NWRM: an ecosystemic approach

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CEDEX

Overview

1. Must NWRM be based on an ecosystemic approach?

2. Different ecosystemic approaches to NWRM

3. Some examples

4. Conclusions and recommendations

1. Must NWRM be based on an ecosystemic approach?

Yes, they should. But why?

- only ecosystem-based measures will sustainably fulfill the expected goals in the **medium** and **long** term

- **complexity** of river systems make artificial measures prone to **failure**

- non-working measures can be an **obstacle** for **future** planning and management

- **inefficient measures** can promote (social, economic and environmental) unexpected **inconveniences**

- uncertainties and knowledge gaps in river functioning recommend a **cautious approach**, as close as possible to the **natural river dynamics**

2. Different ecosystemic approaches to NWRM

NWRM would restore ecosystems…But how?

Potential approaches of restoration initiatives to promote NWRM:

- historical range of variability
- reference image
- maximization of biodiversity
- recovery of valued species
- recovery of lost ecosystem processes
- ecosystem services framework

…And what do each of them offer?

i. Historical range of variability
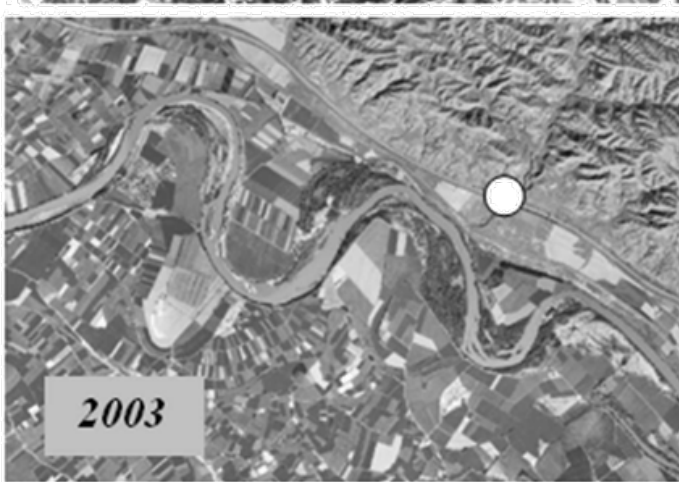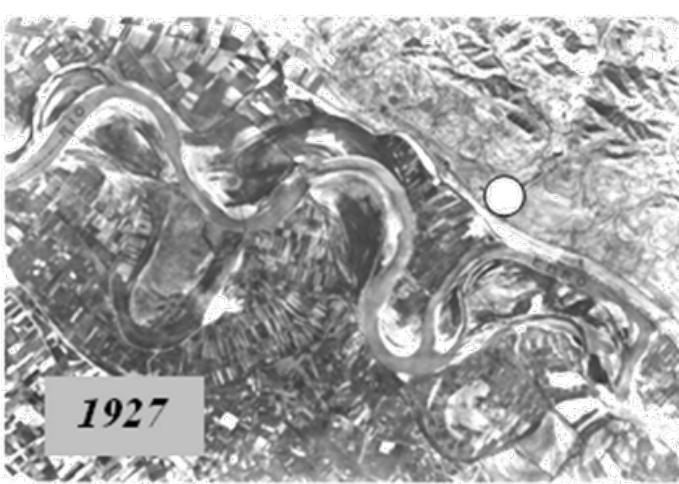
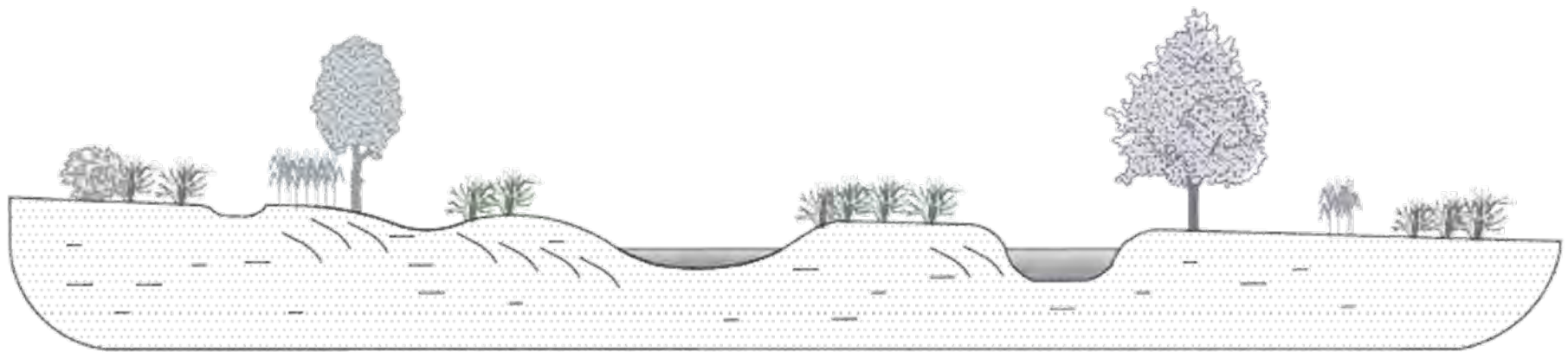Static vs. dynamic reaches - in static vs. dynamic watersheds:
how we should restore?

ii. Reference image

Pre-disturbance status

Post-disturbance status

Pseudo-adjustments or valid references?

Source: Magdaleno *et al.*, 2012

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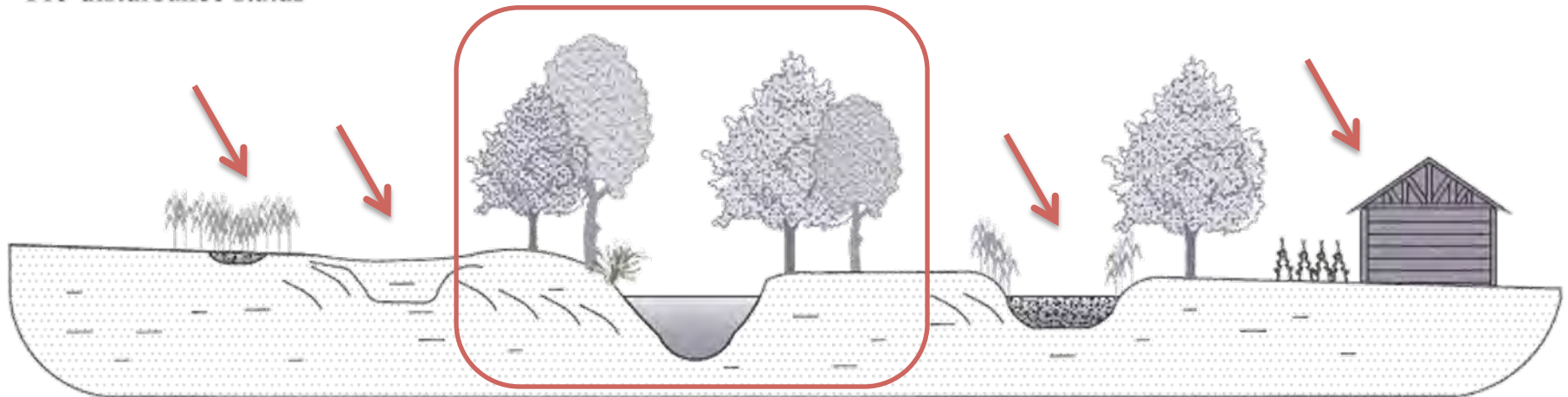MINISTERIO
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iii. Maximization of biodiversity

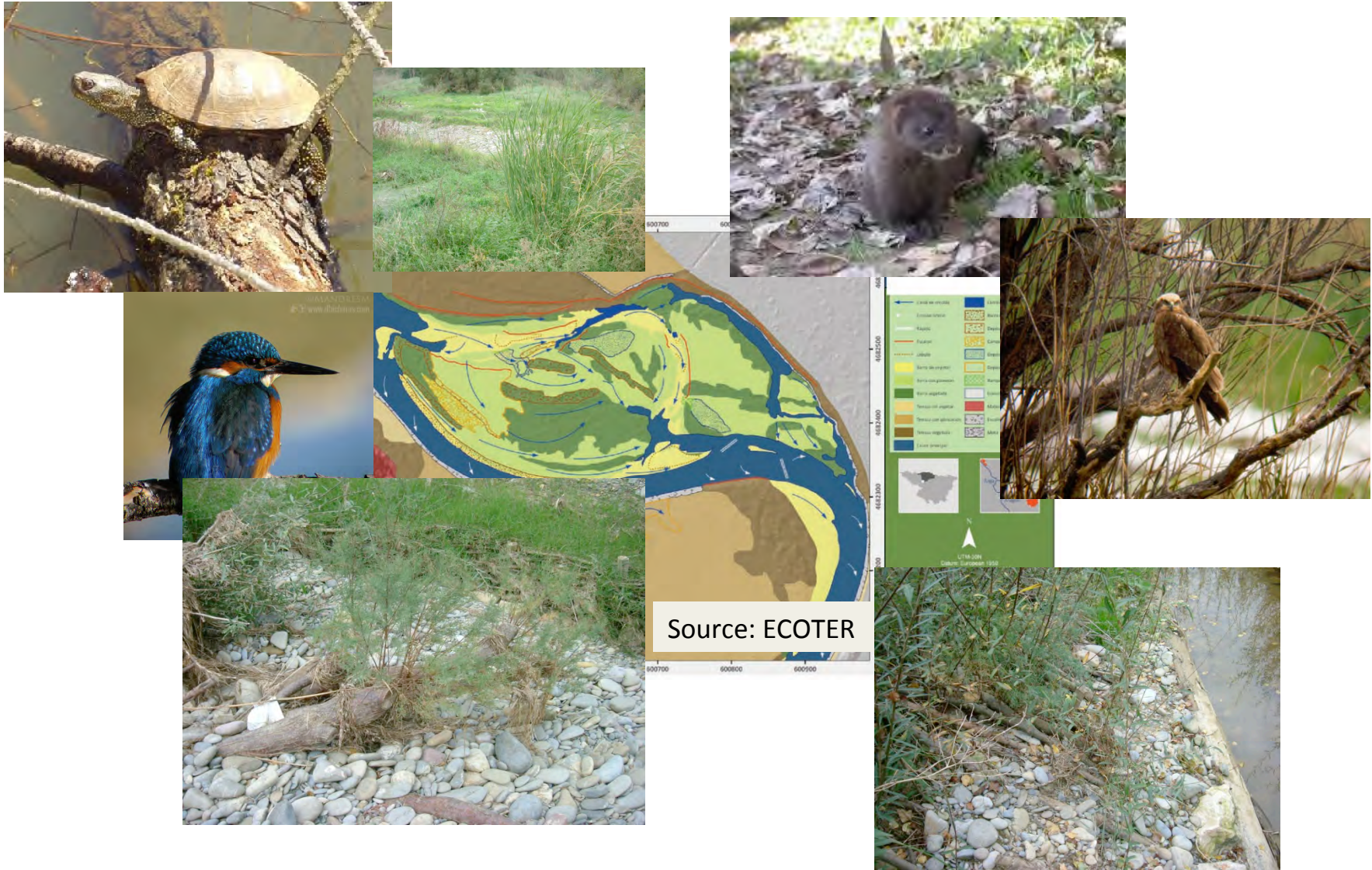Source: ECOTER

How possible in pressured sites?

iv. Recovery of valued species

Restoration of Aragón River – European mink (*Mustela lutreola*)

Restoration of Negro River - Giant European freshwater pearl mussel (*Margaritifera auricularia*)

Single- or multi-species approach?

v. Recovery of lost ecosystem processes

Floodplain reconnection in Aragón River. Source: Elena Díaz

Aquifer recharge in Segovia (Spain). Source: DINA-MAR project

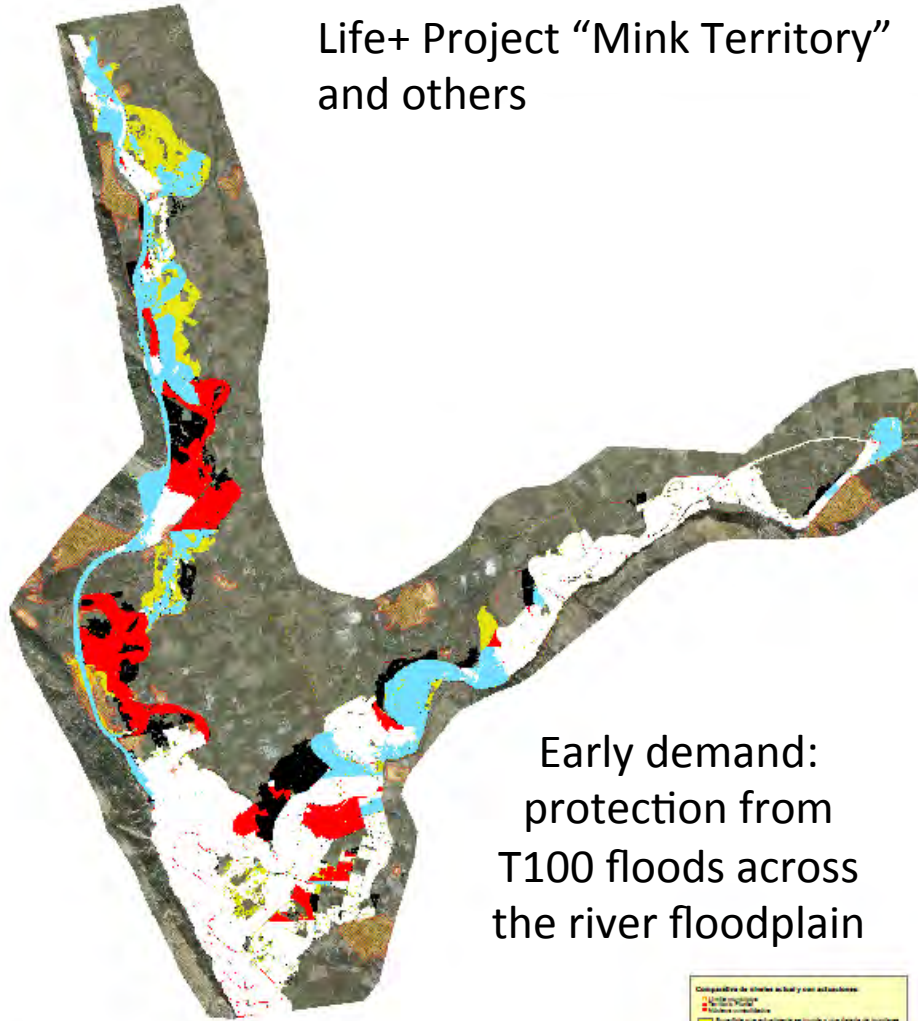# vi. Ecosystem services processes

Constructed wetlands for biodiversity and tertiary treatment of urban/ industrial wastewater
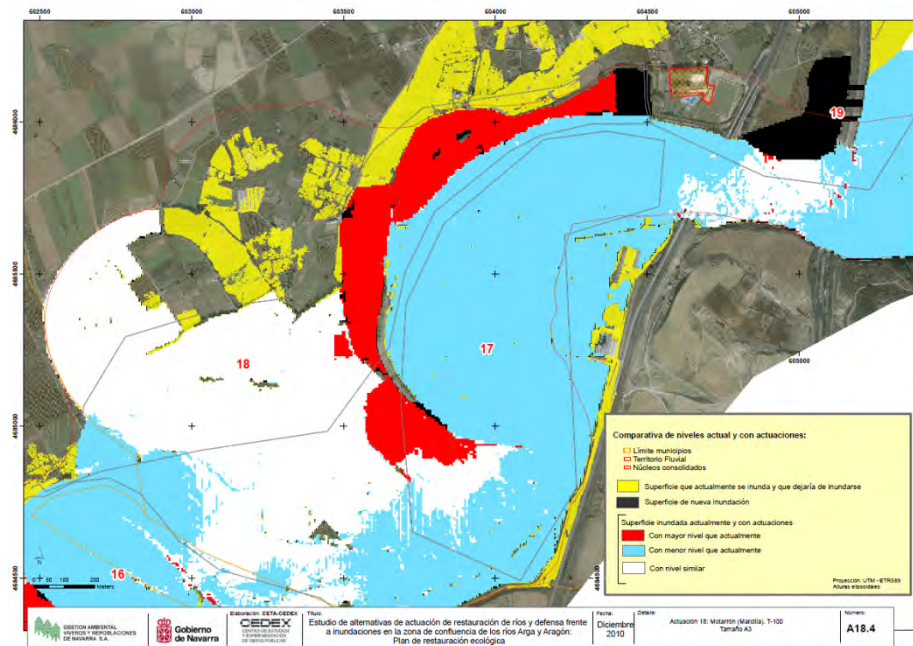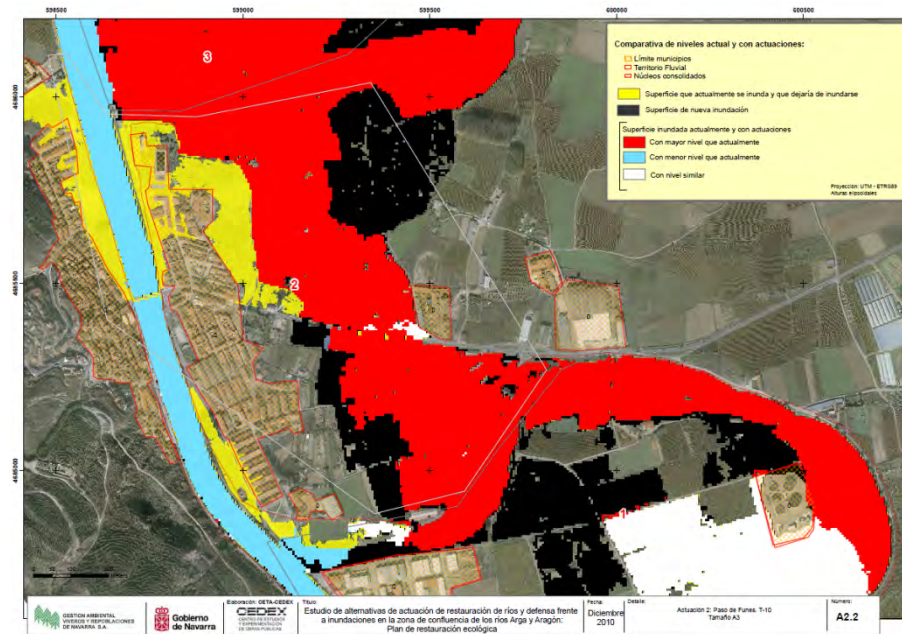(Congost River, Barcelona)

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3. Some examples

Life+ Project "Mink Territory" and others

Early demand: protection from T100 floods across the river floodplain

Source: Government of Navarre

3. Some examples

Restoration of >10 ha of specific
habitat for european minks

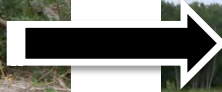Natural   Created

Construction of wetlands for habitat of endangered species and improvement of water cycles (retention, infiltration, etc.)

3. Some examples

Natural

Restoration of >10 ha of specific
habitat for european minks

Created

Reintroduction/maintenance of LWD for habitat, water and sediment trap, improved trophic connections, etc.

3. Some examples

Natural

Recovery of >100 ha of river territory   Created

Connectivity improvement for habitat, flood amelioration, better W/D ratio, infiltration, reduction of erosion and encroachment

3. Some examples

Removal of >6km of artificial levees

Connectivity improvement for habitat, flood amelioration, better W/D ratio, infiltration, reduction of erosion and encroachment

3. Some examples

Connectivity improvement for habitat, flood amelioration, better W/D ratio, infiltration, reduction of erosion and encroachment

3. Some examples

Restoration of 230 ha of
prioritary habitats

Natural

Created

Diversity, low density and opportunity of plantations: role of vegetation in water
retention and habitat dynamics

3. Some examples

Natural

Created

(Standing) Dead trees for habitat, improved hydromorphology, refuge, etc.

3. Some examples

Natural

Created

Biological removal of stumps to avoid loss of quality of riparian soils (and infiltration), enhance trophic network…and also social interest!

3. Some examples

And why not ecosystem-based NWRMs for public spaces?

3. Some examples

...But, of course, we need to monitor and learn more and more from nature!!

4. Conclusions and recommendations

- Ecosystemic approach can be applied from very different perspectives, but should always be inherent to NWRMs

- NWRMs, ESS, LSS, EOs-WFD/FRD/BHD can be intermingled and optimized through ecosystem-based procedures

- Design of measures must target long-lasting solutions for multi-pressured and changing systems

- Discuss outcomes of alternatives, one different solution for each site and condition

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