Land abandonment and fire in the Mediterranean Europe: implications for bird and mammal communities.

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Outline of presentation

- **Drivers of agricultural abandonment, pathways of land use change and relationship to fire**
- **Fires in Mediterranean landscapes: processes and patterns**
- **Global impact of agricultural abandonment and fire on Mediterranean birds and mammals**
- **The future: scenarios for landscape management and biodiversity**
- **Conclusions**

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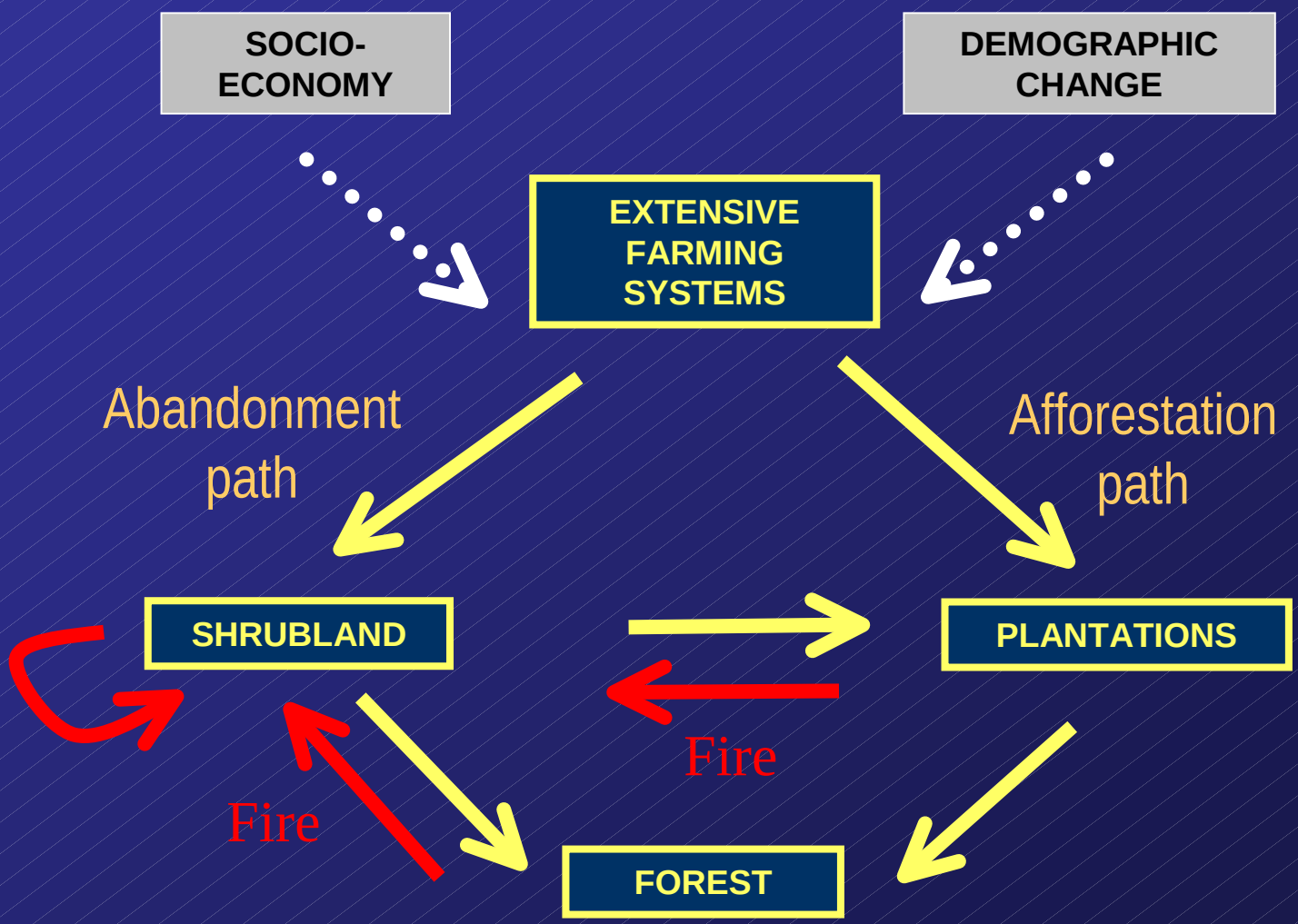
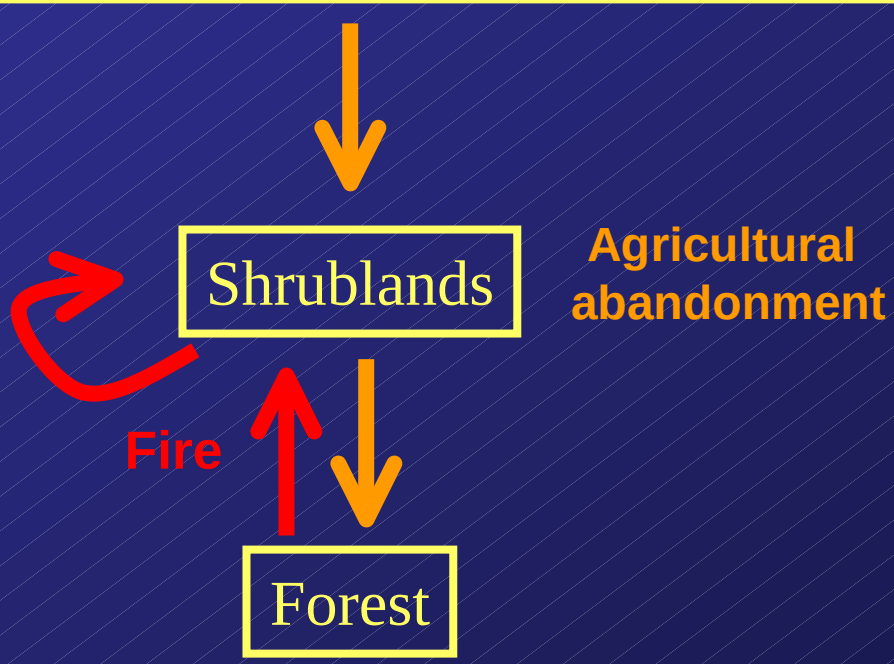
PATHWAYS OF LANDSCAPE CHANGE AND FIRE



A SIMPLER MODEL OF LANDSCAPE CHANGE

Extensive farming systems / “open landscapes”



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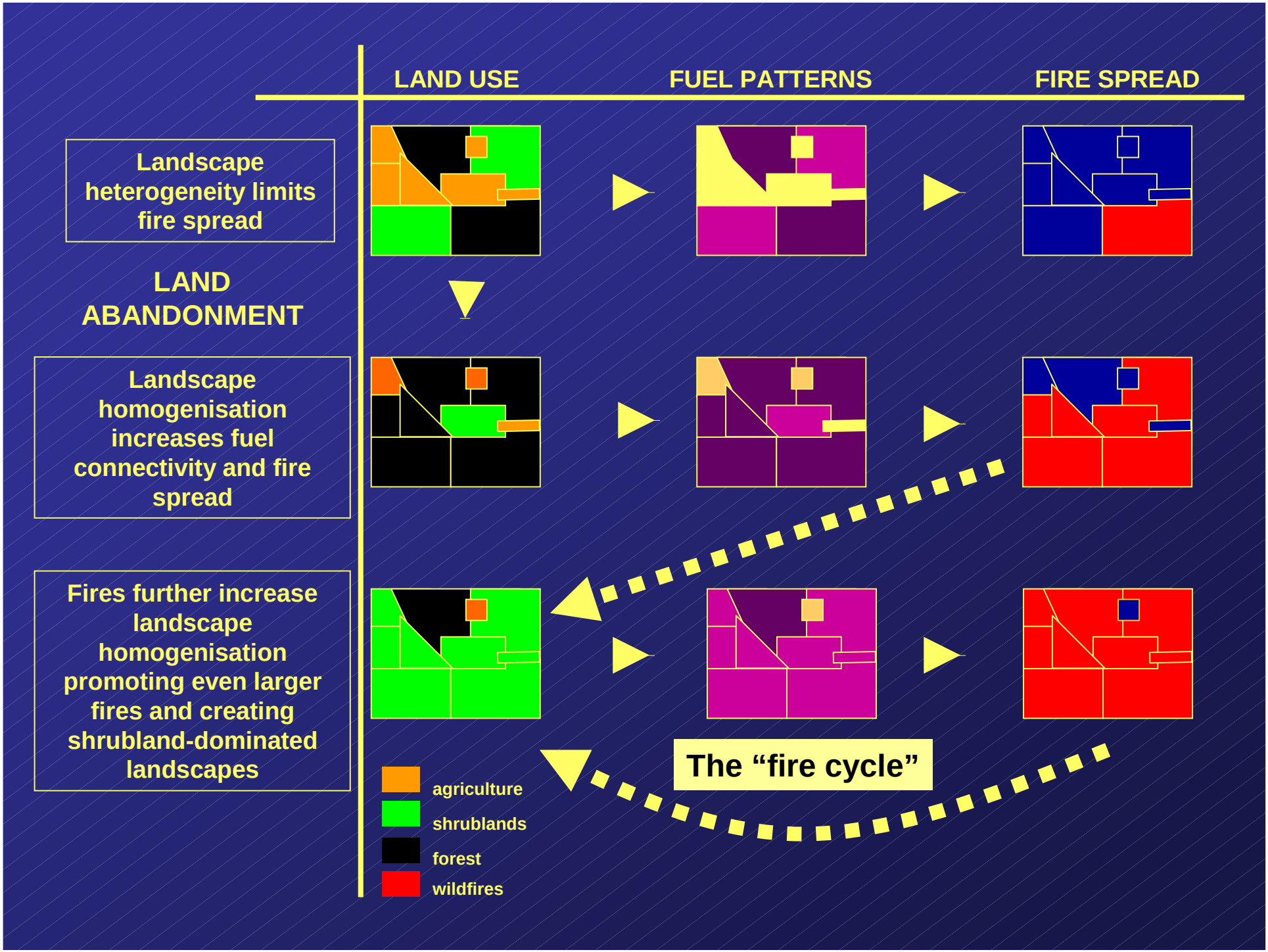
LAND USE
FUEL PATTERNS
FIRE SPREAD
Landscape heterogeneity limits fire spread
LAND ABANDONMENT
Landscape homogenisation increases fuel connectivity and fire spread
Fires further increase landscape homogenisation promoting even larger fires and creating shrubland-dominated landscapes
agriculture
shrublands
forest
wildfires
The “fire cycle”

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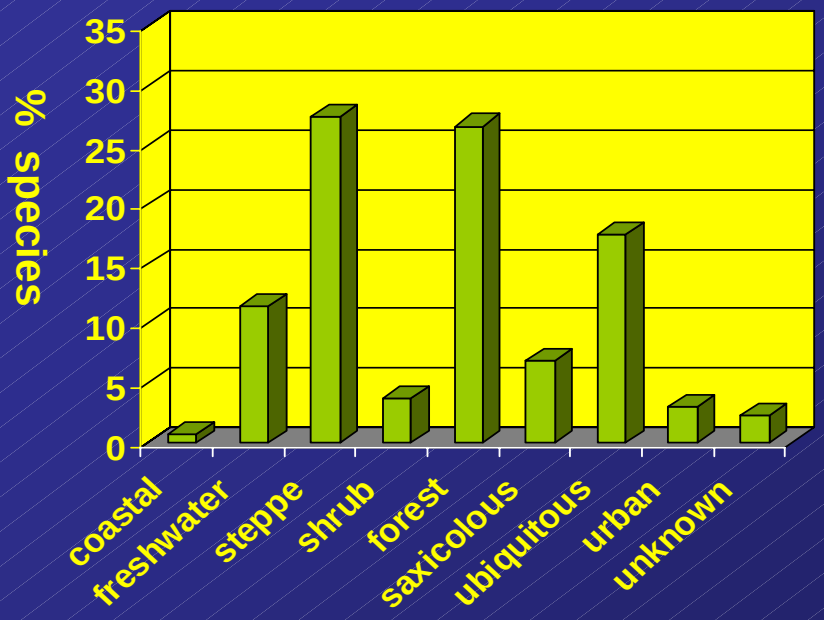
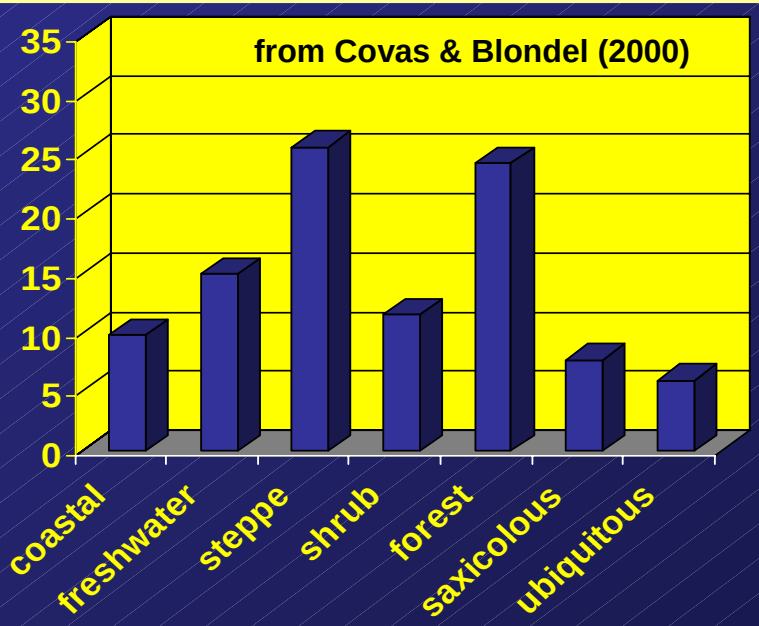
MAIN BREEDING HABITAT FOR ALL BIRDS AND MAMMALS OCCURRING IN THE MEDITERRANEAN REGION

MAMMALS



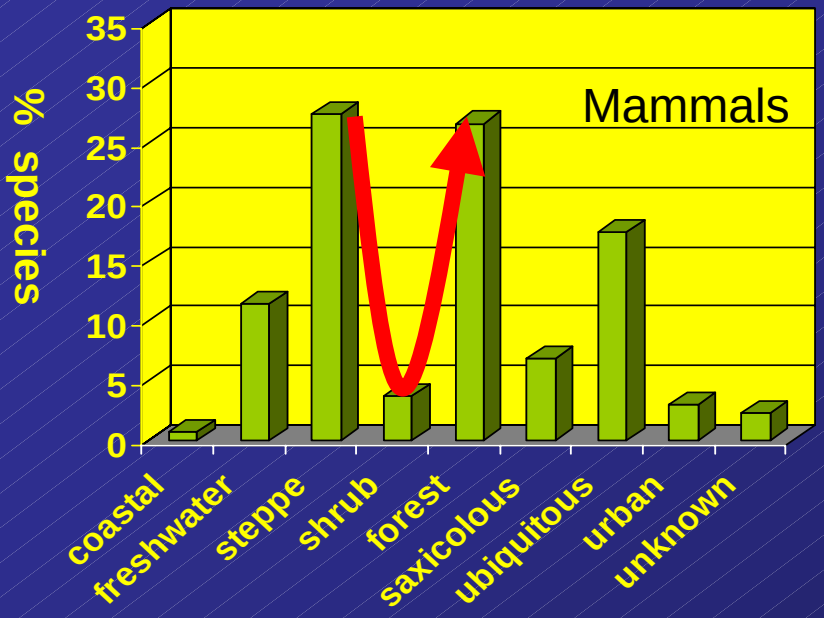
- 131 species occur in the region
- Main habitats: steppe, forest and generalist species
- compared to birds, higher % ubiquitous and lower % coastal and scrubland species

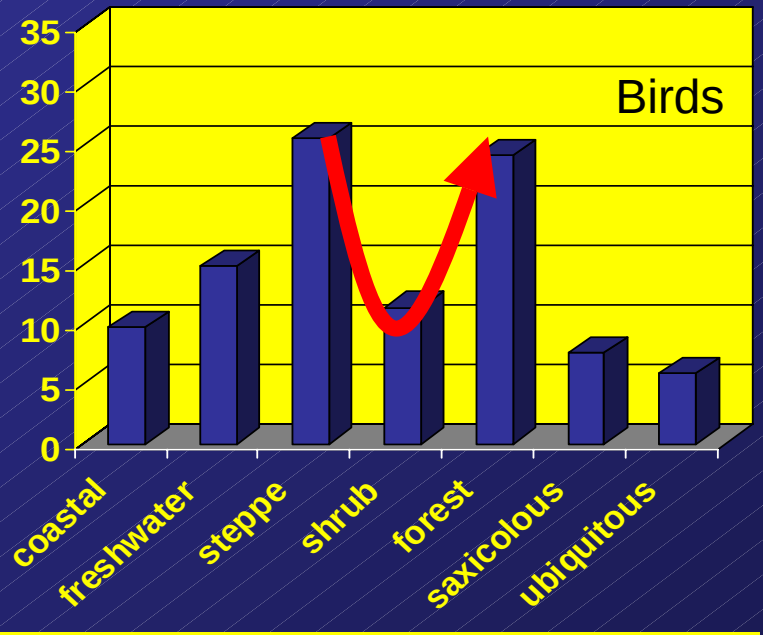
BIRDS



- 366 species occur in the region
- Main habitats: steppe, forest and freshwater
- compared to mammals, lower % ubiquitous and higher % coastal and scrubland species

IMPLICATIONS RELATED TO LAND ABANDONMENT AND FIRE





- **open habitat species represent ca. 25% of total number of species. These should be the more affected by land abandonment**

- **Data suggest quadratic relationships, more pronounced for mammals, for species richness as a response to land abandonment**

- **Fire decreases species richness as forests turn to scrublands**

A closer look at exclusively Mediterranean species:

(1) Identify all species which:

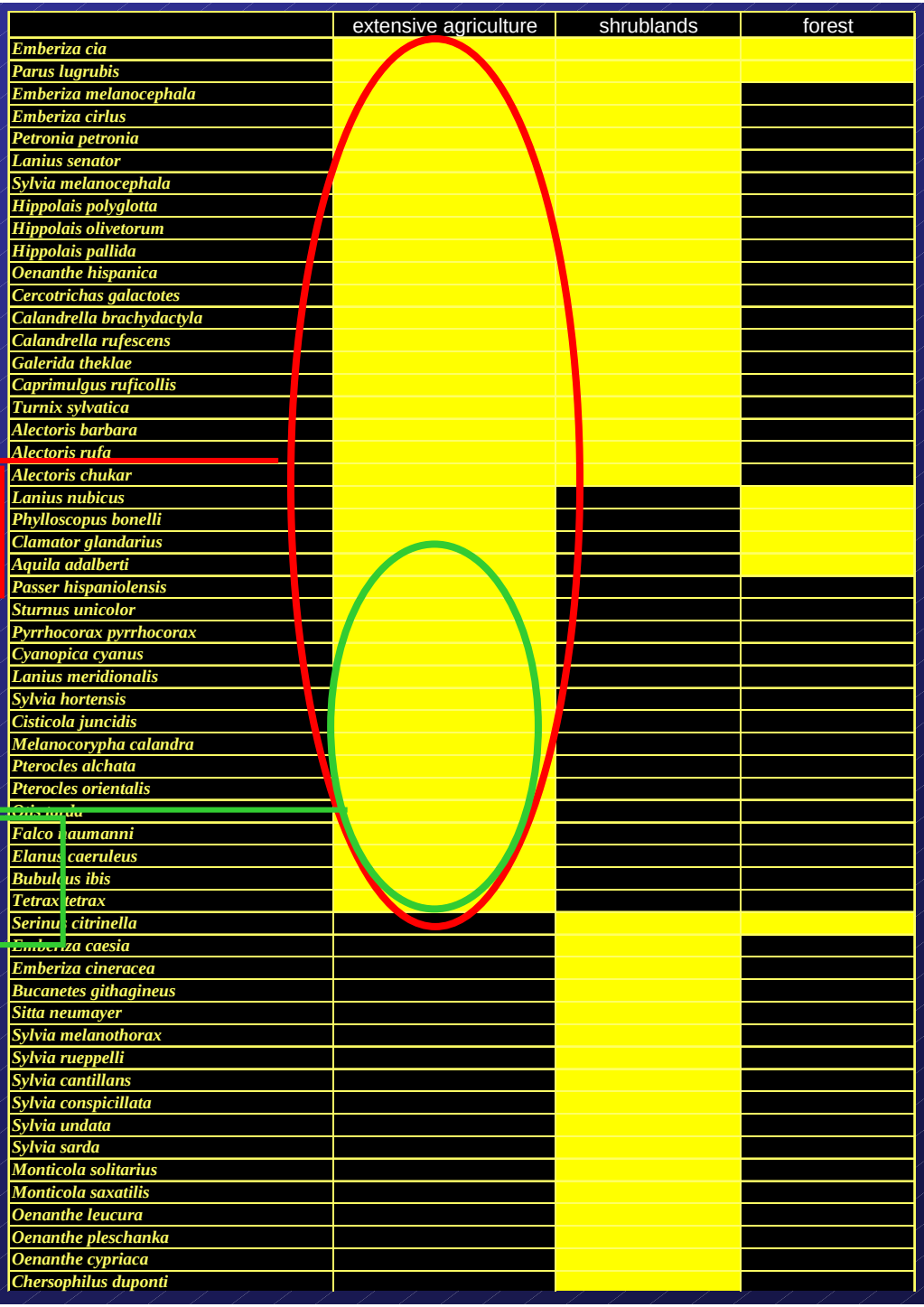
- **have a exclusive South European (Mediterranean) distribution within Europe (during the breeding season);**
- **occur predominantly in extensive farming systems (including pastures, grasslands, cereal steppes, orchards, *Quercus* spp. woodland) shrublands (including rocky outcrops and recent forest plantations) or forests (any type);**
- **have unfavourable conservation status in Europe**

(2) using the simple model of habitat change in response to agricultural abandonment and fire, describe how biodiversity of Mediterranean species is predicted to respond to agricultural abandonment and fire;

EXAMPLE OF CLASSIFICATION TABLE

All species which occur in extensive farming systems

All species exclusive to extensive farming systems

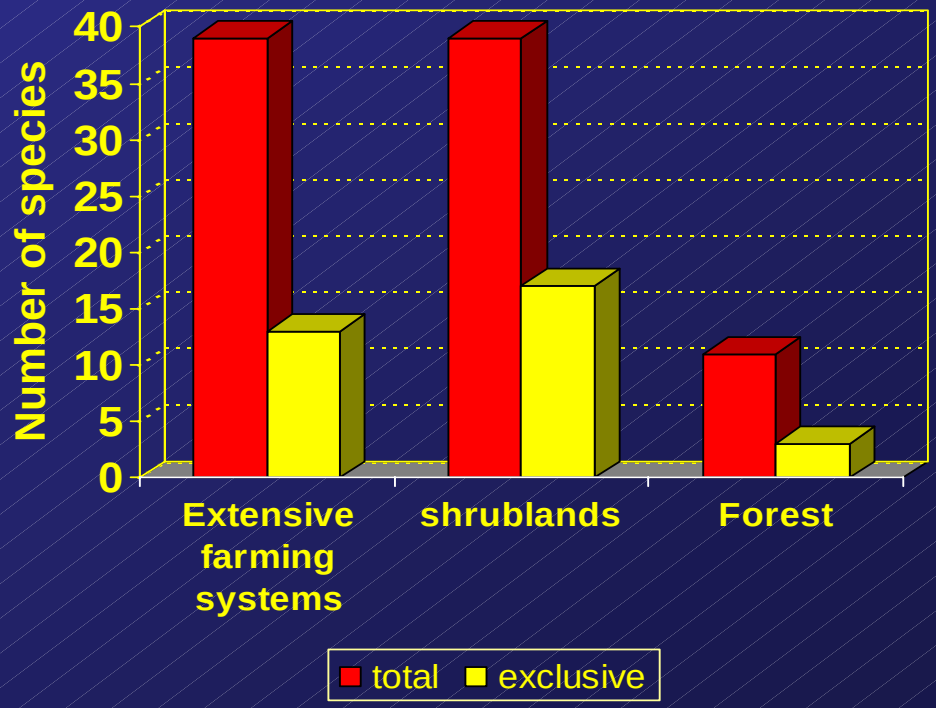


MEDITERRANEAN BIRD SPECIES (n=61) ASSOCIATED TO BROAD LAND USE TYPES

- EFS and shrublands hold the highest number of Mediterranean species; Mediterranean forests poor in Mediterranean birds

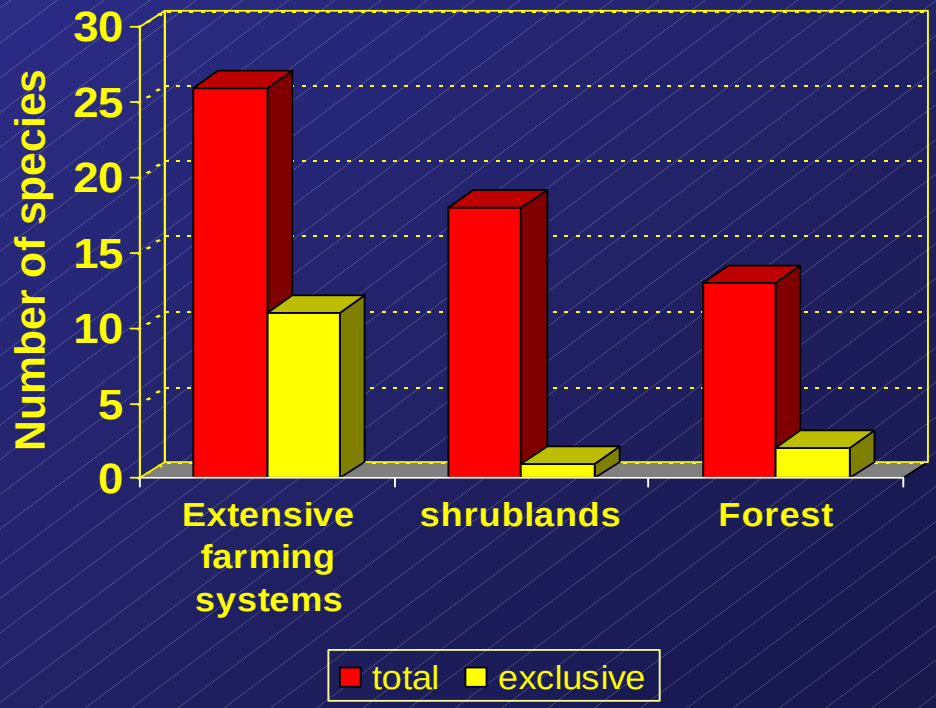
- All land use types have exclusive species (n=33), although % higher in shrublands and lower in forests.

- Global diversity of Mediterranean bird fauna only preserved in a mosaic of EFS, shrubland and forest.



MEDITERRANEAN MAMMAL SPECIES (n=34) ASSOCIATED TO BROAD LAND USE TYPES

- EFS hold the highest number of Mediterranean mammals;
- All land use types have exclusive species (n=14), although % much lower in shrublands
- Global diversity of Mediterranean mammal fauna mostly dependent on co-existence of open areas and forests



MEDITERRANEAN FAUNA ASSOCIATED WITH EXTENSIVE FARMING SYSTEMS


Microtus cabrerae


Vormela peregusna


Tetrax tetrax

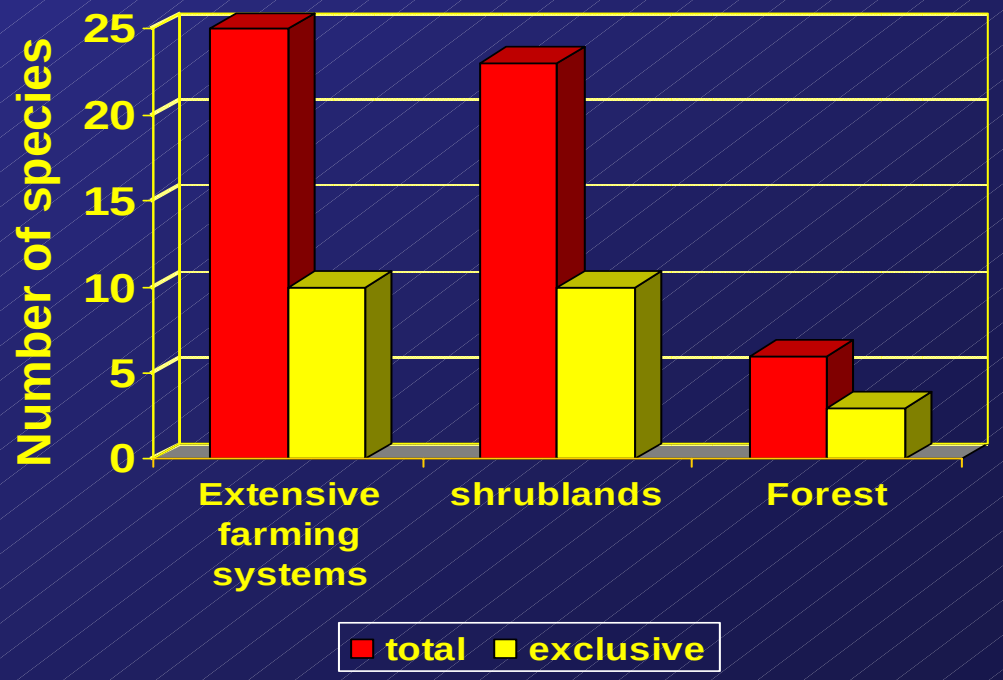

Melanocorypha calandra

MEDITERRANEAN FAUNA ASSOCIATED WITH SHRUBLANDS

MEDITERRANEAN FAUNA ASSOCIATED WITH FORESTS

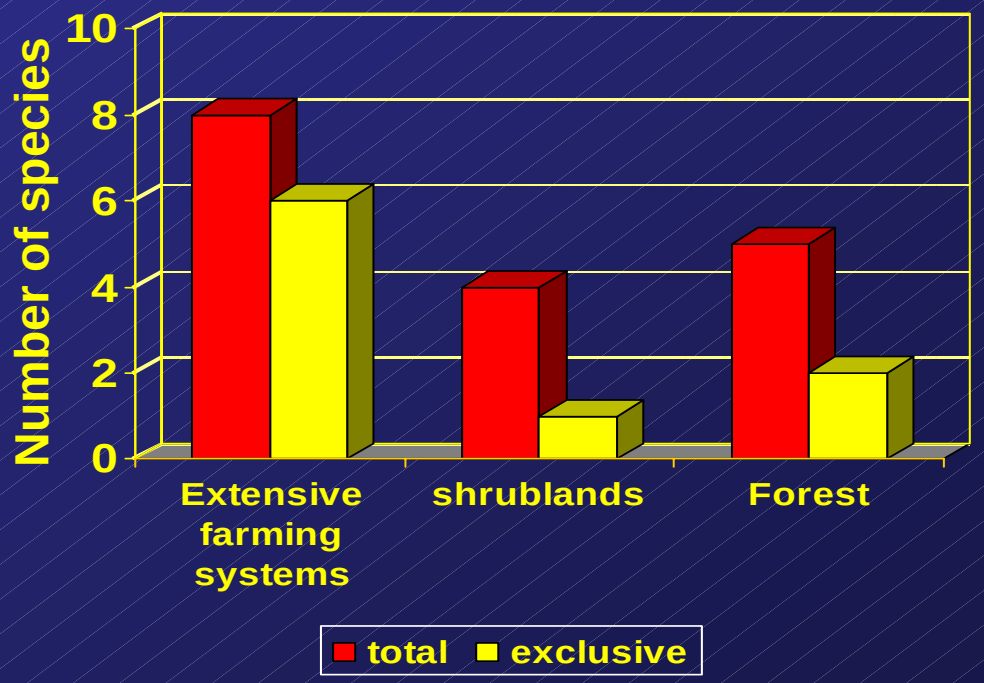
MEDITERRANEAN BIRD SPECIES WITH UNFAVOURABLE CONSERVATION STATUS (SPECS 1-3) ASSOCIATED TO BROAD LAND USE TYPES

- Number of species with unfavourable conservation status decreases along gradient EFS > shrublands > forest
- number of exclusive species lower in forests
- Conservation value decreases from EFS to forests

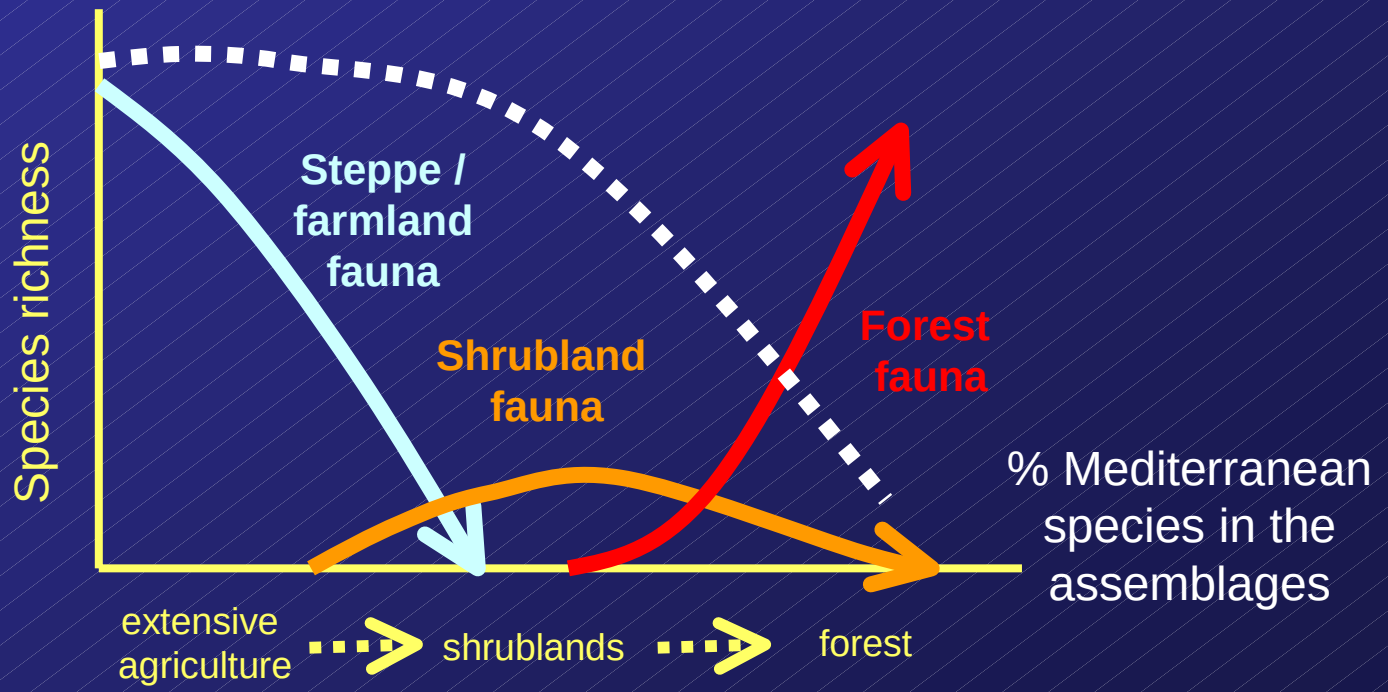


MEDITERRANEAN MAMMAL SPECIES WITH UNFAVOURABLE CONSERVATION STATUS (IUCN list or EU Directives) ASSOCIATED TO BROAD LAND USE TYPES

- Number of species with unfavourable conservation status higher in EFS but similar (lower) in shrublands and forest
- number of exclusive species lower in shrublands
- Conservation value of forests larger than the one of shrublands ?



RESPONSE OF THE MEDITERRANEAN FAUNA TO LAND ABANDONMENT (local/regional scale)



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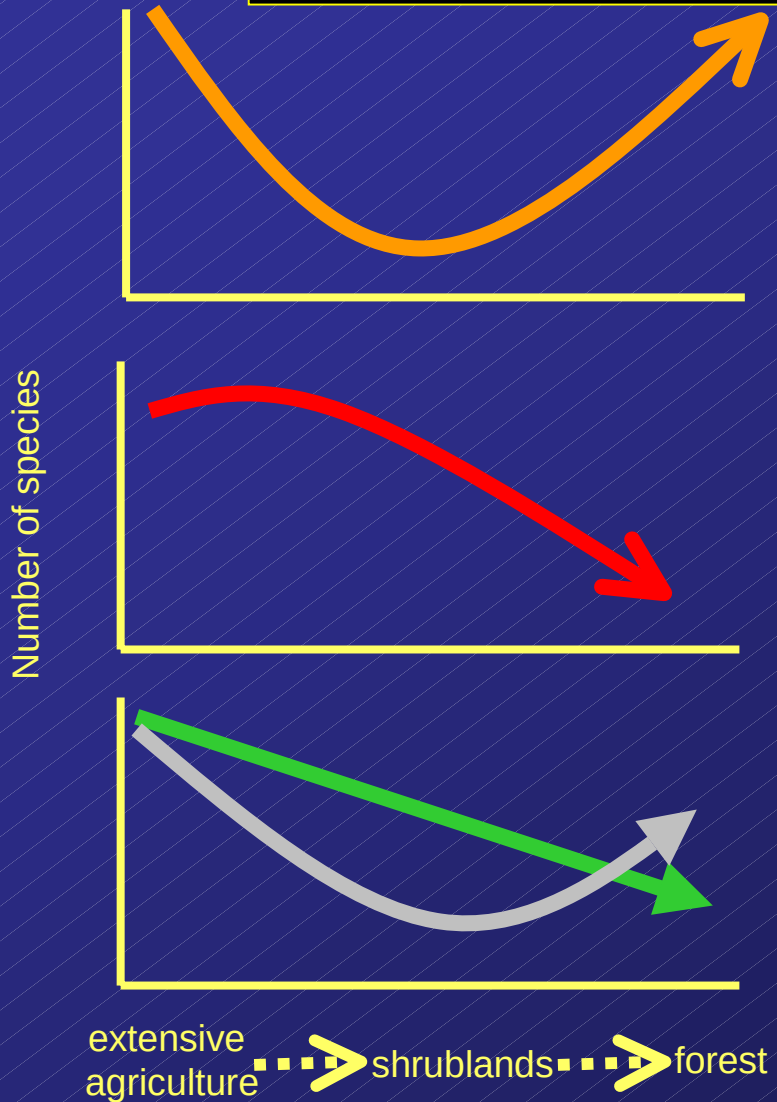


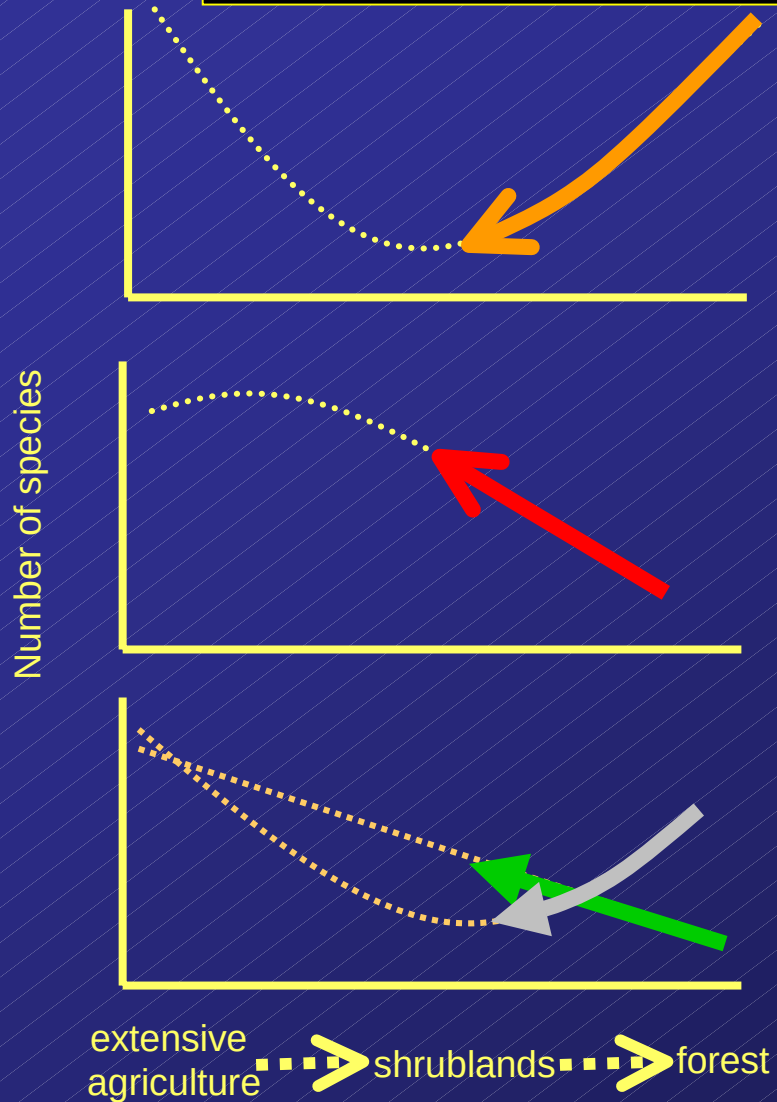
Total species richness first declines (loss of Mediterranean species), then increases (gain of widespread European species).

Mediterranean species richness declines.

Conservation value of bird communities declines

Conservation value of mammal communities might increase towards forest

RESPONSE OF THE MEDITERRANEAN FAUNA TO FIRE (local/regional scale)



Total species richness declines due to losses of forest species.

Mediterranean species richness increases due to higher habitat availability

Conservation value usually increases for birds (but trend variable according to regional species pool)

Conservation value declines for mammals (but trend variable according to regional species pool)

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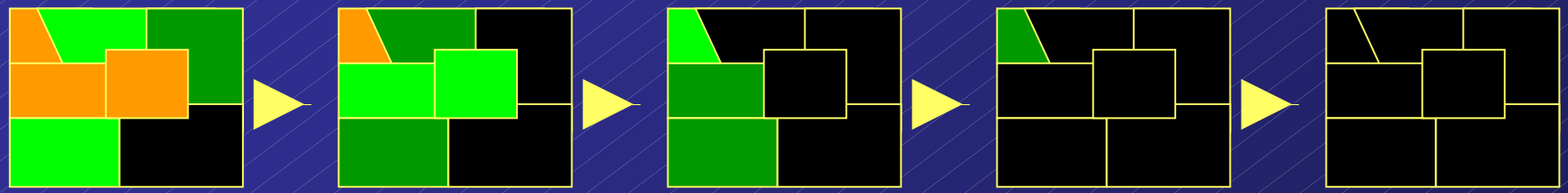
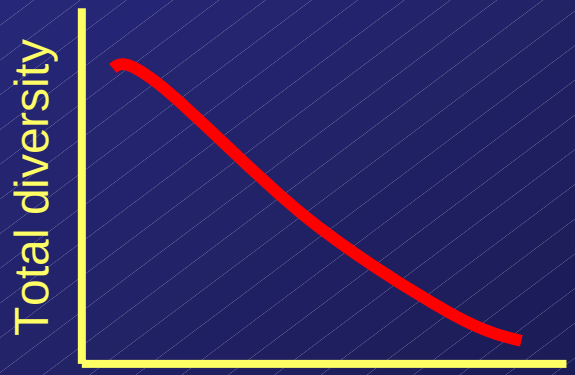
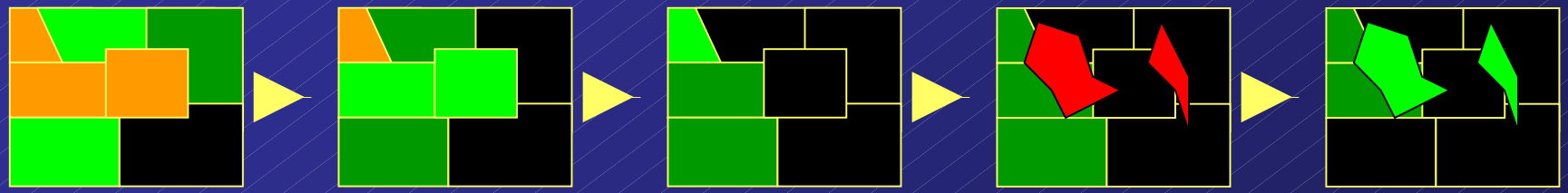
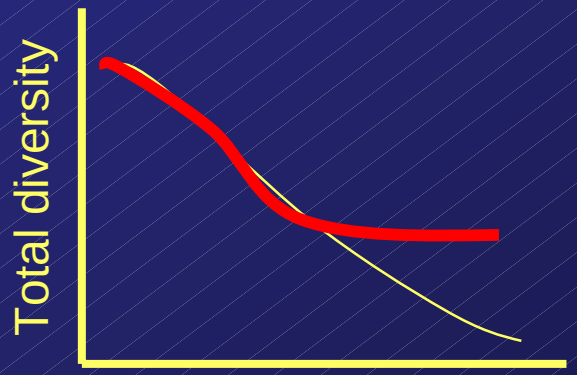
Scenario I – agricultural abandonment, afforestations & fire exclusion policies



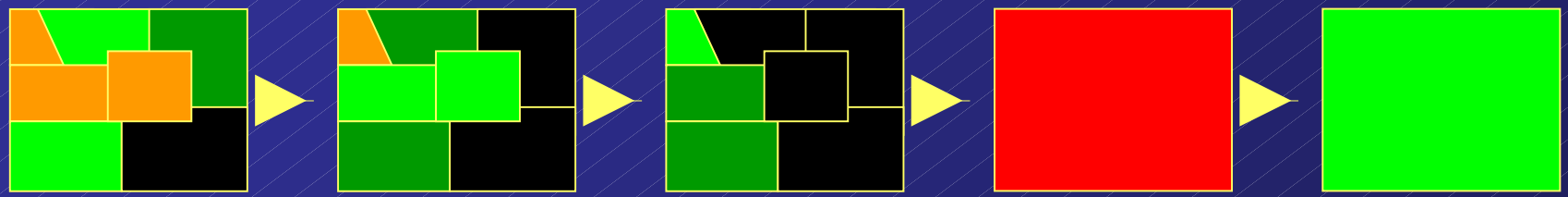


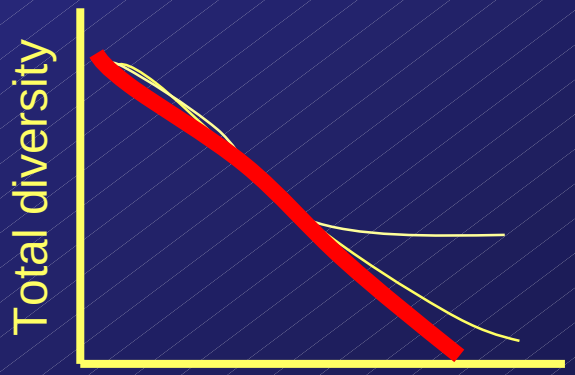
Scenario II – agricultural abandonment, afforestations & small scale fires



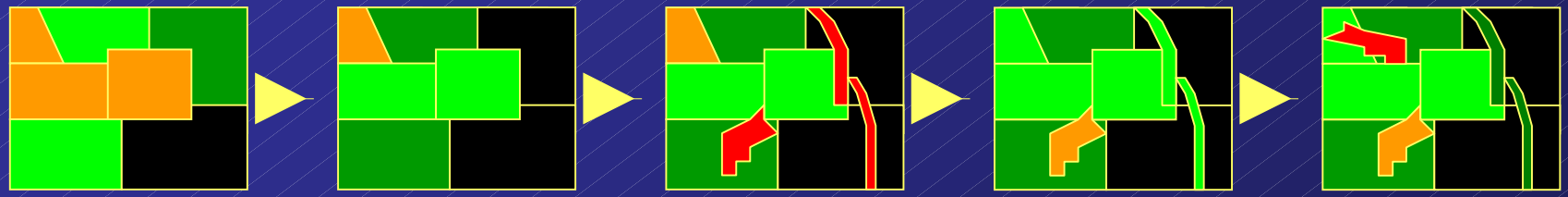


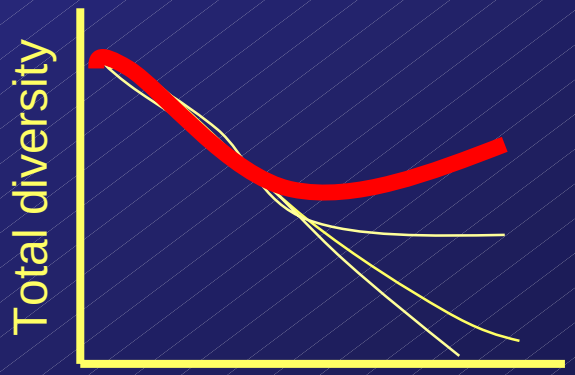
Scenario III – agricultural abandonment, afforestations & large fires



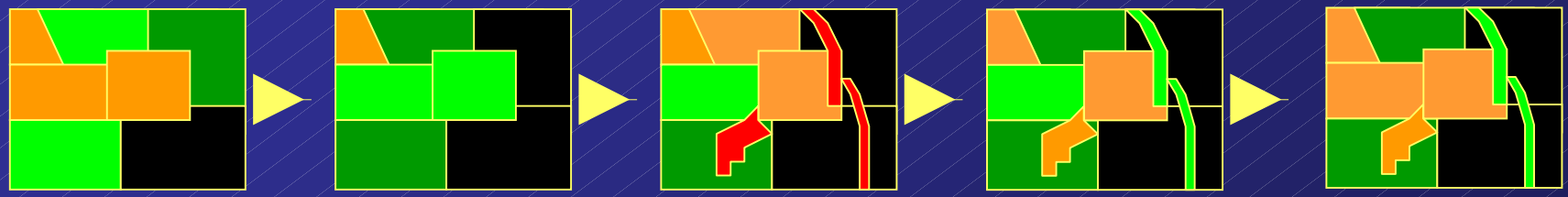


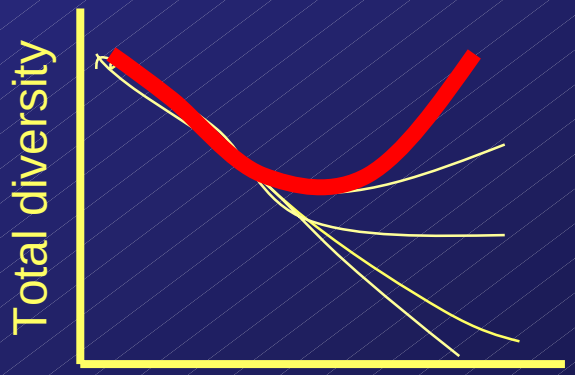
Scenario IV – agricultural abandonment, prescribed fire & grazing





Scenario V – Agri-environmental policies, prescribed fire & grazing





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Should we bother about land abandonment ?

YES.

It will cause:

A loss of species associated with extensive farming systems.

The replacement of species-rich open land assemblages with species-poor shrubland assemblages.

Afforestation of abandoned land and secondary forest re-growth will increase species richness at the local level, but these will consist mostly of widespread European species (mainly for birds).

As landscapes become covered with forests, diversity at the landscape level will decrease because of the loss of region-specific open land and shrubland vertebrate assemblages.

Should we bother about fire ?

IT DEPENDS...

It depends on the fire regime:

At small scale (relative to landscape extent) fire may act as a source of landscape heterogeneity, increasing habitat that would not be available otherwise, and increasing species diversity in relation to a fire-excluded abandoned landscape.

In contrast, extensive fires may cause landscape homogenization, creating vast areas of shrubland with species-poor communities.

Prescribed fire, along with extensive grazing, might minimize the impact of land abandonment, by preventing large scale fires and creating habitat for vertebrates dependent on shrublands and some types of grassland/ extensive farming systems.

However, Mediterranean landscapes managed this way will never attain the diversity levels of landscape mosaics composed of extensive farming systems, shrublands and forests.

But what happens with other components of Mediterranean European biodiversity ?

More scientific research needed....