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REPORT

ReSurveyEurope: A database of resurveyed vegetation plots in Europe

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Abstract

Aims: We introduce ReSurveyEurope — a new data source of resurveyed vegetation plots in Europe, compiled by a collaborative network of vegetation scientists. We describe the scope of this initiative, provide an overview of currently available data, governance, data contribution rules, and accessibility. In addition, we outline further steps, including potential research questions.

Results: ReSurveyEurope includes resurveyed vegetation plots from all habitats. Version 1.0 of ReSurveyEurope contains 283,135 observations (i.e., individual surveys of each plot) from 79,190 plots sampled in 449 independent resurvey projects. Of these, 62,139 (78%) are permanent plots, that is, marked in situ, or located with GPS, which allow for high spatial accuracy in resurvey. The remaining 17,051 (22%) plots are from studies in which plots from the initial survey could not be exactly relocated. Four data sets, which together account for 28,470 (36%) plots, provide only presence/absence information on plant species, while the remaining 50,720 (64%) plots contain abundance information (e.g., percentage cover or cover–abundance classes such as variants of the Braun-Blanquet scale). The oldest plots were sampled in 1911 in the Swiss Alps, while most plots were sampled between 1950 and 2020.

Conclusions: ReSurveyEurope is a new resource to address a wide range of research questions on fine-scale changes in European vegetation. The initiative is devoted to an inclusive and transparent governance and data usage approach, based on slightly adapted rules of the well-established European Vegetation Archive (EVA). ReSurveyEurope data are ready for use, and proposals for analyses of the data set can be submitted at any time to the coordinators. Still, further data contributions are highly welcome.

KEYWORDS
biodiversity, community ecology, database, macroecology, monitoring, relevé, species richness, temporal change, time series, vascular plants, vegetation dynamics

1 | INTRODUCTION

Plot-based vegetation samples, called vegetation plots henceforth, document plant species diversity and community composition at a given location at a given time. Such data allow for a wide variety of research questions to be addressed, and accordingly, they have been widely used in vegetation ecology for more than a century (e.g., Braun-Blanquet, 1964; Ellenberg & Leuschner, 2017). More recently, the mobilization of vegetation-plot data, and their compilation in large repositories such as the European Vegetation Archive (EVA, http://euroveg.org/eva-database) and the global vegetation database sPlot (https://www.idiv.de/de/splot.html) have substantially expanded the availability of these types of data (Schaminée et al., 2009; Dengler et al., 2011).

Vegetation plots also contain metadata (Mucina et al., 2000) that describe properties of the surveyed site (e.g., topography, land use, slope inclination and aspect), the plot (e.g., size, shape), and the sampling (e.g., date of sampling, surveyor name). In most cases, information on the location of the vegetation plot is provided, although this information may be given in a variety of ways and with different geographic accuracies, ranging from vague textual descriptions of localities to highly accurate geographic coordinates based on GPS data or permanent marks in the field.

Increasing human pressures on the natural environment during the last decades have caused substantial changes in the European flora and vegetation (e.g., Richner et al., 2015; Jandt, Bruelheide, Jansen, et al., 2022). Vegetation-plot data offer excellent opportunities to study temporal vegetation changes with fine resolution across large areas by resurveying historical vegetation plots, or by establishing permanent plots that are revisited on a regular basis. In recent decades, an increasing number of studies have used these approaches for studying large-scale (including continental and global) vegetation change in response to pressures such as land-use change (e.g., Nielsen et al., 2021), climate change (e.g., Gottfried et al., 2012; Steinbauer et al., 2018), eutrophication (e.g., Peppler-Lisbach et al., 2020; Ridding et al., 2020; Kammer et al., 2022; Staude et al., 2022), and biological invasions (e.g., Del Vecchio et al., 2015).

The number of publications (and corresponding data sets) based on resurveyed vegetation plots in Europe (and elsewhere) has increased strongly since the start of the new millennium (Figure 1). While some initiatives with a focus on specific habitats such as forests (forestREplot, https://forestreplot.ugent.be/) and alpine environments (GLORIA, https://www.gloria.ac.at/hom/) have integrated a part of these data, many resurvey data sets are not yet integrated into large data repositories that ensure easy access and interoperability of the data. As a consequence, the potential of using existing data to address research questions remains limited. Therefore, we launched ReSurveyEurope in 2020 to fill this gap at the European level. ReSurveyEurope is closely connected to the European Vegetation Archive and aims to build a data repository of fine-scale plot-based plant community resurvey data (relevés, plots). Here, we describe the scope of this initiative, provide an overview on data, governance rules, accessibility, and outline further steps of how to ensure that ReSurveyEurope stays a living database.

2 | COMPILATION AND CONTENT OF THE ReSurveyEurope 1.0 DATABASE

2.1 | Scope of ReSurveyEurope

The geographic scope of ReSurveyEurope is the continent of Europe, including adjacent, biogeographically similar areas such as the Macaronesian Islands (excluding Cape Verde), Greenland, Georgia, Armenia, Azerbaijan, Anatolia, Cyprus, and the Mediterranean Biome in northern Africa and the Near East. Suitable data sets are fine-grain biodiversity data (e.g., vegetation plots, relevés, transects) from all habitats that document the presence (and ideally also proxies of the cover) of vascular plants (and optionally bryophytes and lichens) with at least two repeated observations (i.e., individual surveys of each plot) in different years. Observations have to be made with identical or at least similar and comparable methods at the same or a similar location close by.

To be suitable for ReSurveyEurope, data sets have to fulfill a set of minimum requirements: (i) a complete list of vascular plants in defined plots, preferably also with information on species cover or proxies for cover such as biomass; (ii) plot location including longitude and latitude, and information on the precision of the coordinates; (iii) sampling date (ideally the precise date, minimum the year); and (iv) plot size (see Appendix S1 for details). Further, information on the methods of data collection, total vegetation cover, elevation, slope inclination and aspect, bedrock, land use, recent land-use change and vegetation or habitat type are welcome to increase the value of the data set.

2.2 | Data preparation, integration and taxonomic standardization

The first data call for ReSurveyEurope was announced on October 6, 2020 (http://euroveg.org/download/ReSurveyEurope_EVA_Call.pdf). Data contributors were asked to ideally provide their data in Turboveg 2 format (Hennekens & Schaminée, 2001), with a set of predefined header data fields following the guidelines in Appendix S1. For easier data preparation, providers can download the database structure with the standard database fields from https://www.synbiosys.alterra.nl/turboveg/ (under Database dictionaries/ReSurvey) using Turboveg 2 version 2.148 or higher.

All databases in ReSurveyEurope are stored and managed in Turboveg 2 using national species lists as the taxonomic backbone for the individual databases. The header data were checked and, if necessary, standardized by the first author of this article before integrating the data sets into ReSurveyEurope. As a next step, all databases were pooled in a single database in Turboveg 3, which

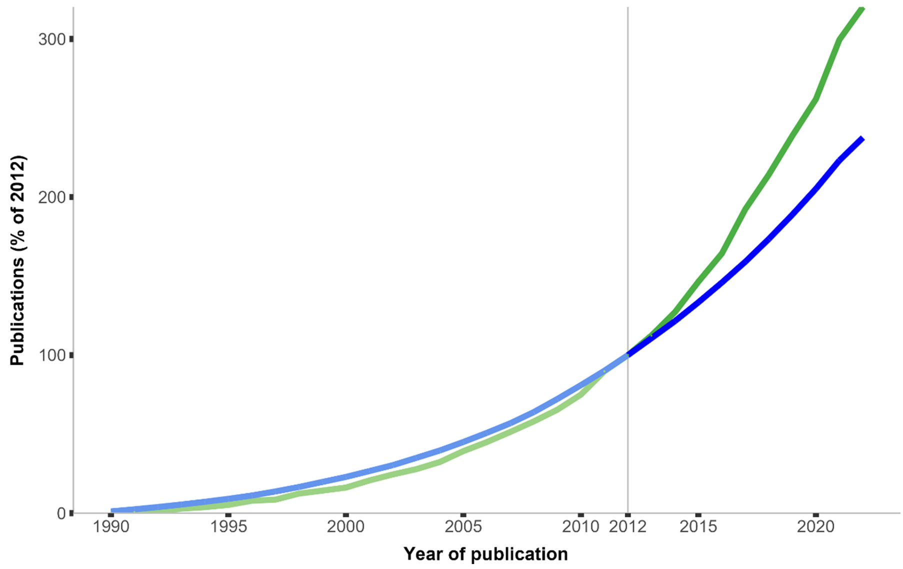

FIGURE 1 Cumulative number of published studies on vegetation change including studies using resurveyed vegetation plots (green) based on 1345 publications indexed in Web of Science (as of December 6, 2022) following the same search criteria as Vellend et al. (2013), compared to the overall number of publications within the field of ecology (blue). Of the former, 420 publications are from 1990–2012 (i.e., the period covered by Vellend et al., 2013; in light green) and an additional 925 papers were published thereafter (in dark green)—an increase by 220% during the last decade. In comparison, overall publications within the field of ecology have only increased by 146% (following a Web of Science search based on the search string: *"plant" AND "species" AND "ecology"*). The search string used here and by Vellend et al. (2013) was: (*"plant community" OR "plant communities" OR "vegetation" OR "forest*" OR "grassland*" OR "wetland*" OR "desert*" OR "savanna*" OR "tundra*" OR "steppe*" OR "shrubland*" OR "prairie*" OR "taiga" OR "rainforest*" OR "woodland*" OR "mangrove*") AND TITLE-ABS-KEY ("biodiversity" OR "diversity" OR "richness" OR "evenness" OR "composition") AND ALL ("resurvey*" OR "resample*" OR "revisit*" OR "temporal change")*.

has been developed for EVA by S.M. Hennekens to facilitate joint management of databases using different species lists and database dictionaries.

2.3 | Description and characterization of the plots and observations

In total, version 1.0 of ReSurveyEurope contains 79,190 plots with 283,135 observations (i.e., resurveys of individual plots) from 449 independent resurvey projects (Figure 2; see https://euroveg.org/resurvey/database for a full list). Of the total number of plots, 62,139 (78%) are from permanent (incl. manipulated) plots, for example, marked or geotagged plots which allow for high spatial accuracy in resurveying (Figure 2b,c). Note that this category also includes plots that are not permanently marked in the field, but were located with high precision (e.g., GPS-measured locations, photos).

The remaining 17,051 (22%) plots are quasi-permanent plots, which in the initial survey had not been sufficiently georeferenced to guarantee their unambiguous retrieval (Figure 2d). Resurveys of such plots rely on the geographic information available from the first survey including geographic coordinates, textual description of plot locations, information from field notes and maps, and surveyors' knowledge of plot locations. These plots are thus associated with higher uncertainties on the location of the initial plots.

Four data sets accounting for 28,470 (35%) plots provide only presence/absence information on plant species; one data set from Denmark is especially large and accounts for most of the presence/absence-only data; however, for this data set, abundance information will be provided in the near future. Of the remaining 50,720 (65%) plots, the majority contain abundance information (e.g., percentage cover or cover–abundance classes such as variants of the Braun-Blanquet scale) with some plots from mixed data sets (i.e., containing abundance information for a subset of plots).

The geographical distribution of plots included in ReSurveyEurope is uneven, with central and northwestern European countries contributing the most data so far (Table 1; Figure 2; Appendix S2). For the full data set (including abundance and presence/absence data sets), Denmark ranks first by a wide margin (35%), followed by the United Kingdom (17%), Germany (15%), Switzerland (7%), and Poland (3%). When only considering the plots with species abundance information, the highest percentages are for the United Kingdom (28%), followed by Germany (25%), Switzerland (10%), Poland (5%), and Spain (4%).

For the full data set, the density of plots (i.e., number of plots per 100 km^2) is by far the highest in Denmark (62 plots/100 km^2), followed by Switzerland (13), the United Kingdom (6), Belgium (5), and Germany as well as the Czech Republic (3 each) (Table 1, Appendix S2). For observations with species abundance information, Switzerland (12 plots/100 km^2) ranks first, followed by the United Kingdom (6), Belgium (5), Germany (3), and the Czech Republic (2).

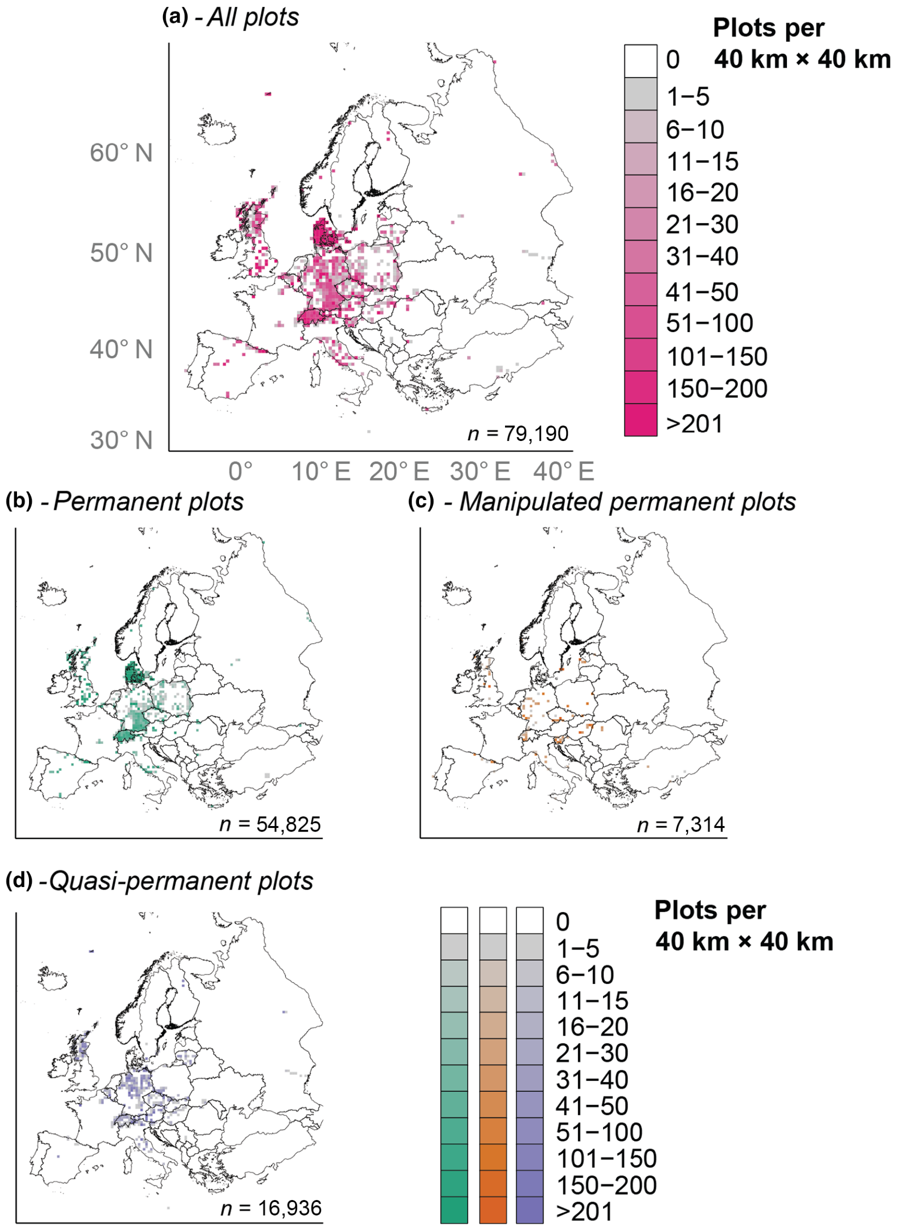

FIGURE 2 Geographic distribution of the 79,190 plots contained in ReSurveyEurope version 1.0 (a). Plots grouped by different study designs corresponding to (b) permanent plots, (c) manipulated permanent plots, and (d) quasi-permanent plots, in which plots of the initial survey have not been precisely georeferenced.

The oldest plot included was sampled in 1911 in the Swiss Alps (data set "DISEQUALP", Braun-Blanquet, 1913; Rumpf et al., 2018), while the latest resurveys are from 2022 (Figure 3, Appendix S3). Thus, the total time span covered by ReSurveyEurope is 111 years. The mean time span between sampling the first and the last observation is 26 years across all the 449 projects. Mean starting dates within data sets are more recent, as often first observations of plots within a data set have been done in different years (Appendix S3). Four projects started with the first plots until 1930, 21 additional projects by 1950, and another 84 projects by 1970. The longest mean time span covered by one data set is 104 years (data set "DISEQUALP").

The assignment of the data in ReSurveyEurope 1.0 to EUNIS Level 1 habitat classes using the classification expert system EUNIS-ESy (Chytrý et al., 2020) (Figure 4) shows that for 36,333 plots (46%) an assignment to a EUNIS habitat class was not possible — most often this was the case because the assignment to a habitat type is not possible for plots without species cover information. A total of 21,357 plots (27%) were assigned to grasslands, followed by 8976 (11%) assigned to multiple habitat groups (i.e., as a result of change of habitat types over time due to e.g., succession, land-use change or disturbance), forests (6936 plots; 9%), heathlands, scrub and tundra (1363 plots; 2%), vegetated man-made habitats (1126 plots; 1%), and wetlands (1020 plots; 1%); all other EUNIS classes are represented by lower numbers of observations.

Plot size differed substantially between plots, with plots located in forests being larger on average than plots in non-forest vegetation types (Figure 5b). In non-forest vegetation, median plot size is 2 m^2 (minimum: 0.001 m^2; maximum: 2500 m^2, mean: 26 m^2), while the median plot size for forest plots is 100 m^2 (minimum: 3 m^2; maximum: 2500 m^2, mean: 153 m^2).

Spatial uncertainty of plot locations varies between 0 and 15,000 m (Figure 5c). By far the highest number of observations has

TABLE 1 Overview of the top 10 countries ranked by plots included in ReSurveyEurope.

Rank	Country	Country area [km^2]	Plots	Observations	Plots [%]	Observations [%]	Plots per 100 km^2	Observations per 100 km^2
All data								
1	Denmark	44,493	27,777	99,650	35	35	62	224
2	United Kingdom	242,495	13,747	40,164	17	14	6	17
3	Germany	357,386	12,057	40,393	15	14	3	11
4	Switzerland	41,285	5365	11,208	7	4	13	27
5	Poland	312,685	2618	6612	3	2	0.8	2
6	Sweden	450,295	2296	12,446	3	4	0.5	3
7	Spain	498,511	1977	7510	3	2	0.4	2
8	Italy	301,318	1754	5012	2	2	0.6	2
9	Czech Republic	78,866	1544	14,242	2	5	2	18
10	Belgium	30,510	1543	2425	2	0.9	5	8
Only data with species abundance information								
1	United Kingdom	242,495	13,747	40,164	17	14	6	17
2	Germany	357,386	11,994	40,267	15	14	3	11
3	Switzerland	41,285	5088	10,499	6	4	12	25
4	Poland	312,685	2618	6612	3	2	1	2
5	Spain	498,511	1968	7348	2	3	0.4	1
6	Italy	301,318	1754	5012	2	3	0.6	2
7	Belgium	30,510	1543	2425	2	1	5	8
8	Russian Federation[a]	3,968,200	1523	8179	2	4	0.04	0.2
9	Czech Republic	78,866	1508	13,543	2	5	2	17
10	Austria	83,858	1474	3876	2	1	2	5

Note: Countries are ranked by the number of plots within their borders. For the full list of countries, see Appendix S2.

[a]For the Russian Federation, only the European territory is considered.

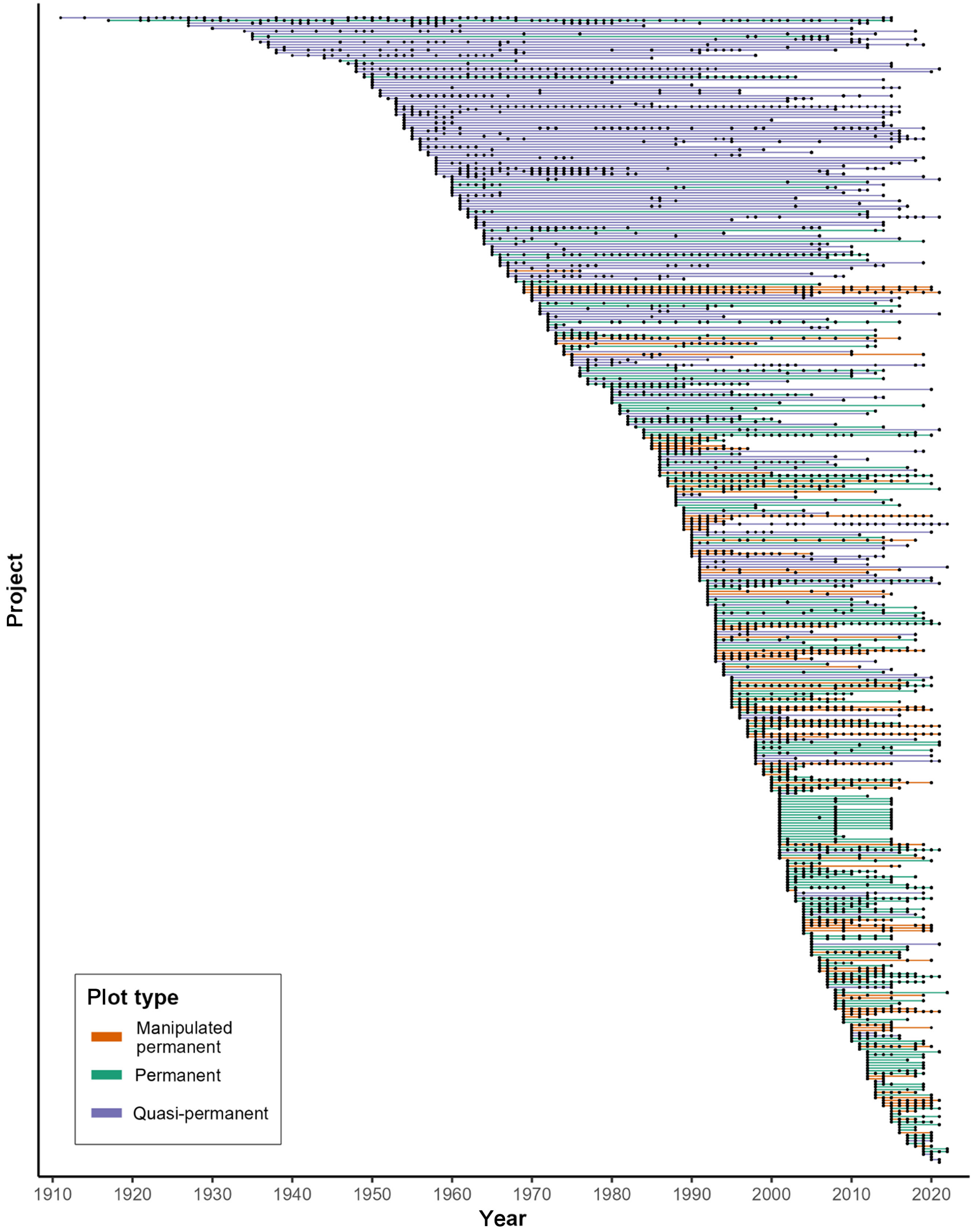

FIGURE 3 Time period covered by the 449 individual projects in ReSurveyEurope 1.0. Projects with permanent, manipulated permanent and quasi-permanent plots are shown in different colors. Note that manipulated permanent projects may also contain some unmanipulated (=control) plots. Black points indicate sampling times.

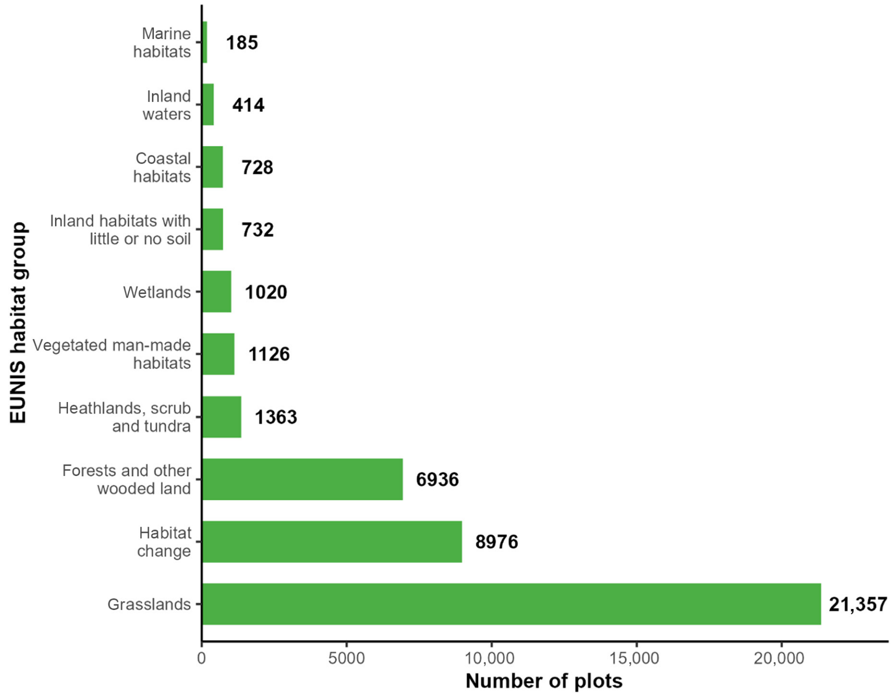

FIGURE 4 Distribution of 42,837 plots in ReSurveyEurope across habitat types defined as EUNIS Level 1 habitat classes classified using EUNIS-ESy (Chytrý et al., 2020). The category "habitat change" refers to plots that were assigned to different habitat types over the course of their observations. The remaining plots (not shown in the figure) are those without species cover information, which cannot be classified using EUNIS-ESy.

a spatial uncertainty of less than 10 m (53,252 plots). These plots are either permanently marked in the field or located using GPS or photos. On the opposite side of uncertainty, there are 975 plots with an uncertainty of 100–1000 m, and 117 plots with an uncertainty greater than 1000 m. Typically, these spatially most uncertain observations were from plots established several decades ago and (re-)located post-hoc based on historical materials like maps or descriptive textual information given in the original source.

The number of observations per plot varies among data sets. The majority of data sets have been surveyed twice (mostly resurveying studies) or at most a few times (mostly studies with permanent plots), while a few, mostly small data sets have high numbers of observations (Table 2).

2.4 | Taxonomic and nomenclatural standards and recommendations for data usage

ReSurveyEurope applied the EVA approach of simultaneously using a set of nationally used plant taxonomic and nomenclatural concepts to best represent individual data sets. A total of 31 species lists are used for storing species data in particular databases. Some species lists are fully taxonomically standardized and follow taxonomic concepts of particular countries (e.g., GermanySL 1.4, Czechia_Slovakia_2015), other lists are not fully standardized. In different species lists, the same name can refer to different taxa, different names can refer to the same taxon, and taxa can be circumscribed and ranked differently. To unify different taxonomic concepts, species lists were matched to the taxonomic and nomenclatural backbone of the Euro+Med PlantBase (Euro+Med, 2006) using the SynBioSys Taxon Database developed for EVA. Some taxa (e.g., non-European aliens, aggregates, unresolved names from the original data sets) that are not included in Euro+Med were retained in the data set. Both the original and harmonized taxonomies are preserved so that users can decide which of them they prefer to use. For cryptogams (lichens, bryophytes), taxonomy and nomenclature are so far largely unresolved across data sets in EVA and ReSurveyEurope.

The harmonized nomenclature for vascular plants according to Euro+Med can be further adjusted using the expert system EUNIS-ESy (Chytrý et al., 2020) to merge multiple taxonomic levels (e.g., subspecies) to the level of species and aggregates for groups of closely related species that are often identified inconsistently across vegetation plots. This adjustment can be performed using JUICE 7 (Tichý, 2002), Turboveg 3 (Hennekens, 2015) or an R script developed by Bruelheide et al. (2021). Before analyses, different observations from the same plot should also be checked for possible inconsistencies (e.g., the same taxon can be identified to the level of aggregate in the first sampling and to the level of species in the second sampling). In any case of doubt about correct taxonomic interpretation, the users should check the taxonomy and nomenclature used in the original data set.

2.5 | Cooperations and side projects

ReSurveyEurope makes use of pre-existing infrastructure, procedures and expertise developed and employed by EVA, and it is embedded in the EVA governance structure. Data integration and storage are coordinated and conducted at Masaryk University in Brno. EVA data are formally divided into EVA core databases (non-repeated observations) and ReSurveyEurope. There is some overlap between these two subsets. Some databases contain mostly non-repeated observations but also a small part of repeatedly

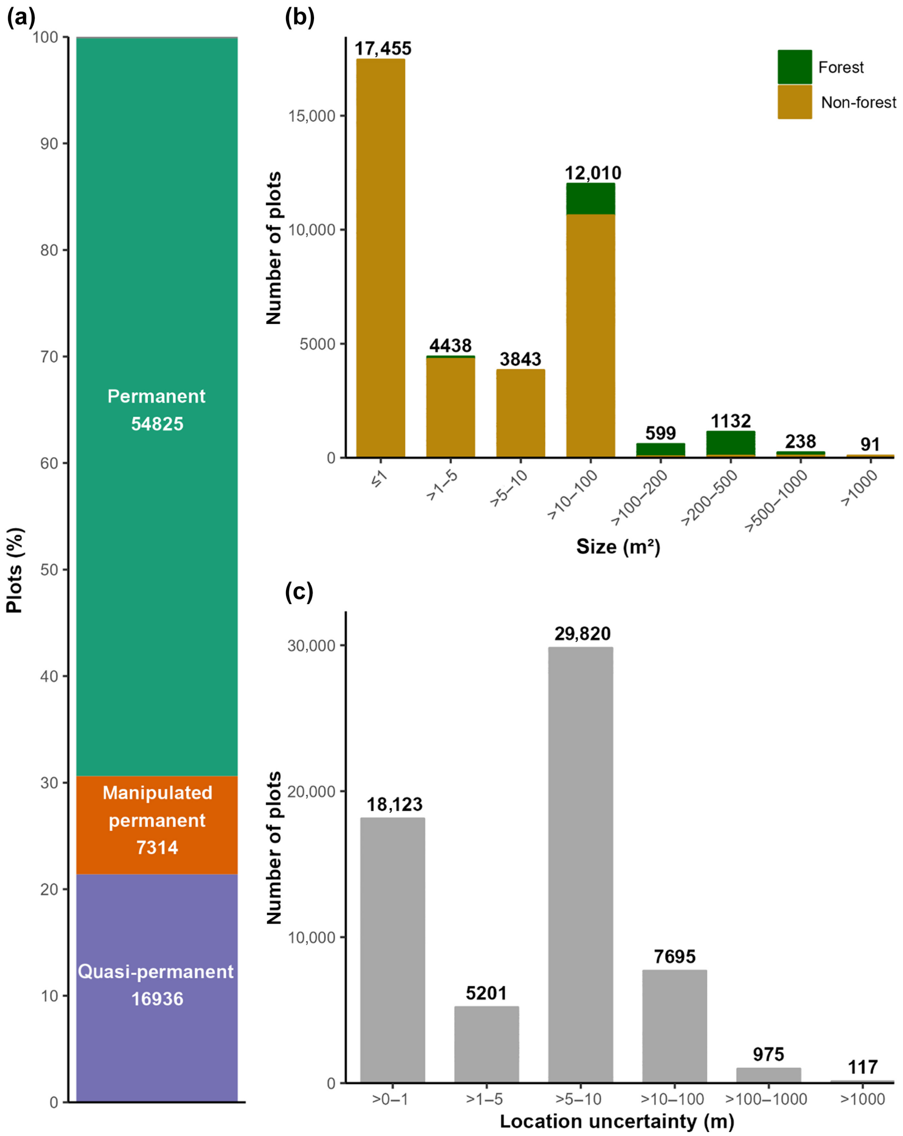

FIGURE 5 Key attributes of plots ($n = 79,190$) in ReSurveyEurope 1.0. (a) Percentage of resurveying methods, 115 plots with mixed methods of resurveying not shown (see text). (b) Plot size distribution (forests are given as a separate category as the plot sizes are usually larger). (c) Distribution of the plot-location uncertainty.

sampled plots included in ReSurveyEurope. Other databases (e.g., EU-GB-004 FloodplainMeadows, EU-GB-005 Scottish Coastal Survey or EU-GB-006 Scottish Vegetation Resurvey) include only repeated plots but from vegetation types and areas that are otherwise poorly represented in EVA, and therefore they are included both in EVA core databases and ReSurveyEurope. Both EVA core databases and ReSurveyEurope can be provided for projects using the same data request form, in which the project proponent indicates the data selection criteria.

ReSurveyEurope has established a number of cooperation agreements on data-sharing and possible joint analyses with other initiatives. These include, in particular: forestREplot, a database of forest resurvey plots in temperate zones (Verheyen et al., 2017; https://forestreplot.ugent.be/), the Global Observation Research Initiative in Alpine Environments (GLORIA) network (Pauli et al., 2015; https://www.gloria.ac.at/home), and the Long-term Vegetation Sampling (LOTVS; Sperandii et al., 2022; https://lotvs.csic.es/). Most European data sets from these global networks were integrated into ReSurveyEurope with the help of database managers and based on the consent of owners or providers of the individual original data sets. ReSurveyEurope also integrated the ReSurveyGermany database, developed in parallel with the development of ReSurveyEurope and using the same structure (Jandt, Bruelheide, Berg, et al., 2022). Further, a cooperation has been initiated with the Nutrient Status Initiative, which explores the role of nutrient availability on local plant diversity. A joint data call has been launched (http://euroveg.org/download/ReSurveyEurope_NutrientStatus_DataCall2021.pdf).

2.6 | Strengths, gaps, limitations, and pitfalls

ReSurveyEurope represents the first European data set of vegetation plots resurveyed at least once from a wide range of habitats. The original data were in most cases sampled for different purposes, by using a range of methodologies applied within the respective projects. Despite the harmonization of basic attributes upon integration of the data sets into ReSurveyEurope, there is substantial variation in many relevant features such as the accuracy of plot location, plot

TABLE 2 Overview on the 10 largest projects by number of plots included in ReSurveyEurope 1.0.

	Name	Country	Abundance information	Number of plots	Number of observations	Start year	End year
1	NOVANA: Danish National Monitoring data	DK	No	27,689	99,298	1988	2020
2	UK floodplain meadows long-term monitoring	UK	Yes	9316	25,867	1986	2020
3	Scottish Coastal Survey	UK	Yes	2539	5064	1976	2010
4	Bavarian grassland monitoring	DE	Yes	2509	5159	2002	2013
5	Monitoring Effectiveness of Habitat Conservation	CH	Yes	1961	3921	2011	2019
6	Mechanisms of coexistence in species-rich grasslands: Öland site	SE	Mixed	1920	11,220	1985	1997
7	DISEQALP	CH	Yes	1516	3032	1911	2015
8	Monitoring Effectiveness of Agrienvironmental Schemes	PL	Yes	1200	2376	2012	2019
9	Monitoring tidal marshes Zeeschelde	BE	Yes	819	819	1995	
10	Mechanisms of coexistence in species-rich grasslands	NL	No	750	4500	1985	1994

Note: The full list of projects is given in Appendix S3.

size, species abundance, recording of cryptogams, intervals between surveys and experimental manipulations.

Accordingly, it is crucial to clarify which data are suitable for specific analyses and to select—and possibly edit—data sets accordingly (Chytrý et al., 2014; Kapfer et al., 2017). Perhaps most importantly, it is necessary to know whether particular plots represent non-manipulated vegetation, or experimental plots after some manipulation (e.g., nutrient addition, experimental disturbance) or a successional series. If the aim is to study spontaneous vegetation change, it may be necessary to select only control plots from experiments. Even then, researchers have to be careful about selecting the suitable subset of data (e.g., in regularly mown areas, experimental manipulation can be abandonment with a mown plot as a control, whereas in abandoned areas, manipulation can be mowing with an abandoned plot as a control).

Further, individual studies should only compare changes over identical periods, in terms of both the interval between two samplings and between the starting or mean date. For example, two resurvey data sets, one collected between the 1960s and 1980s and the other collected between the 1990s and 2010s, can show different trends, although the interval length between the first and last survey is the same.

Resurveyed vegetation plots provide a valuable resource for the study of vegetation dynamics and their responses to environmental change in Europe. A particular strength of ReSurveyEurope is that empirical time-series data are provided for largely exact locations, which makes them ideal for calibrating or validating models. For example, the plot records might be linked to remote-sensing information on land-use change or change in habitat quality. They may also allow assessing the change in the conservation status of Annex 1 habitats of the EU Habitats Directive. At times of global climate and land-use change, ReSurveyEurope is an important archive of past vegetation composition. Such data can be used to inform conservation and management decisions, improve our understanding of ecosystem dynamics and help develop strategies to mitigate the impacts of climate change.

3 | PROPERTY RIGHTS, DATA USAGE AND ACCESS

ReSurveyEurope is devoted to an inclusive and transparent governance, collaboration, co-authorship, and data usage approach. ReSurveyEurope Data Property and Governance Rules (approved at the first ReSurveyEurope workshop in Vienna in April 2022; http://euroveg.org/download/ReSurveyEurope_Rules.pdf) are based on experience gathered in similar community-based initiatives, and basically are slightly modified rules of EVA. Thus, (i) data owners/contributors have control over the use of their data in any specific analysis (allowing them to opt-in for individual projects according to specific criteria such as the number of plots used in the analysis), and (ii) colleagues not directly involved in ReSurveyEurope can submit proposals for analyses, which will be subject to approval by the ReSurveyEurope Board consisting of the initiators of ReSurveyEurope and elected members of the EVA Coordinating Board (https://euroveg.org/resurvey/). The data request form is available at http://euroveg.org/download/eva-data-request-form.docx.

4 | FUTURE DEVELOPMENTS AND OUTLOOK

ReSurveyEurope is intended to be a living and dynamic resource, and thus, we expect that it will further grow and mature in the years to come. While a large number of existing resurvey data sets from Europe have already been included in ReSurveyEurope 1.0, we expect and hope that further data sets will become mobilized and contributed. In addition, several studies resurveying historic vegetation-plot data are underway or have been proposed. Thus, we expect that further data sets will be sampled and, hopefully, contributed to ReSurveyEurope. As regular data updates are foreseen, we highly encourage colleagues to provide additional data once they become available. Submission of data sets is possible at any time (see https://euroveg.org/resurvey/ for further information).

In addition, we believe that there is substantial potential for developing further collaborations or joint activities with colleagues and initiatives to expand the scope of ReSurveyEurope. This may include (i) expanding the geographic scope, (ii) expanding the taxonomic scope, and (iii) standardizing and expanding metadata content in ReSurveyEurope.

To conclude, the ReSurveyEurope consortium is open and interested in discussing suggestions for extending the initiative and thus encourages colleagues to bring any such ideas forward. As ReSurveyEurope data have become ready for use, several projects have already been initiated, and further proposals for analyses can be submitted to the coordinators.

AUTHOR CONTRIBUTIONS

Franz Essl, Ilona Knollová, Milan Chytrý, Helge Bruelheide, and Stefan Dullinger conceived the original idea for ReSurveyEurope, which was jointly developed by a core team also including Bernd Lenzner, Ilona Knollová, Florian Jansen, Ute Jandt and Stephan Hennekens. Stephan Hennekens, Milan Chytrý, Helge Bruelheide, Ute Jandt and Ilona Knollová designed the database structure. Ilona Knollová compiled the database with help from Stephan Hennekens. Ilona Knollová, Ekin Kaplan, Michael Glaser and Bernd Lenzner created the figures and tables for this article. Franz Essl led the writing of the manuscript with substantial contributions of Milan Chytrý, Helge Bruelheide, Stefan Dullinger, Ute Jandt, and Ilona Knollová. All other authors (ordered alphabetically) contributed plot data and commented on an advanced version of the manuscript. All authors agreed with the final manuscript.

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DATA AVAILABILITY STATEMENT

The data used in this paper are derived from the ReSurveyEurope 1.0 database (accession date: 1 May 2023). They can be requested from ReSurveyEurope following the Data Property and Governance Rules of ReSurveyEurope available at https://euroveg.org/resurvey/.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Appendix S1. Definitions of the fields in the ReSurveyEurope 1.0 database.

Appendix S2. Overview of the distribution of plots and observations in ReSurveyEurope across countries.

Appendix S3. Overview of all datasets included in ReSurveyEurope 1.0.

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