



D2.1 Target Bird Species List

Deliverable for the Horizon Europe Project BirdWatch

Version 1.2



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Introduction

BirdWatch's aim is to provide an EU-wide service supporting the monitoring and improvement of farmland habitat suitability for bird species which breed or forage on agricultural land. Agricultural intensification has led to an especially stark decline¹ in so-called common farmland bird species, which motivated the development of the BirdWatch project.

The BirdWatch service will consist of an Earth Observation (EO) data-based monitoring service which evaluates the habitat suitability of farmland parcels for specific bird species as well as of an optimisation workflow, serving as a decision-support for the identification of appropriate eco-schemes.

The habitat suitability is derived from the habitat preferences of a bird species. To be able to associate a quantitative, and thus measurable value, with a specific area, descriptors of a habitat, including, e.g., the structural makeup or the distance to certain elements (e.g. forests, hedges, etc.), need to be measured and fed into species distribution models (SDM)². These models can, on the one hand, help to understand the influence of environmental conditions on the occurrence or abundance of a species, on the other hand, evaluate a species' expected distribution based on the characteristics of the habitat. The latter is framed as a probabilistic distribution, not as deterministic values of specific occurrence numbers. SDMs also support the evaluation of scenarios of planned changes in the habitat structure. The establishment of the SDM framework is part of WP4 of the BirdWatch project and will be described in more detail in the deliverable D4.1- *Data, Algorithms and Workflows for SDM*.

Habitat descriptors will be calculated from satellite data freely available from the Copernicus-program of the EU that was jointly implemented with the European Space Agency (ESA), Entrusted Entities and Member States. Multispectral and radar images of the Sentinel-2 and Sentinel-1 satellites will be used to derive, e.g., textural parameters and land cover types, necessary to describe the makeup of the habitat. These are tasks of WP3 and will be described in detail in the deliverables D3.2-*Dynamic tools to integrate harmonised Sentinel-2 and Landsat timeseries in the modelling workflow* and D3.3-*Dynamic tools to integrate harmonised Sentinel-1 timeseries in the modelling workflow*.

In order to evaluate scenarios involving different greening measures, such as the planting of hedgerows or the choice of a particular parcel as fallow land, BirdWatch will establish an optimisation workflow to identify appropriate pathways for the improvement of habitat suitability of a specific agricultural parcel or holding. The optimisation algorithm is part of WP5 and will be elaborated on in D5.1 - *Description of a Land Use Allocation Algorithm*.

During the project's lifetime the BirdWatch service will be developed in four different test regions in the EU, namely in Flanders, Belgium, in Germany, in Lithuania, and in South Tyrol, Italy.

¹<https://pecbms.info/european-common-bird-indicators-2022-update/>

² Edith J. & Leathwick J.R., 2009, *Species Distribution Models: Ecological Explanation and Prediction Across Space and Time*, Annual Review of Ecology, Evolution and Systematics, Vol 40:677-697, <https://doi.org/10.1146/annurev.ecolsys.110308.120159>



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Target Bird Species Selection

To establish both the monitoring and the optimisation workflows, an important input will be the target bird species along with their respective habitat requirements. These will guide all further software choices and thus are elemental for the development of the BirdWatch service.

The reason for selecting a subset of species is the inherent complexity in taking into account all the different variables to monitor and furthermore, to optimise habitat suitability. This includes the fact that some species might co-occur while some require habitat parameters which are mutually exclusive. Thus, optimising for the habitat requirements of one species might represent a potential deterioration of the habitat of another.

Therefore, the development of the service considers only a selection of all possible farmland bird species to start with a manageable complexity. Once the service is set up and has been evaluated positively, further species will be added, after appropriate cycles of testing and validation.

The choice of the target bird species is the centre of this deliverable and will be described in this section.

Background on the selection of farmland bird species

Bird species abundance is monitored by national bird monitoring schemes, in turn collected by the PanEuropean Common Bird Monitoring Scheme (PECBMS) which uses the monitoring data to calculate common bird species indicators.

Among the common bird species are 39 species classified as farmland species on EU level. The table below lists all bird species classified as farmland species.

Bird Species	English Name
<i>Alauda arvensis</i>	Eurasian Skylark
<i>Alectoris rufa</i>	Red-legged Partridge
<i>Anthus campestris</i>	Tawny Pipit
<i>Anthus pratensis</i>	Meadow Pipit
<i>Bubulcus ibis</i>	Cattle Egret
<i>Burhinus oedipnemos</i>	Eurasian Stone-Curlew
<i>Calandrella brachydactyla</i>	Greater Short-toed Lark
<i>Ciconia ciconia</i>	White Stork
<i>Corvus frugilegus</i>	Rook
<i>Curruca communis</i>	Common Whitethroat
<i>Emberiza calandra</i>	Corn Bunting
<i>Emberiza cirrus</i>	Cirl Bunting
<i>Emberiza citrinella</i>	Yellowhammer
<i>Emberiza hortulana</i>	Ortolan Bunting
<i>Emberiza melanocephala</i>	Black-headed Bunting
<i>Falco tinnunculus</i>	Common Kestrel



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<i>Galerida cristata</i>	Crested Lark
<i>Galerida theklae</i>	Thekla's Lark
<i>Hirundo rustica</i>	Barn Swallow
<i>Lanius collurio</i>	Red-backed Shrike
<i>Lanius minor</i>	Lesser Grey Shrike
<i>Lanius senator</i>	Woodchat Shrike
<i>Limosa limosa</i>	Black-tailed Godwit
<i>Linaria cannabina</i>	Common Linnet
<i>Melanocorypha calandra</i>	Calandra Lark
<i>Motacilla flava</i>	Western Yellow Wagtail
<i>Oenanthe hispanica</i>	Western Black-eared Wheatear
<i>Passer montanus</i>	Eurasian Tree Sparrow
<i>Perdix perdix</i>	Grey Partridge
<i>Petronia petronia</i>	Rock Sparrow
<i>Saxicola rubetra</i>	Whinchat
<i>Saxicola rubicola</i>	European Stonechat
<i>Serinus serinus</i>	European serin ³
<i>Streptopelia turtur</i>	European Turtle Dove
<i>Sturnus unicolor</i>	Spotless Starling
<i>Sturnus vulgaris</i>	Common Starling
<i>Tetrax tetrax</i>	Little Bustard
<i>Upupa epops</i>	Eurasian Hoopoe
<i>Vanellus vanellus</i>	Northern Lapwing

Table 1: List of Common Farmland Bird Species according to the PECBMS

The classification is based on their predominant habitat use⁴. The bird species in this list are dependent on farmland for feeding and nesting and are not able to thrive in other habitats⁵.

The selection process behind Table 1 also considers data availability, as the PECBMS focuses on common birds that are widespread and abundant. Species which are not covered by generic monitoring schemes are often difficult to detect and therefore not part of the indicator.⁶ Therefore, the lack of monitoring data would equally affect our success. This implies that the species selected by the PECBMS all have sufficient data available and that only a few endangered and no critically endangered species (on EU or EU28-level) are part of the farmland bird index. Additionally, there are biogeographical factors which can lead to differences in habitat preferences.

³ formerly named *Saxicola torquatus* – the Common stonechat

⁴ <https://pecbms.info/methods/pecbms-methods/3-multispecies-indicators/species-selection-and-classification/>

⁵ EBCC/RSPB/BirdLife/Statistics Netherlands: the European Bird Census Council (EBCC) and its Pan-European Common Bird Monitoring Scheme (PECBMS), <http://www.ebcc.info/pecbm.html>

⁶ <https://pecbms.info/methods/pecbms-methods/3-multispecies-indicators/species-selection-and-classification/>



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As birds are considered as an indicator species for the health of our ecosystems, farmland birds can serve as proxies for the biodiversity of an agricultural area. The farmland bird index (FBI) turns the occurrence of farmland birds into a measurable and comparable unit. The FBI is a composite index, measuring the rate of change in the relative abundance of common farmland bird species at selected sites.

On EU level, the farmland bird index consists of the 39 species listed in Table 1. However, in the individual EU-countries, the number of bird species used for the calculation of the FBI varies. Member states can select their own species set, ideally following guidelines from the European Bird Census Council (EBCC). No rare species are included in EU species selection. Population trends are derived from the counts of individual bird species at census sites and modelled as such through time⁷.

The FBI is calculated annually, as a percentage change in relation to a reference year or a range of reference years (usually multiple decades ago). It is reported with a delay of two to three years.

For BirdWatch, the FBI is an important target indicator as it is already part of various reporting schemes.

For example, the FBI is considered

1. an agri-environmental indicator (AEI), reflecting the state of as impact on biodiversity and habitats⁸
 2. a sustainable development indicator (SDI)⁹
- and
3. part of the Pan-European Streamlining European Biodiversity Indicators (SEBI) initiative¹⁰.

⁷ https://agridata.ec.europa.eu/Qlik_Downloads/InfoSheetEnvironmental/infoC35.html

⁸ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental_indicators_-_fact_sheets#Establishing_agri-environmental_indicators

⁹ https://ec.europa.eu/eurostat/cache/metadata/en/sdg_15_60_esmsip2.htm

¹⁰ <https://www.eea.europa.eu/ims/abundance-and-distribution-of-selected>



Selection Process and initial Target Bird Species list

The number of species in Table 1 has to be reduced to a subset in the early stages of the project. This initial limitation is related to the potential amount of data needed for model building and the aim to first test the habitat suitability models for a few species. Once the initial trials achieve our aspired quality, it will be gradually applied to more of the bird species in Table 1.

First, we checked if a species is known to occur in the initial test regions of Flanders, Germany, Lithuania and South Tyrol. Applying this criterium, this leaves 21 out of 39 species, as well as *Limosa limosa* (which is not resident in South Tyrol) to include an endangered species (on EU28 level).

Nine further bird species were filtered out because they are not part of the *regional* FBI in more than one of the test regions.

The regional FBI is important, as the European Red List of Birds¹¹ often reports species as „Not Threatened“ or as „Least Concern“, while the status of individual species actually varies between European member states. One species might be near extinct in one country, but still be fairly abundant in another.

Attention was paid to a) the Red List Status in individual test regions and b) to the trend in the status over the past few generations of a species in order to have a diverse selection of different population states and trends to test our methods sufficiently.

Thus, to make sure that our final service is comparable to the already established FBI of the respective test region, we prioritized species that are part of the FBI in as many test regions as possible. This allows us to ensure that the BirdWatch service can support the regional monitoring framework.

For example, *Streptopelia turtur* was chosen due to its rapid decline in some of the test regions (e.g., Flanders) and its near threatened status in EU28. It serves as a species to test the performance of the future species distribution models for rarer birds and as an example of negative trends in regards to time series. *Anthus pratensis* serves as an example for a species that is quite common in some areas and rare in others (it is endangered in Germany).

Furthermore, observational bird data availability is an important aspect as the development of the SDM algorithms will strongly depend on this information. Bird species were chosen for which data are most likely obtainable, e.g., from the national monitoring schemes. As it might be possible to receive observational data on *Limosa limosa*, *Lanius Collurio*, *Alauda arvensis*, *Sturnus vulgaris*, *Passer montanus*, *Emberiza citrinella* and *Streptopelia turtur* via personal contacts to the LIFE Nardus & Limosa project¹² in Flanders and via the Natural Museum of Bolzano, the respective species were given more weight in the selection process.

¹¹ <https://www.birdlife.org/wp-content/uploads/2022/05/BirdLife-European-Red-List-of-Birds-2021.pdf.pdf>

¹² https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=7179



Thus, the remaining 12 species were filtered further a) by considering knowledge on the observational data availability and b) by the type of descriptors of the habitats, preferred by the the respective species. The latter aspect was assessed with regards to the ability of remote sensing data to detect indicators for the respective habitat requirement.

The selection process, in regards to our criteria considering the test regions and the regional FBI, is visualised in Table 2. To not introduce further complexity, a simple point system was used to evaluate the candidate species with regards to the four test regions, i.e., Flanders, Germany, Lithuania and South Tyrol. One point was awarded for each test region the species occurs in, under the condition that it is part of the FBI in the respective region.

The bird species highlighted in green represent our selection of intital target bird species.



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Table 2: Criteria for the initial bird species selection.

The final selection of target birds are highlighted in green. Points are highlighted from red (less relevant) to green (more relevant) to emphasise on their respective relevance for the test regions. Here, it is also shown if the species was part of the initial BirdWatch-application¹³ from 2018.

(F = Flanders, G = Germany, L = Lithuania, S = South Tyrol)

Name (scientific)	Occurrence in test regions	red list status (EU)	red list status (EU28)	trend	EU28 endemic	habitat type	test regions	FBI F	FBI G	FBI L	FBI S	points
<i>Alauda arvensis</i>	F,G,L,S	LC	LC	decreasing		open, dry, GL, AL	4	1	1	1	1	8
<i>Emberiza citrinella</i>	F,G,L,S	LC	LC	decreasing		AL, hedges, shrubs, heathland	4	1	1	1	1	8
<i>Saxicola rubetra</i>	F,G,L,S	LC	VU	decreasing		structured, heathland, GL, perches	4		1	1	1	7
<i>Lanius collurio</i>	F,G,L,S	LC	LC	decreasing		AL, heathland, hedges, shrubs	4		1	1	1	7
<i>Passer montanus</i>	F,G,L,S	LC	LC	stable		edges, hedges, shrubs, settlements	4	1		1	1	7
<i>Vanellus Vanellus</i>	F,G,L,S	VU	VU	decreasing		open, wet, AL, GL, coasts	4	1	1	1		7
<i>Hirundo rustica</i>	F,G,L,S	LC	LC	decreasing		settlements	4	1		1	1	7
<i>Sturnus vulgaris</i>	F,G,L,S	LC	LC	stable		AL, GL	4			1	1	6
<i>Curruca communis</i>	F,G,L,S	LC	LC	stable		structured, wasteland	4	1		1		6
<i>Anthus pratensis</i>	F,G,L,S	LC	LC	decreasing		structured, wet, shrubs, GL	4	1				5
<i>Limosa limosa</i>	F,G,L	NT	EN	decreasing		open, wet, GL, patches of water	3	1	1			5
<i>Anthus campestris</i>	F,G,L,S	LC	LC	stable		open, dry	4			1		5
<i>Falco tinnunculus</i>	F,G,L,S	LC	LC	decreasing		open, AL, heathland, trees, perches	4	1				5
<i>Linaria cannabina</i>	F,G,L,S	LC	LC	increasing		open, wet, GL, wasteland	4	1				5
<i>Motacilla flava</i>	F,G,L,S	LC	LC	decreasing		wet, GL, pastureland, swamps, lakeshores	4	1				5
<i>Perdix perdix</i>	F,G,L,S	LC	VU	decreasing		open, AL, edges	4	1				5
<i>Serinus serinus</i>	F,G,L,S	LC	LC	decreasing	near	AL, settlements, parks, perches	4				1	5
<i>Streptopelia turtur</i>	F,G,L,S	VU	NT	decreasing		trees, partly open, AL, heathland	4					4
<i>Ciconia ciconia</i>	F,G,L,S	LC	LC	increasing	Y	open, GL, AL, pastureland	4					4
<i>Corvus frugilegus</i>	F,G,L,S	VU	LC	decreasing		open, GL, AL, hedges, trees, settlements	4					4
<i>Emberiza calandra</i>	F,G,L	LC	LC	decreasing		structured, AL, heathland	3		1			4
<i>Emberiza hortulana</i>	G,L,S	LC	NT	decreasing		open, AL, hills and mountains	3					3
<i>Galerida cristata</i>	F,G,L	LC	LC	decreasing		dry, scarce, AL, roadsides	3					3
<i>Upupa epops</i>	G,L,S	LC	LC	stable		heathland, AL, orchards, GL	3					3
<i>Lanius minor</i>	L	LC	LC	decreasing		open, scattered shrubs and trees, perches	1					1
<i>Oenanthe hispanica</i>	G	LC	LC	decreasing		open, scattered trees, perches, slopes	1					1
<i>Saxicola torquatus</i>	-	LC	LC	decreasing		open, GL, heathland, marsh, scrubs	0	1				1
<i>Alectoris rufa</i>	-	NT	NT	decreasing	near	open, dry	0					0
<i>Bubulcus ibis</i>	-	LC	LC	increasing		open, GL, AL, pastureland	0					0
<i>Burhinus oedicephalus</i>	-	LC	LC	unknown		open, dry, wasteland	0					0
<i>Calandrella brachydactyla</i>	-	LC	LC	increasing		open, dry, wasteland, desert	0					0
<i>Emberiza cirlus</i>	-	LC	LC	stable	near	AL, hedges, heathland	0					0
<i>Emberiza melanocephala</i>	-	LC	LC	unknown		orchards, gardens, open forests	0					0
<i>Galerida theklae</i>	-	LC	LC	increasing		dry, scarce, shrubs	0					0
<i>Lanius senator</i>	-	NT	NT	decreasing		open, scattered shrubs and trees, perches	0					0
<i>Melanocorypha calandra</i>	-	LC	LC	decreasing		open, AL, steppe	0					0
<i>Petronia petronia</i>	-	LC	LC	increasing		open, AL, hills, rocky, settlements	0					0
<i>Sturnus unicolor</i>	-	LC	LC	decreasing	near	AL, GL, gardens, parks	0					0
<i>Tetrax tetrax</i>	-	VU	EN	decreasing		open, AL, GL, shrubs, weeds	0					0

¹³ Initial version of the BirdWatch-application, available for the state of Brandenburg, Germany: <http://birdwatch.lup-umwelt.de/>



Appendix

1. *Alauda arvensis*

English name	Eurasian Skylark
Flemish name	Veldleeuwerik
German name	Feldlerche
Italian name	Allodola
Lithuanian name	Dirvinis vieversys



Fig. 1: Adult eurasian skylark; Image Source: Peter Kennerley <https://macaulaylibrary.org/asset/237452191>

EU red list status:

Least concern

EU population trend:

Decreasing

Status in test regions:

Flanders	Vulnerable. Decreasing (2007-2018: -35%)
Germany	Endangered
Lithuania	Moderate decrease between 2000 and 2020
	Moderate increase between 2014 and 2020
South Tyrol	Moderate decline



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2. *Anthus pratensis*

English name	Meadow Pipit
Flemish name	Graspieper
German name	Wiesenpieper
Italian name	Pispola
Lithuanian name	Pievnis kalviukas



Fig. 2: Meadow pipit; Image Source: Adrien Mauss, <https://macaulaylibrary.org/asset/36424311>

EU red list status:

Least concern

EU population trend:

Declining

Status in test regions:

Flanders	Threatened. Decreasing (2007-2018: -52%)
Germany	Critical
Lithuania	Stable between 2000 and 2020
	Moderate decrease between 2014 and 2020
South Tyrol	No information



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3. *Emberiza citrinella*

English name	Yellowhammer
Flemish name	Geelgors
German name	Goldammer
Italian name	Zigollo Giallo
Lithuanian name	Geltonoji Starta



Fig. 3: Yellowhammer; Image Source: Nigel Voaden, <https://macaulaylibrary.org/asset/78557031>

EU red list status:

Least concern

EU population trend:

Decreasing

Status in test regions:

Flanders	Least concern. No significant trend.
Germany	Moderate decrease
Lithuania	Stable between 2000 and 2020
	Stable between 2014 and 2020
South Tyrol	Moderate decrease



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4. *Saxicola rubetra*

English name	Whinchat
Flemish name	Paapje
German name	Braunkehlchen
Italian name	Stiaccino
Lithuanian name	Kiauliukė



Fig. 4: *Saxicola rubetra*; Image Source: Ian Davis, <https://macaulaylibrary.org/asset/42408031>

EU red list status:

Least Concern

EU population trend:

Decreasing

Status in test regions:

Flanders	Critically endangered (0-2 pairs)
Germany	Critical
Lithuania	Moderate decrease between 2000 and 2020
	Moderate decrease between 2014 and 2020
South Tyrol	Moderate decrease



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5. *Lanius collurio*

English name	Red-backed Shrike
Flemish name	Grauwe Klauwier
German name	Neuntöter
Italian name	Averla Piccola
Lithuanian name	Paprastoji medžarkė



Fig. 5: Red-backed Shrike; Image Source: Ferit Başbuğ, <https://macaulaylibrary.org/asset/28885141>

EU red list status:

Least concern

EU population trend:

Decreasing

Status in test regions:

Flanders	Endangered. Was extinct, last years a few pairs → increasing
Germany	Moderate decrease
Lithuania	Moderate decrease between 2000 and 2020 Strong decrease between 2014 and 2020
South Tyrol	Moderate decrease



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6. *Limosa limosa*

English name	Black-tailed Godwit
Flemish name	Grutto
German name	Uferschnepfe
Italian name	Pittima Reale
Lithuanian name	Paprastasis griciukas



Fig. 6: Black-tailed Godwit; Image Source: Paul Tavares, <https://macaulaylibrary.org/asset/35830281>

EU red list status:

Near threatened

EU population trend:

Stable

Status in test regions:

Flanders

Vulnerable. Decreasing. Threats: desiccation, early mowing, planting hedges, high cattle density

Lithuania

Moderate increase between 2000 and 2020

Moderate increase between 2014 and 2020



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7. *Passer montanus*

English name	Eurasian Tree Sparrow
Flemish name	Ringmus
German name	Feldsperling
Italian name	Passera Mattugia
Lithuanian name	Karlkažvirblis



Fig. 7: Adult Eurasian Tree Sparrow; Image Source: Ivan Sjögren, <https://macaulaylibrary.org/asset/219798061>

EU red list status:

Least concern

EU population trend:

Decreasing

Status in test regions:

Flanders	Endangered. Decreasing (2007-2018: -18%)
Germany	Vulnerable
Lithuania	Stable between 2000 and 2020
	Stable between 2014 and 2020
South Tyrol	Moderate decrease



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8. *Streptopelia turtur*

English name	European Turtle Dove
Flemish name	Zomertortel
German name	Turteltaube
Italian name	Tortora Selvatica
Lithuanian name	Paprastasis purplelis



Fig. 8: Juvenile European Turtle Dove; Image Source: Yann Kolbeinsson, <https://macaulaylibrary.org/asset/183922461>

EU red list status:

Vulnerable

EU population trend:

Decreasing

Status in test regions:

Flanders	Critically endangered. Decreasing (< 500 pairs left)
Germany	Critical
Lithuania	Moderate increase between 2000 and 2020
	Moderate increase between 2014 and 2020
South Tyrol	Stable



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9. *Sturnus Vulgaris*

English name	Common Starling
Flemish name	Spreeuw
German name	Star
Italian name	Storno
Lithuanian name	Varnėnas



Fig. 9: Adult Common Starling; Image Source: Ryan Schain, <https://macaulaylibrary.org/asset/39278421>

EU red list status:

Least concern

EU population trend:

Decreasing

Status in test regions:

Flanders	Decreasing (2007-2018: -36%)
Germany	Endangered
Lithuania	Moderate decrease between 2000 and 2020
	Moderate decrease between 2014 and 2020
South Tyrol	Moderate increase



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10. *Vanellus vanellus*

English name	Northern Lapwing
Flemish name	Kievit
German name	Kiebitz
Italian name	Pavoncella
Lithuanian name	Pempė



Fig. 10: Northern Lapwing; Image Source: Yann Kolbeinsson, <https://macaulaylibrary.org/asset/23897261>

EU red list status:

Vulnerable

EU population trend:

Decreasing

Status in test regions:

Flanders	Endangered. Decreasing (2007-2018: -59%)
Germany	Critical
Lithuania	Stable between 2000 and 2020 Moderate decrease between 2014 and 2020



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