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OBSERVER: Copernicus Land Monitoring Service: Measuring the effectiveness of protecting Natura 2000 grasslands

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Grassland habitats in Europe are facing an overall decline in terms of extent and biodiversity. Through the Natura 2000 network, the world's largest ecological network of protected areas, these species-rich habitats are being protected, but continuous monitoring is needed in order to understand how grasslands are changing.

The Copernicus Land Monitoring Service, through its N2K product, supports the monitoring of Natura 2000 sites, by providing evidence-based knowledge for improving reporting.

What is Natura 2000?

Natura 2000 is a network of core breeding and resting sites for rare and threatened species, including some rare natural habitat types which are protected in their own right, that stretches across all EU countries, both on land and at sea. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats that are listed under the Birds Directive and the Habitats Directive. The network covers about 18% of the EU's land area throughout all 27 EU Member States (MS). Natura 2000 is the world's largest ecological network of protected areas, a network of key breeding and resting places for rare and endangered species.

Why are grasslands important?

Grassland habitats can be found throughout Europe and exist in areas where climatic or soil conditions are too harsh for trees or other dense vegetation to grow.

Over the last decades, and despite their protection under Natura 2000, many species-rich grassland habitats have suffered substantial losses throughout the EU, both in terms of extent and species richness. Because of their high ecological and landscape value, the loss of these grasslands has adverse consequences for the protection of species, soils, water and the climate, making it a priority to monitor the status and trends of grasslands in Natura 2000 sites and their vicinity.

The State of Nature report produced by the European Environment Agency in 2020 assessed the results of the countries reporting under the nature directives for the reporting period 2013-2018. The report highlighted that:

- land cover changes are less within Natura 2000 than outside, but habitats are still being lost;
- dominant land cover changes within the Natura 2000 network occurred for grasslands;
- a noteworthy portion of the reported information comes from expert opinion and partial surveys, due to incomplete monitoring schemes in some Member States.

Almost half of the grasslands assessed recorded a 'bad' conservation status with over a third assessed as being 'poor'. Only 7 % of grasslands assessed showed an improving trend, while nearly 51 % of grassland trends were classified as deteriorating.

How is the Copernicus Land Monitoring Service helping?

The Copernicus Land Monitoring Service (CLMS) local component is coordinated by the European Environment Agency and aims to provide specific and detailed information that focuses on different thematic hotspots and areas that are prone to specific environmental challenges and problems. One such product is **N2K** which supports the monitoring of Natura 2000 sites, important hotspots for nature conservation.

N2K aims to provide detailed Land Cover / Land Use (LCLU) mapping results, covering a large number (4.790) of grassland-rich Natura 2000 sites. The aim of the product is to assess whether those selected sites are being effectively preserved and if a decline of certain grassland habitat types is being halted.

Why is the N2K product so important?

N2K covers 631,820 km2 of land surface across Europe for three reference years: 2006, 2012 and 2018. The reference year 2018 was recently released together with a revised version of the 2006 and 2012 databases, which provides a valuable and timely insight into the state of Natura 2000 sites.
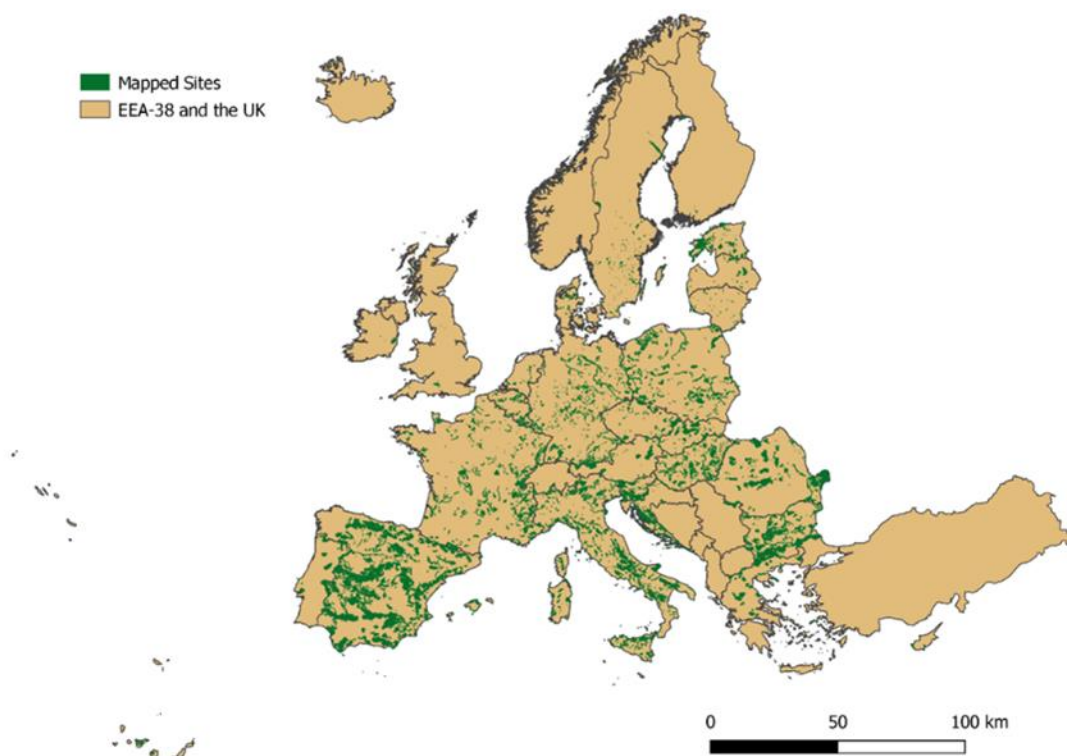
Figure 1: Overview of all mapped sites, including a 2 km buffer for each site (Source: EEA).

N2K is a unique product with a high level of detail (Minimum Mapping Unit (MMU) is 0.5 ha), based on Very High Resolution (VHR) satellite data. It also covers a 2 km buffer zone (Figure 1 above). The classification provides 55 distinct thematic classes and the class definitions follow a pre-defined nomenclature based on the Mapping and Assessment of Ecosystems and their Services typology of ecosystems (at level 1) and are further harmonised with Corine Land Cover and adapted to the specific characteristics of grasslands habitats (levels 2 to 4). It offers two types of products: status maps for the three reference years and two change products for the two reference periods.

The N2K product offers a good basis to analyse the LCLU situation in grassland-rich Natura 2000 sites and furthermore allows to devise the general trends and change factors within the sites through the observation periods, as well as within the buffer zone surrounding those.

Does the N2K product include all EU member states?

The selection of Natura 2000 sites to be mapped by the N2K product was based on the occurrence of grassland habitats within the sites and was done with the support of experts from the European Commission (DG ENV). However, the final selection also depended to a large extent on the satellite data availability for 2006 and 2012. In this case, it has meant that the mapped Natura 2000 sites are unfortunately not equally distributed across Europe nor equally representative of the MS or the Biogeographical regions. Therefore, as highlighted by the map, this has resulted in a high representation of selected sites in South, South-western, Central and Eastern Europe whereas the Nordic countries and the British and Irish Isles are underrepresented. With the continuously improving provision of VHR satellite imagery by the

European Space Agency, it is hoped in the future to cover a much greater area. Meanwhile we can still gain valuable insights.

What does the latest N2K knowledge base tell us about the assessment of general land cover trends?

CLMS has undertaken an assessment of LCLU trends throughout the Natura 2000 sites and the buffer zone. Both types of areas have a similar coverage, with the accumulated Natura 2000 sites area covered by CLMS N2K being slightly smaller (roughly 31.2 million ha) than the 2 km buffer zone.

The assessment of the changes between the two reference periods (2006 – 2012 & 2012 – 2018) revealed (as shown in Figure 2 below):

- high dynamics in the Urban and Grassland classes;
- urban areas show the highest growth and Grassland is substantially lost over both reference periods;
- a proportional high loss was experienced by Wetlands as well as Heathland and Scrub;
- the decrease of Cropland between 2006 – 2012 is compensated by an increase in the following six years;
- the Open spaces with little or no vegetation class has experienced a reverse trend from an area gain in the period 2006 – 2012 to an area loss in 2012 – 2018.
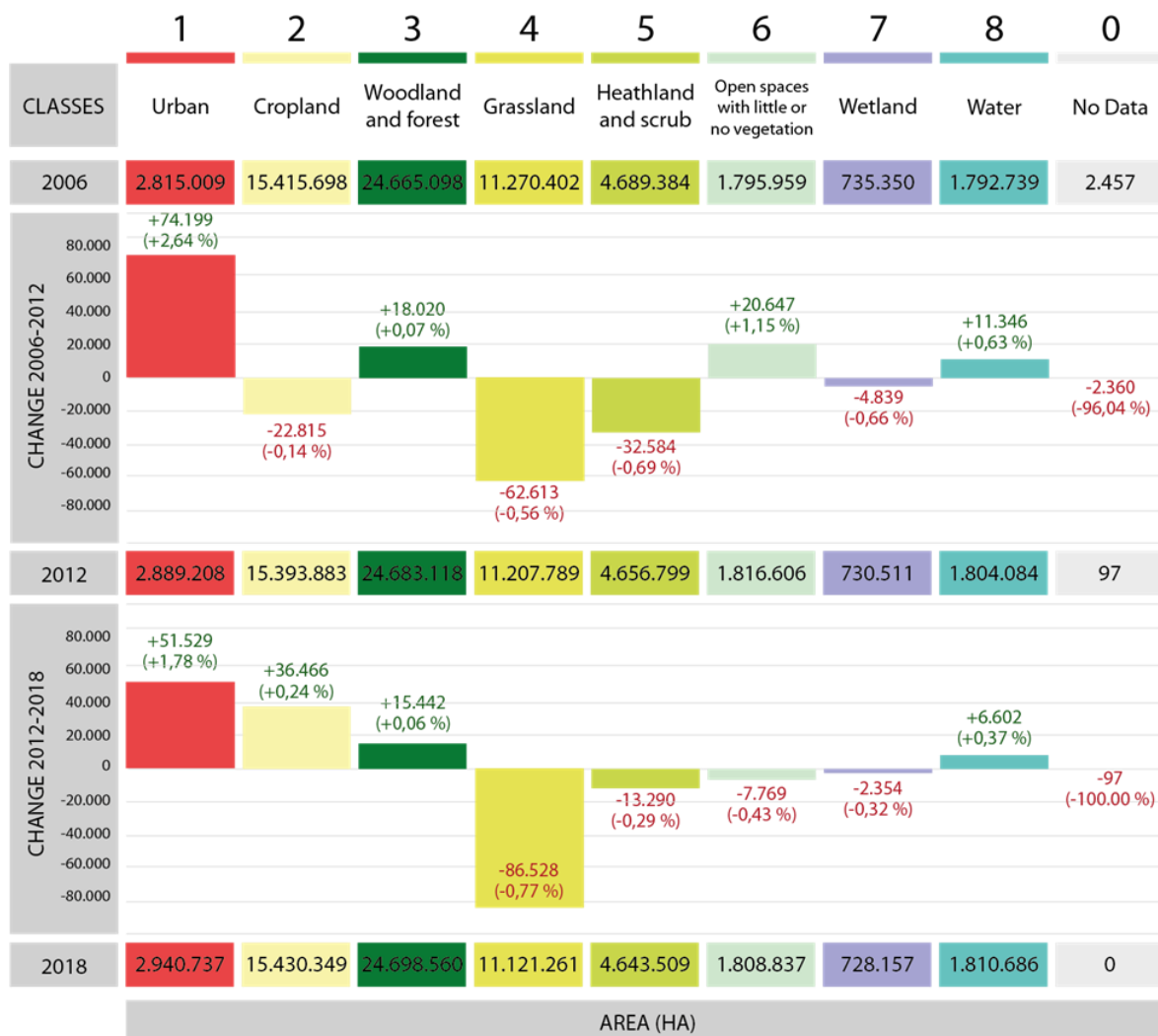
Figure 2: Overview of total gains and losses per class in ha and % for the periods 2006-2012 and 2012-2018

When comparing LCLU inside the Natura 2000 sites to LCLU in the 2 km buffer surrounding the sites, anthropogenic land uses, such as urban and cropland, cover larger areas in the buffer zones (Table 1). In contrast, natural and semi-natural land cover is more abundant inside the sites. Grasslands are found to an almost equal extent in both areas because the class includes not only natural and semi-natural (species-rich) but also intensely managed (species-poor) grasslands, which are more comparable in their use to croplands.

Overall, a continuous loss of grasslands can be observed, and the trend is visible both in the buffer zone and the sites themselves, even though to a lesser extent in the latter. The main reasons for grassland area losses during the 2012-2018 period were Agricultural conversion to Cropland (36%), followed by Urbanisation (22%) and Tree encroachment (14%).

AREA (%)		N2000 SITES			2 KM BUFFER ZONE		
		2006	2012	2018	2006	2012	2018
1	Urban	1,06%	1,09%	1,11%	7,76%	7,96%	8,11%
2	Cropland	13,41%	13,42%	13,49%	35,11%	35,04%	35,07%
3	Woodland and forest	45,36%	45,38%	45,40%	32,88%	32,91%	32,94%
4	Grassland	18,51%	18,46%	18,38%	17,18%	17,03%	16,84%
5	Heathland and scrub	10,25%	10,17%	10,16%	4,67%	4,64%	4,61%
6	Open spaces with little or no vegetation	4,48%	4,54%	4,52%	1,25%	1,25%	1,25%
7	Wetland	2,10%	2,09%	2,08%	0,25%	0,25%	0,25%
8	Water	4,82%	4,84%	4,85%	0,91%	0,92%	0,93%
0	No Data	0,01%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 1: Comparison of LCLU classes in the Natura 2000 sites and the 2 km buffer zones for 2006, 2012 and 2018

Other key findings (as shown in table 2 below) include:

- Grasslands showed a decline for two of the four different classes distinguished in the mapping. Managed grassland (class 4100) and Semi-natural grassland with woody plants (class 4212) have the highest losses;
- Alpine areas (4220) are the only type being more or less stable;
- Semi-natural grassland without woody plants (4211) experienced a gain for both reference periods.

Classes Level 4	4100	4211	4212	4220
CLASSES	Managed grassland	Semi-natural grassland with woody plants (CCD ≥ 30 %)	Semi-natural grassland without woody plants (CCD < 30%)	Alpine & sub-alpine natural grass-land
AREA (HA)	4100	4211	4212	4220
2006	4.994.954	784.537	4.603.982	886.929
Change 06-12	-43.464 (-0,87 %)	+1.962 (+0,25 %)	-20.970 (-0,46 %)	-142 (-0,02 %)
2012	4.951.490	786.500	4.583.012	886.787
Change 12-18	-40.204 (-0,81 %)	+75 (+0,01 %)	-46.135 (-1,01 %)	-265 (-0,03 %)
2018	4.911.286	786.575	4.536.877	886.522

Table 2: Area cover of the 4 grassland sub-classes in 2006, 2012 and 2018, with trend (in absolute and relative terms) for the two periods 2006-2012 and 2012-2018

Looking at the data for Natura 2000 sites and buffer zones separately (Figure 3 below), the grassland classes inside the Natura 2000 network can be seen to still be declining in area, apart from class 4211, which experienced slight gains in both periods, the reason for this most likely being land abandonment leading to shrub encroachment. In the buffer zone, classes 4100, 4212 and 4220 all decline more severely than inside the sites. The graph clearly shows once again that grassland cover seems overall to be subject to bigger changes outside Natura 2000 sites (i.e., in the buffer).
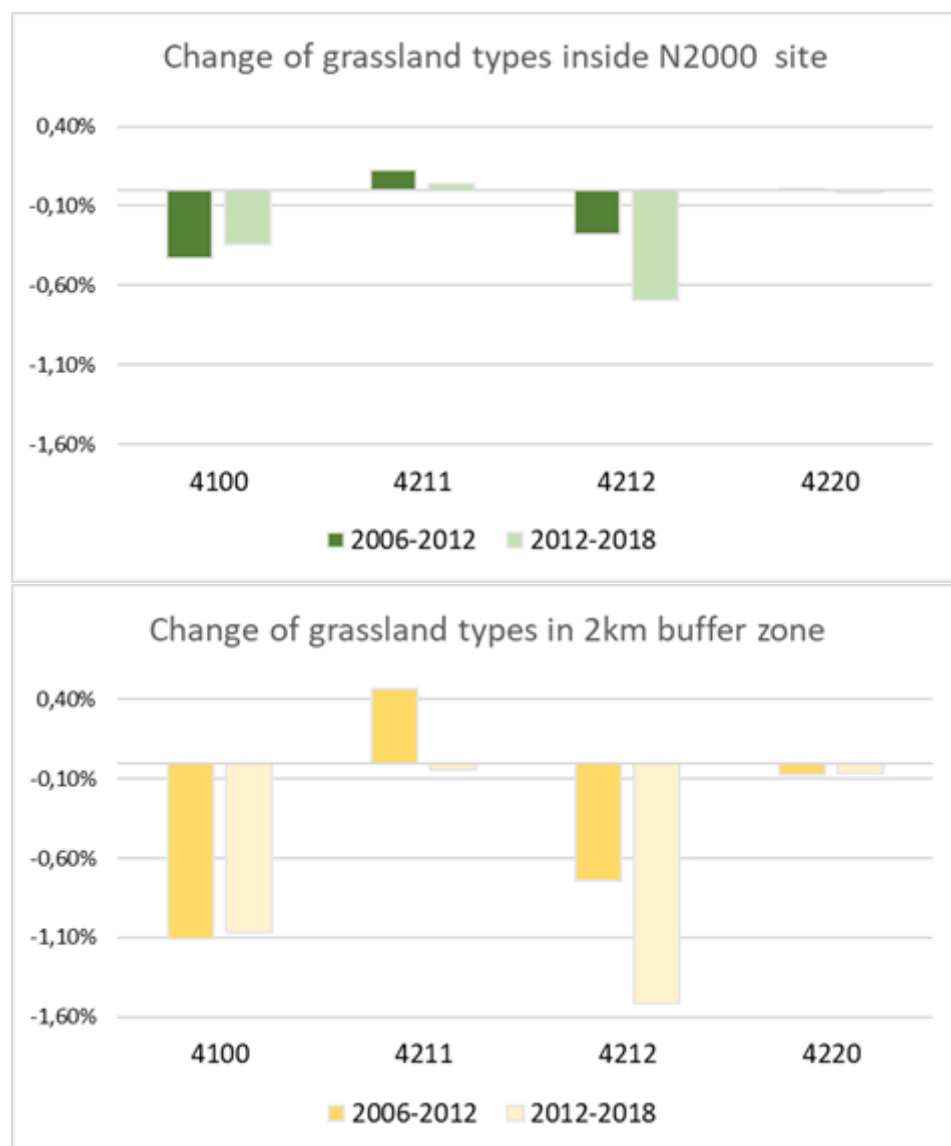
Figure 3: Changes of grassland types in Natura 2000 sites & buffer zone for both periods of observation.

What does it mean for the future?

The N2K product allows us to recognise that good work is being done within Natura 2000 areas to lessen the decline of grasslands areas. However, it also tells us more work is required

to protect these valuable areas, in particular with the continuous monitoring of changing agricultural practices.

The Copernicus Land Monitoring Service (implemented by the European Environment Agency for the local and Pan-European components) is committed to the continuous improvement of such monitoring schemes to address these challenges collectively. In particular, it is hoped that grasslands can not only be effectively preserved with N2K, but that the monitoring and assessment of biodiversity in line with the objectives of the EU Biodiversity Strategy to 2030 can also be achieved to the highest level. All of which will help ensure the continuous protection of the vitally important Natura 2000 grasslands.