

Matthias Harnisch

Floodplain meadow restoration at the northern Upper Rhine Measures and monitoring



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Riedstadt



Federal Agency for
Nature Conservation



German Foundation
for the environment



University of Giessen



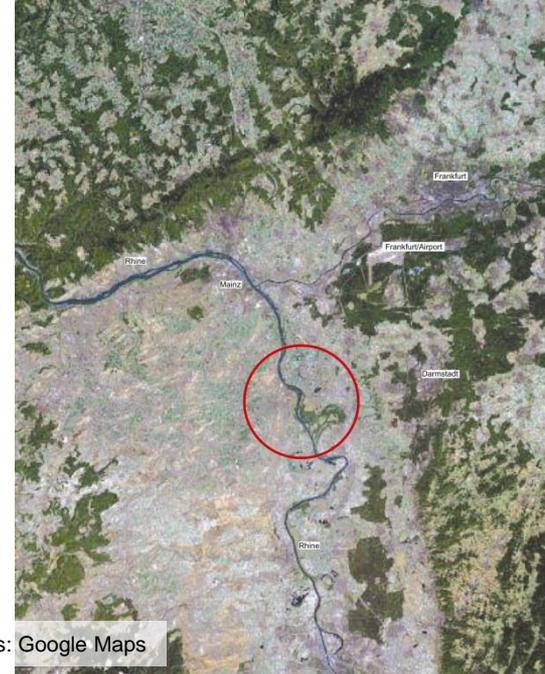
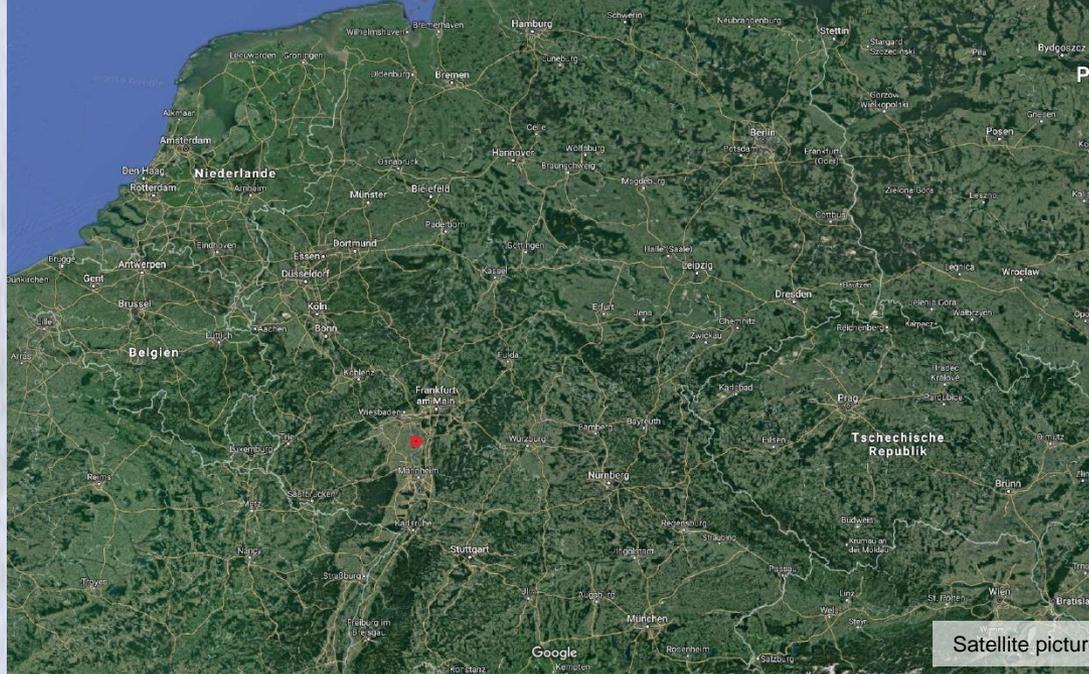
Federal State
of Hesse



Frankfurt Airport

Project Area





Satellite pictures: Google Maps

Riedstadt, 40 km south-west to Frankfurt / M., in the Holocene floodplain of the northern Upper Rhine

70 ha along both sides of the main dyke, thus including areas in the functional as well as in the fossil floodplain

52 ha provided by the municipality of Riedstadt
(thereof 21 ha bought from federal subsidies)

17 ha contributed by the Federal State of Hesse

1 ha provided by a private organisation for nature conservation



Ecological conditions:

- Warm and dry climate
(Average annual temperature:
10-11° C;
Average annual precipitation:
550 mm)
- Extreme change of
water conditions
(up to 7 m between lowest
and highest water-level)
- Non-intensive
agricultural utilisation
(1 max. 2 cuts / year, no
fertilizers)



June 2013

July 2013



- Individual- and species-rich remnant stands of floodplain-meadows at the Hessian Upper Rhine
- Two types: Alliances *Cnidion* and *Molinion*, both protected according to appendix 1 of the Flora-Fauna-Habitat directive of the EU
- In Central Europe *Cnidion*-meadows are one of the most endangered plant communities
- Many typical species reach in the study area the north-western limits of their distribution (e.g.: *Allium angulosum*, *Cnidium dubium*, *Scutellaria hastifolia*, *Viola pumila*)



Starting Point

1983: demolition of the inner dyke-system of the nature reserve „Kühkopf-Knoblochsaue“ by a big flood

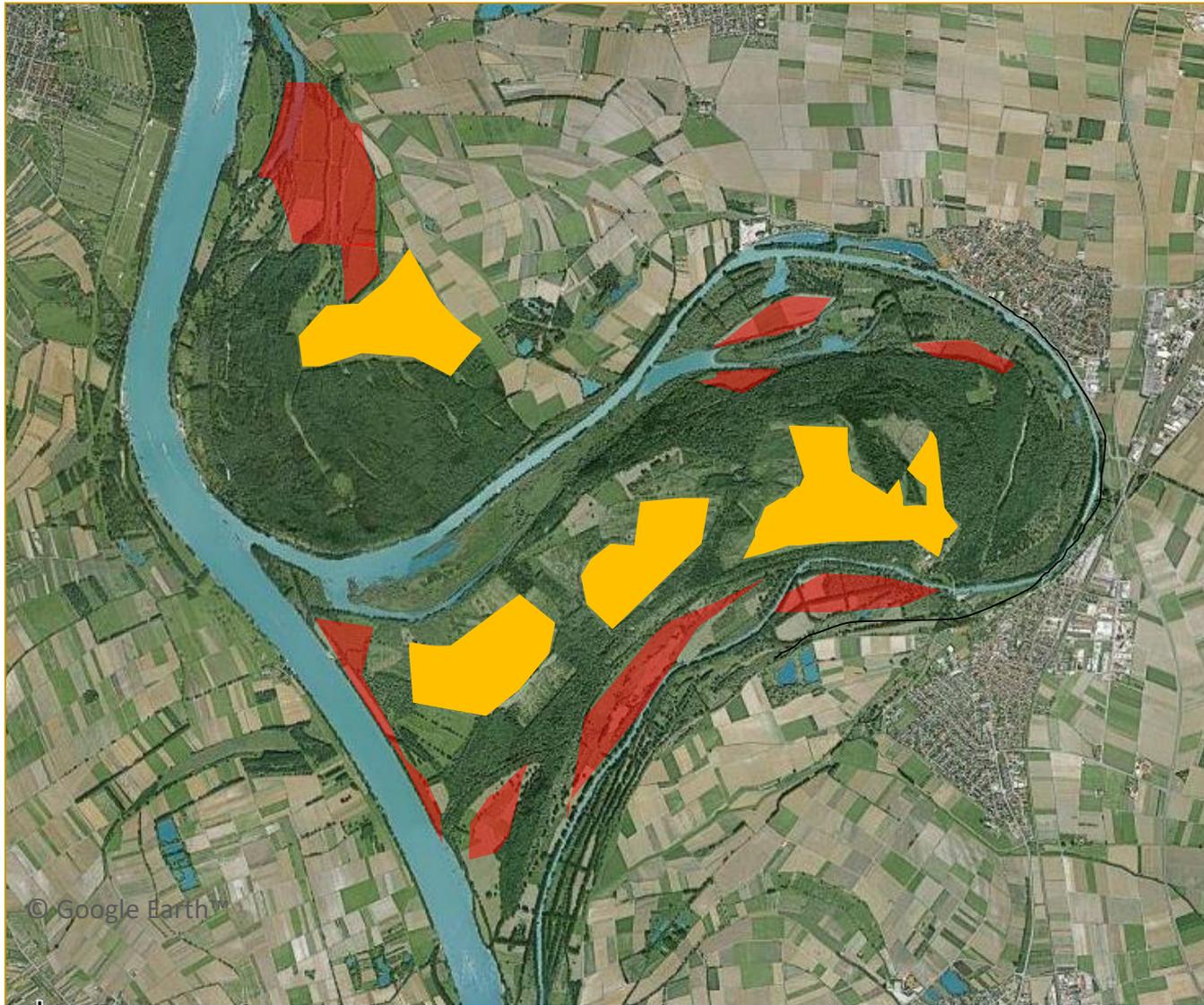
In consequence: 300 ha of former arable land were changed into woods (150 ha) and grasslands (150 ha, by means of controlled succession)

Now, after more than 30 years and in spite of suitable ecological conditions on those meadows:

- still low number of species,
- prevailing trivial and common species,
- no rare floodplain-meadow species



Development after the floods of 1993



Old Meadows, species rich



New meadows, species poor

So, as

- the ecological site conditions are favourable,
- highly valuable species-rich floodplain meadows are nearby (distances lower than 1 km),
- the new meadows are – after the partly destruction of the dykes in 1983 – regularly flooded,
- the management of the new meadows aims at the development of floodplain-meadows



- Why did no target species occur after now 30 years? and
- What are the limiting factors?

- Many of the target species do not build up a persisting soil seed-bank (about 50 %)
- Many of the target species are characterised by very small dispersal distances (usually < 1 m/year)
- Seemingly no effective transfer of propagules through regularly occurring floods, in spite of stands with target species nearby
- Old means of dispersal do not exist anymore in modern agricultural landscapes (as e.g. random dispersion through loss of seeds in course of haymaking/transport, transfer with cattle ect.)



Limiting factor:

Lack of effective dispersal of target species.

Restoration Measures



Aims

Enlargement of highly rare species-rich floodplain meadows

Restitution of an old element of the cultural landscape

Testing of diaspore transfer with plant-material as a restoration measure

The implementation of an agricultural utilisation system

Assessment of ecology and population biology of flora and fauna in floodplain meadows.



Diaspore transfer with plant material

Time of transfer: September - November

Application in strips of 5 to 10 m width, 10-15 cm thick

Transfer with a loader-wagon

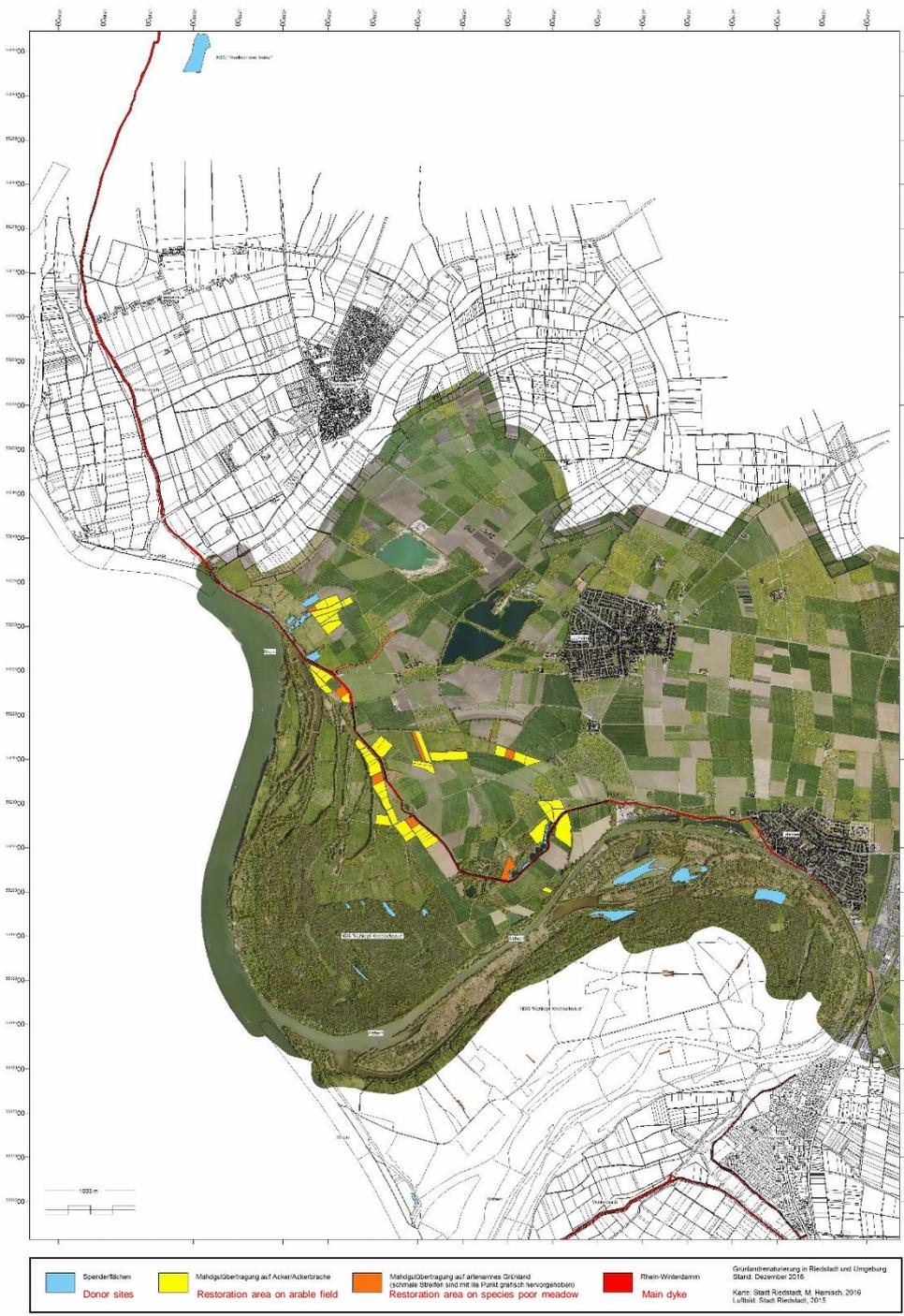
Disturbance of the exist
Stripes with plant material

Costs: 0,75 Euro / sqa





10 km



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www.riedstadt.de
www.stromtalwiesen.de

Mahdgutherkunft Origin of green hay

-  Cnidionwiese / Cnidion meadow
NSG "Riedwiesen von Wächterstadt"
-  Molinionwiese / Molinion meadow
NSG "Riedwiesen von Wächterstadt"
-  Cnidionwiese / Cnidion meadow
NSG "Riedloch von Trebur"
-  Auenwiese / Floodplain meadow
NSG "Kornsand Schacht Geinsheim"
-  Dammflächen / Dyke
NSG "Bruderlöcher"
-  Renat.-Fläche "Norbertwiese"
Restoration area "Norbert's meadow"

Auftragsjahr Year of green hay transfer

 -  2000 - 2016





Siberian Iris
(*Iris sibirica*)



Blue Iris
(*Iris spuria*)



Blue Iris (*Iris spuria*)

Great burnet
(*Sanguisorba officinalis*)



Spear-leaved Skullcap
(*Scutellaria hastifolia*)

Tall violet (*Viola elatior*)



Meadow violet (*Viola pumila*)



Fen violet (*Viola stagnina*)





Mouse garlic (*Allium angulosum*)



Cnidium dubium



Saw Wort (*Serratula tinctoria*)



Marsh Gentian
(*Gentiana pneumonanthe*)

Monitoring



2001 – 2006

Scientific evaluation within the framework of the E-+E-Project

Non-biotic factors: (soil etc.)

Vegetation: donor-sites, restoration fields: 120 permanent vegetation plots 10 x 10 m, seedbank

Fauna: qualitatively and quantitatively:
ground beetles, grasshoppers, butterflies (including skippers *Hesperiidae* and burnet moths *Zygaenidae*) and bugs

only qualitatively: vertebrates, leaf and snout beetles, other beetles, snails

Means: Barber pitfall traps, dip net catches, hand catches and field observations

2007 – 2008

Scientific evaluation within the framework of the DBU-Project

as before + assessment of the effects of late mown meadow strips on insects



2014 Vegetation mapping

(thanks to a donation from the FRAPORT Company)

120 “old” permanent plots (dating back to 2001/02)

+

30 new plots 10 x 10 m

+

qualitative assessment of 10 new restoration fields

Time: May/June 2014

Conducted by

Dr. Dorota Michalska-Hejduk, Botanist

Katedra Geobotaniki i Ekologii Roślin, Uniwersytet Łódzki, PL 90-237 Łódź





Areal pictures: City of Riedstadt, 2015

Results and Conclusions

Diaspore transfer with plant material is a very effective and cheap measure for the restoration of rare grassland-communities

- on the restoration fields in the whole 212 species, thereof 110 species from green hay transfer and 37 species of the Red Lists
- Mean number of species per plot: 42
Maximum: 66



It requires:

- Donor-sites of high quality (species- and individual-rich) and similar ecological conditions nearby
- Effective organisation and good timing
- Extensive mutual information
- Integration in the local agricultural management system



But: the possibility to restore habitats effectively must not provide an excuse for the destruction of still existing habitats

Thank You!

Further information:

www.riedstadt.de/stromtalwiesen

www.stromtalwiesen.de

(both german and english)

Thanks to

Dr. Tobias W. Donath, University of Kiel

Prof. Dr. Norbert Hölzel, University of Münster

and all the many others involved





A tempestuous wind bears the seeds of a plant
many miles through the air,
and then delivers them to the ocean;
the oceanic current drifts them to a distant continent;
by the fall of the tide they become the food of numerous birds,
and one of these is seized by a hawk or eagle,
which, boaring across hill and dale to a place retreat,
leaves, after devouring its prey,
the unpalable seeds to spring up and flourish in a new soil.

Scientific poetry taken from Sir Charles Lyell, Elements of Geology, 1837