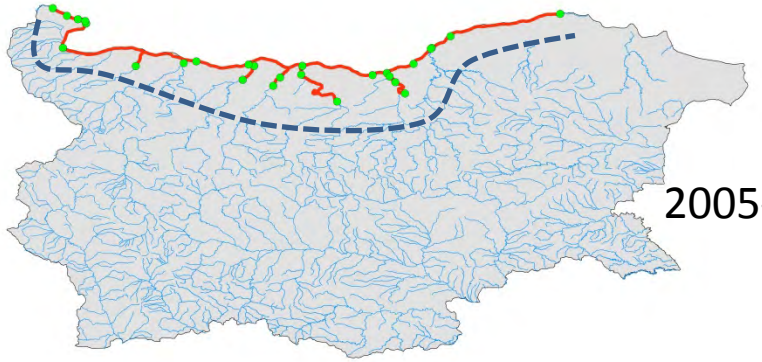
1. Estimate dispersal rates in time: *how fast the IAS are colonizing the new environment?*

Expected results for

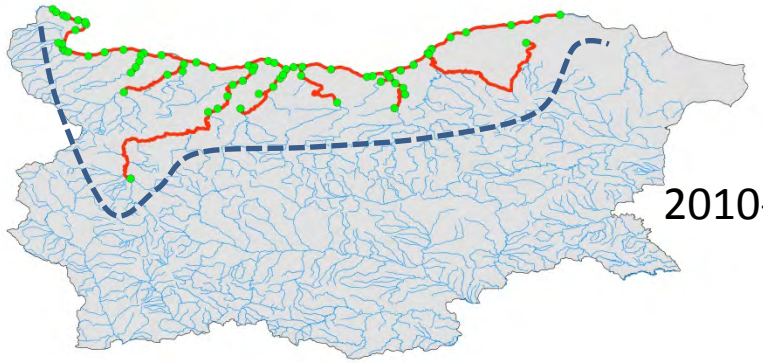
Asian clam *Corbicula fluminea* (O. F. Müller, 1774)



2001-2004



2005-2009



2010-2012

2. Delineate the dispersal routes in space: *what routes they use to disperse?*

Methods to be used

Circuitscape uses circuit theory to estimate individuals' dispersal throughout the landscape. It was used mostly for conservation purposes but can be applied for invasive species dispersal as well.

2. Delineate the dispersal routes in space: *what routes they use to disperse?*

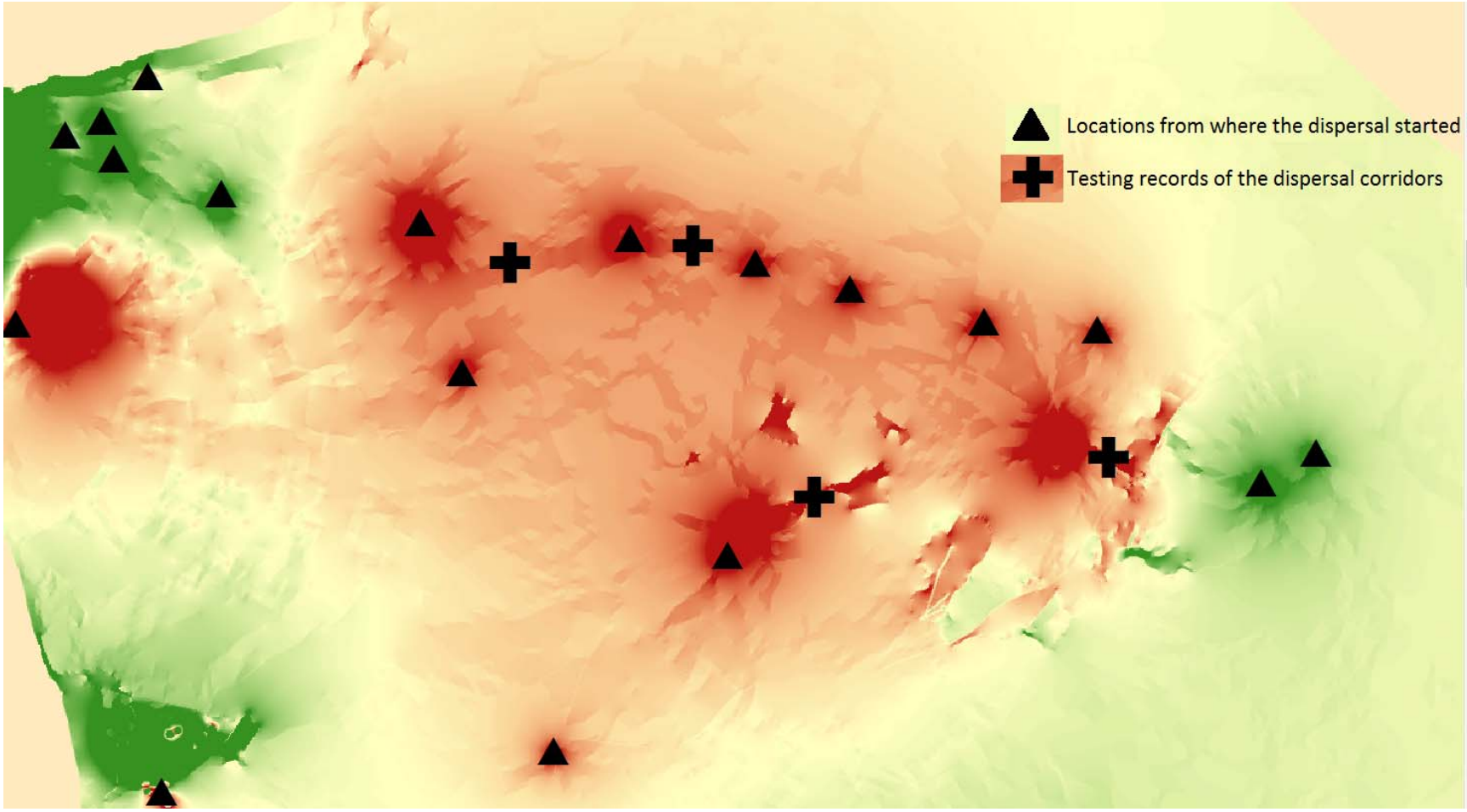
Data needed

- Core records = records from where the dispersal started in the new environment (e.g., Danube River)

- Resistance layer = a layer with resistance values to dispersal of IAS. It can be a model of environmental variables such as altitude, river bed substrate, water chemistry, etc.

2. Delineate the dispersal routes in space: *what routes they use to disperse?*

Expected results



3. Project the dispersal in the near future: *risk map creation*

Methods to be used

After estimating the dispersal rate in time and understand the factors that favor/limit the dispersal we will extrapolate into future scenarios.

3. Project the dispersal in the near future: *risk map creation*

Expected results for

Zebra mussel, Dreissena polymorpha (Pallas, 1771)