RECOMMENDATION ON OECM ASSESSMENT: CONSIDER INCLUDING THE LEVEL OF FRAGMENTATION OF THE LARGER TERRITORIAL UNIT

Stéphane Rivière[1*] and Joseba Garmendia Altuna[1]

*Corresponding author: stephane.riviere@gmail.com

[1] Fundación Delegación de Paisaia European Landscape Foundation, Altzo-Muino 73, 20268 Altzo (Gipuzkoa), Spain

ABSTRACT

To meet the objectives of the Global Biodiversity Framework (GBF) Target 3 to effectively conserve and manage at least 30 per cent of terrestrial, inland water, coastal and marine areas by 2030, the number of high-quality sites that are important for biodiversity will need to increase. Other Effective Area-based Conservation Measures (OECMs) are increasingly recognised globally and are expected to play a significant role towards meeting GBF Target 3. Following a decision adopted by the Conference of the Parties to the Convention on Biological Diversity (CBD) in 2018, the assessment of new OECM candidate sites can be achieved by applying an IUCN site-level tool published in 2023 based on eight criteria. The criteria do not specify a minimum size for OECM candidate sites. Here we suggest that the CBD Parties consider a metric on the fragmentation level of an OECM candidate site's larger territorial unit to help define the minimum size of this site, and we apply the metric to a case study in the EU. We believe this would be a realistic and practical approach and would give incentives for CBD Parties to assess potential new OECM sites even in highly fragmented territorial units.

Keywords: effective mesh size method; Nomenclature of Territorial Units for Statistics (NUTS3); unfragmented functional units for *in-situ* conservation; Global Biodiversity Framework (GBF) Target 3

RATIONALE

Areas outside protected areas may contribute to the effective in-situ conservation of biodiversity, and for this reason the Convention on Biological Diversity's (CBD) 2011–2020 Strategic Plan recognised OECMs as a way to deliver effective and long-term *in-situ* conservation of biodiversity (CBD, 2010). OECMs are expected to contribute to the achievement of several targets of the 2030 Global Biodiversity Framework (GBF), especially Target 3 (Jonas et al., 2024a), particularly in the context of emerging landscape approaches to conservation (CBD, 2020).

Since 2018, some Parties to the CBD have designated OECMs, and, as of November 2024, a total of 6,484 marine, inland water or terrestrial OECM records from 15 countries have been globally reported (UNEP-WCMC & IUCN, 2024). At the national level, a country may recognise an individual site which qualifies as an OECM after going through an assessment process which complies with the CBD's definition (CBD, 2018) and meets a published set of criteria (Jonas et al., 2023; Jonas et al., 2024b). In this IUCN site-level tool, the minimum size of an OECM site was not specified, although it was explained that "a site's size and configuration should, as far as possible, be appropriate for managing and maintaining its important biodiversity values". Previously, IUCN-WCPA (2019) outlined that OECMs "should be of sufficient size to achieve the long-term *in-situ* conservation of biodiversity, including all ecosystems, habitats and species communities for which the site is important. 'Sufficient size' is highly contextual and is dependent on the ecological requirements for the persistence of the relevant species and ecosystems."

To make progress towards GBF Target 3 and advance the OECM agenda, we propose that an additional metric should be considered by the CBD Parties to determine the

General view of the Usabelartza wetland complex in Andoain (Gipuzkoa), dominated by transitional peat bogs and reed beds. This wetland is included in group III (unprotected) of the wetlands of the PTS for wetlands (site code, B1G1-05). Due to its characteristics, size and environmental values, it would be one of the candidates to become an OECM site according to our recommendation
© Joseba Garmendia Altuna

Table 1. The five main categories of metrics for level of landscape fragmentation (Betts, 2000).

Main categories of metrics for level of landscape fragmentation	Description of landscape metrics	References
Habitat area/ landscape composition metric	Area of different habitat types	Betts (2000)
	Number of categories in a map and the area associated with each, proportion of each class relative to the entire map, and diversity	Gustafson (1998)
Patch size metric	Patch size frequency distributions	Betts (1999)
	Patch size standard deviation, variance and median	McGarigal and McComb (1995); Baskent and Jordan (1995)
Edge metric	Edge effect	Laurance and Yensen (1991); Didham and Ewers (2012)
Landscape configuration metric	Nearest neighbour statistics	McGarigal and McComb (1995); Baskent and Jordan (1995); Hargis et al. (1998)
	Proximity index to measure patch isolation	Hargis et al. (1998)
	Isolation: measure of landscape configuration	Baskent and Jordan (1995)
	Contagion to measure landscape configuration	Li and Reynolds (1993)
	Network connectivity	Forman (1998)
	Effective mesh size method (m_{eff})	Jaeger (2000)
	Lacunarity analysis of landscape patterns	With and King (1999)
Patch shape metric	Patch elongation	Forman (1998)

minimum size of an OECM candidate site. We propose that its value should be relative to the level of fragmentation of the larger territorial unit where this site is located, as, *de facto*, plots of land are likely to be on average smaller within highly fragmented territorial units. The close relationship between the minimum size of a conservation area and the level of fragmentation of its larger territorial unit is rooted in the notion of the ability of two individuals of an animal species to find each other, therefore allowing interactions (Jaeger, 2000). This is essential for the long-term *in-situ* conservation of biodiversity (IUCN-WCPA, 2019). Regarding metrics for level of landscape fragmentation, five main categories have been described (Betts, 2000) and are summarised in Table 1.

CASE STUDY AND DISCUSSION

We considered a territorial unit according to the European 'Nomenclature of Territorial Units for statistics' (NUTS) – a hierarchical system divided into three levels of territorial units (EUROSTAT, 2024). Among the metrics in Table 1, we chose as an example the 'effective mesh size method' (m_{eff}) (Jaeger, 2000) which is independent of the size of the territorial unit and can be compared between units of different sizes. A single mesh represents the minimum level of unfragmented area and is defined as an "area that is accessible when beginning to move from a randomly chosen point inside a landscape without encountering anthropogenic barriers such as transport routes or built-up areas" (EEA, 2022). Data on the average number of meshes per km² in each NUTS3 was publicly available (EEA, 2018).

In Table 2, we selected three countries with different fragmentation levels (EEA, 2022): Malta (highest fragmented EU country), Finland (lowest fragmented EU country) and Spain (mid-level fragmented EU country). Then, for Malta we selected a NUTS3 with the highest number of meshes per km², for Finland – a NUTS3 with the lowest number of meshes, and for Spain – a NUTS3 with a medium number of meshes (EEA, 2018). We

Oblong-leaved sundew (*Drosera intermedia* Hayne): Endangered on the Basque Country Red List and as Near Threatened at European level. The most significant populations in Gipuzkoa are found in wetlands in protected areas, some of them being very close to unprotected wetlands which could potentially provide extended habitats for the survival of this species. Therefore, the correct management of these unprotected wetlands would increase the probability of survival of this species at a regional level © Joseba Garmendia Altuna

calculated the average area of a single mesh in each of these NUTS3 and rounded it up to 10^{-2}.

Still using m_{eff} as an example of the metrics listed in Table 1, the average area of a single mesh may be calculated

Table 2. The average area of a single mesh in three different EU NUTS3, as of November 2024

EU Country	NUTS3 code	NUTS3 name	Number of meshes per km²	Average area (in ha) of a single mesh	Average area rounded up to 10^{-2} (in ha) of a single mesh
Malta	MT001	Malta	17,965	0.0056	0.01
Spain	ES212	Gipuzkoa	2,261	0.0442	0.05
Finland	FI1D7	Lappi	17	5.8823	5.89

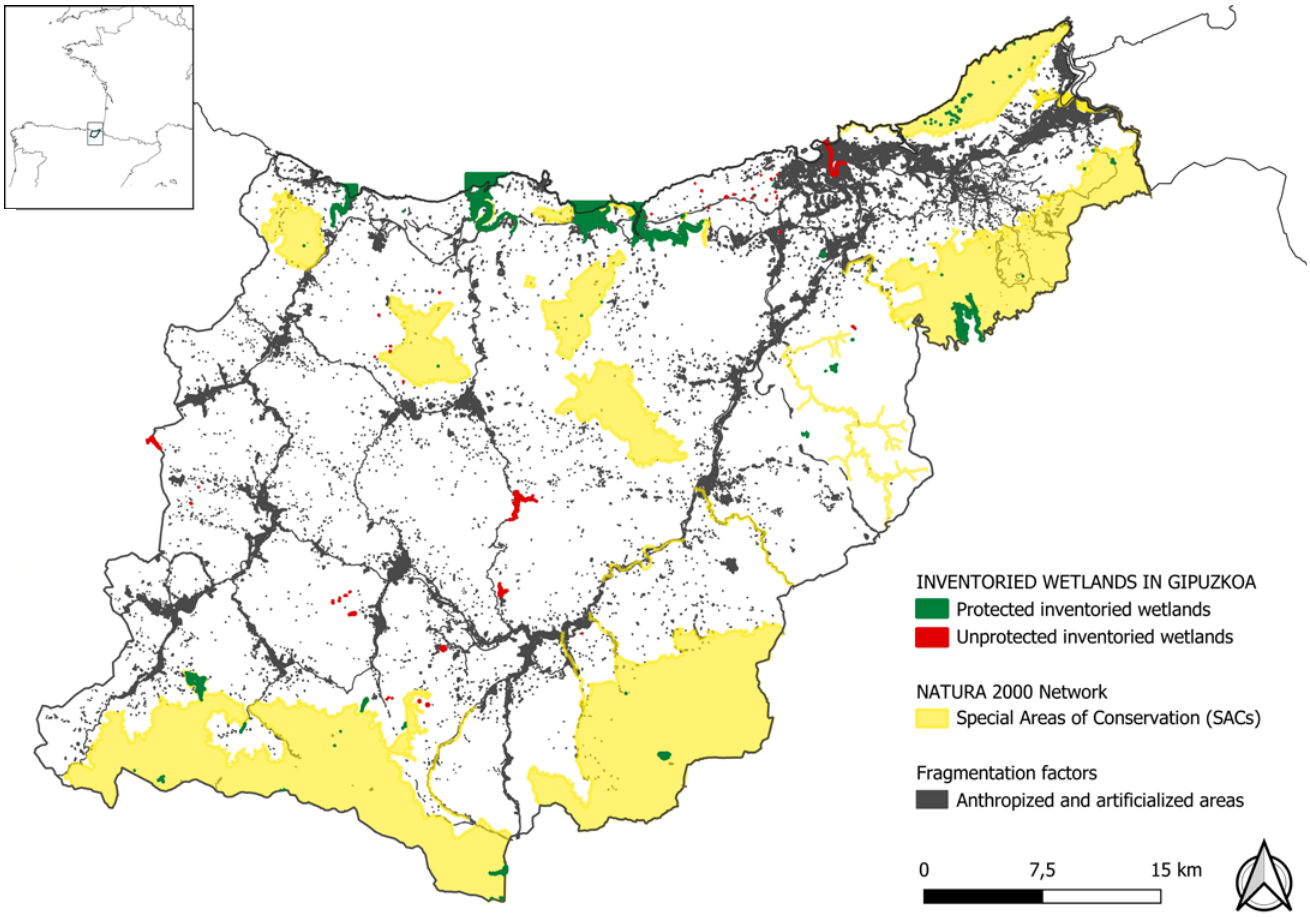

Figure 1. Map of the distribution of inventoried wetlands in Gipuzkoa and their relationship with protected areas and fragmentation factors. Anthropic barriers in Gipuzkoa favour the fragmentation of wetland ecosystems by dividing the territory and hindering connectivity between wetlands.

for worldwide territorial units, where fragmented land datasets based on m_{eff} values are available at global scale (see for example Romanillos et al., 2024).

Metrics based on the fragmentation level of an OECM candidate site's larger territorial unit are important to consider where large ecosystems have already been transformed, as habitat fragments can deliver *in-situ* conservation. From Table 2, if the eight criteria of the IUCN site-level tool are fulfilled for an OECM candidate site (e.g. ES212 – Gipuzkoa, Figure 1), an additional metric such as the average area of a single mesh for that particular NUTS3 (in this case: 0.05 ha) could be considered to set the minimum size of an OECM candidate site. In this same territorial unit of Gipuzkoa, 48 mini-wetlands are located outside protected areas and listed as "unprotected inventoried wetlands lacking management and regulatory instruments" (Basque Country, 2024). These mini-wetlands are essential for amphibian and aquatic species which require unfragmented functional units. Twenty-three (23) of these mini-wetlands have a size of at least 0.05 ha (i.e. 47.91%) and could become OECM candidate sites after a positive screening

Emperor dragonfly (*Anax imperator* Leach, 1815): largest species of hawker dragonfly in Europe and widely distributed. Although it is not considered endangered, it is a good indicator of the presence and quality of small wetlands in Gipuzkoa, essential for the conservation of the biodiversity associated with them © Iñaki Mezquita Aranburu

Common midwife toad (*Alytes obstetricans* Laurenti, 1768): species of amphibian endemic to Europe (listed on the Appendix II of the Berne Convention and on Annex IV of the EU Natural Habitats Directive). Although it has a wide distribution and tolerates anthropization well, the fragmentation of the habitat affects the viability of its populations at a local and regional level. The availability of small wetlands is essential for the development of its life cycle © Iñaki Sanz-Azkue

for the criteria of the IUCN site-level tool. This number would rise to 42 (i.e. 87.5%) if adjacent mini-wetlands smaller than 0.05 ha are aggregated into a mesh of at least 0.05 ha. Consequently, if unprotected and unfragmented (i.e. at least the size of a single mesh) functional units become OECM candidate sites following the OECM criteria screening, their governance and management may be improved to deliver *in-situ* conservation objectives.

CONCLUSION

For OECMs, the effective mesh size method represents an example of a metric that can determine the size of unfragmented functional units for *in-situ* conservation, along with other methodologies (Table 1). Applying this metric together with the IUCN site-level tool could help designate new OECM candidate sites even in highly fragmented territorial units.

For the identification of OECM sites, we recommend CBD Parties consider a metric of the "fragmentation level of the larger territorial unit" to be used in conjunction with the IUCN site-level identification tool. As a prerequisite, an analysis of each metric method (e.g. effective mesh size vs. others) should be performed. We believe that failing to apply this metric may prevent countries with highly fragmented territorial units from ever designating OECM candidate sites. As a result, this may have an adverse effect on (i) *in-situ* conservation as the governance and management of such functional units would not benefit from the OECM designation and (ii) advancing both the OECM agenda and GBF Target 3 worldwide.

ACKNOWLEDGEMENTS

The authors would like to thank **Ion Garin-Barrio** (Director of the Herpetology Department of the Aranzadi Science Society) for his contributions and comments; **Iñaki Sanz-Azkue** and **Manuel Océn** (members of the Herpetology Department of the Aranzadi Science Society) as well as **Iñaki Mezquita Aranburu** (member of the Entomology Department of the Aranzadi Science Society) for providing the photos used in this article.

ABOUT THE AUTHORS

Stéphane Rivière is a plant biologist and forest ecologist by training. He has experience in the management and the coordination of projects around seed *ex-situ* conservation and biodiversity information

analysis in Europe, in the restoration of degraded landscapes in Europe and Africa, and in the sustainable management of traditional and cultural landscapes in Europe. ORCID: 0000-0001-6619-3333

Joseba Garmendia Altuna is a biologist specialising in botany. He leads conservation and research projects on species and habitats of interest at regional and international levels. For almost two decades, he has been an active member of a leading scientific society and was on the board of the largest flora conservation society in Spain. He is especially interested in making traditional land-uses compatible with the conservation of biodiversity. ORCID: 0000-0001-5469-2207

REFERENCES

Baskent, E. & Jordan, G. (1995). Characterising spatial structure of forest landscapes. *Canadian Journal of Forest Research*, 25, 1830–1849. https://doi.org/10.1139/x95-198

Basque Country (2024). Inventory of wetlands in Gipuzkoa, Plan Territorial Sectorial (PTS) de Zonas Húmedas. Group III: "unprotected inventoried wetlands lacking management and regulatory instruments". https://www.euskadi.eus/plan-territorial-sectorial-pts-de-zonas-humedas/web01-a2ingdib/es/

Betts, M. (1999). *A landscape ecological approach to conserving the Appalachian Hardwood Forest*. Fredericton: Nature Trust of New Brunswick. Pp. 95.

Betts, M. (2000). *In search of ecological relevancy: A review of landscape fragmentation metrics and their application for the Fundy Model Forest*. Greater Fundy Ecosystem Research Group (GFERG) https://fundy.ext.unb.ca/metrics.htm#2.0

CBD (Convention on Biological Diversity) (2010). *Strategic Plan on Biodiversity 2011–2020*. https://www.cbd.int/sp/

CBD (Convention on Biological Diversity) (2018). *Decision adopted by the Conference of the Parties to the Convention on Biological Diversity 14/8. Protected areas and other effective area-based conservation measures.* https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-08-en.pdf

CBD (Convention on Biological Diversity) (2020). *Update of the zero draft of the post-2020 Global Biodiversity Framework.* https://www.cbd.int/doc/c/3064/749a/0f65ac7f9def86707f4eaefa/post2020-prep-02-01-en.pdf

Didham, R. K. & Ewers, R. M. (2012). Predicting the impacts of edge effects in fragmented habitats: Laurance and Yensen's core area model revisited. *Biological Conservation*, 155: 104–110. https://doi.org/10.1016/j.biocon.2012.06.019

EEA (European Environment Agency) (2018). *Landscape fragmentation in Europe* https://www.eea.europa.eu/data-and-maps/data/data-viewers/landscape-fragmentation-in-europe

EEA (European Environment Agency) (2022). *Landscape fragmentation pressure in Europe* https://www.eea.europa.eu/en/analysis/indicators/landscape-fragmentation-pressure-in-europe?activeAccordion=546a7c35-9188-4d23-94ee-005d97c26f2b

EUROSTAT (2024). *Territorial units for statistics (NUTS)* https://ec.europa.eu/eurostat/web/gisco/geodata/statistical-units/territorial-units-statistics

Forman, R. T. T. (1998). *Land mosaics: The ecology of landscapes and regions.* Cambridge: Cambridge University Press.

Gustafson, E. (1998). Quantifying landscape spatial pattern: What is the state of the art? *Ecosystems,* 1: 143–156. https://doi.org/10.1007/s100219900011

Hargis, C., Bissonette, J. & David, J. (1998). The behaviour of landscape metrics commonly used in the study of habitat fragmentation. *Landscape Ecology*, 13, 167–186. https://doi.org/10.1023/A:1007965018633

IUCN-WCPA (2019). IUCN-WCPA Task Force on OECMs. *Recognising and reporting other effective area-based conservation measures*. Gland, Switzerland: IUCN. ISBN: 978-2-8317-2025-8. https://doi.org/10.2305/IUCN.CH.2019.PATRS.3.en

Jaeger, J. A. G. (2000). Landscape division, splitting index, and effective mesh size: New measures of landscape fragmentation. *Landscape Ecology,* 15, 115–130. https://doi.org/10.1023/A:1008129329289

Jonas, H. D., Bingham, H. C., Bennett, N. J., Woodley, S., Zlatanova, R., Howland, E., Belle, E., Upton, J., Gottlieb, B., Kamath, V., Lessmann, J., Delli, G., Dubois, G., Ahmadia, G., Claudet, J., Cook, C., Deza, J., Grorud-Colvert, K., Gurney, G., Lemieux, C. J. & Ruiz, L. (2024a). Global status and emerging contribution of other effective area-based conservation measures (OECMs) towards the '30x30' biodiversity Target 3. *Frontiers in Conservation Science*, 5, 1447434. https://doi.org/10.3389/fcosc.2024.1447434. https://doi.org/10.3389/fcosc.2024.1447434

Jonas, H. D., MacKinnon, K., Marnewick, D. & Wood, P. (2023). *Site-level tool for identifying other effective area-based conservation measures (OECMs)*. First edition. IUCN WCPA Technical Report Series No. 6. Gland, Switzerland: IUCN. https://doi.org/10.2305/WZJH1425

Jonas, H. D., Wood, P. & Woodley, S., Volume Editors (2024b). Guidance on other effective area-based conservation measures (OECMs). IUCN WCPA Good Practice Series, No.36. Gland, Switzerland: IUCN. https://doi.org/10.2305/LAAW4624

Laurance, W. F. & Yensen, E. (1991). Predicting the impacts of edge effects in fragmented habitats. *Biological Conservation*, 55, 77–92. https://doi.org/10.1016/0006-3207(91)90006-U

Li, H. & Reynolds, J. F. (1993). A new contagion index to quantify spatial patterns of landscapes. *Landscape Ecology*, 7, 101–110. https://doi.org/10.1007/BF00125347

McGarigal, K. & McComb, W. (1995). Relationships between landscape structure and breeding birds in the Oregon coast range. *Ecological Monographs*, 65(3), 235–260. https://doi.org/10.2307/2937059

Romanillos, G., Robazza, G. & Lovato, F. (2024). A fragmented world: Mapping the global extent of Anthropogenic Landscape Fragmentation. *Journal of Maps*, 20(1), 2307539. https://doi.org/10.1080/17445647.2024.2307539

UNEP-WCMC & IUCN (2024). *Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM)* [Online], November 2024, Cambridge, UK: UNEP-WCMC and IUCN. Available at: https://www.protectedplanet.net/en/resources/november-2024-update-of-the-wdpa-and-wd-oecm

With, K. & King, A. (1999). Dispersal success on fractal landscapes: A consequence of lacunarity thresholds. *Landscape Ecology*, 14, 73–82. https://doi.org/10.1023/A:1008030215600

RESUMEN

Para cumplir los objetivos de la Meta 3 del Marco Mundial para la Biodiversidad (GBF) de conservar y gestionar eficazmente al menos el 30% de las zonas terrestres, de aguas interiores, costeras y marinas para 2030, será necesario aumentar el número de lugares de alta calidad que son importantes para la biodiversidad. Las Otras Medidas Eficaces de Conservación basadas en Áreas (OECM, por sus siglas en inglés) son cada vez más reconocidas en todo el mundo y se espera que desempeñen un papel significativo en el cumplimiento del Objetivo 3 del GBF. Tras una decisión adoptada por la Conferencia de las Partes en el Convenio sobre la Diversidad Biológica (CDB) en 2018, la evaluación de nuevos sitios candidatos a OECM puede lograrse aplicando una herramienta de la UICN a nivel de sitio publicada en 2023 basada en ocho criterios. Los criterios no especifican un tamaño mínimo para los sitios candidatos OECM. Aquí sugerimos que las Partes del CDB consideren una métrica sobre el nivel de fragmentación de la unidad territorial más grande de un sitio candidato a la OECM para ayudar a definir el tamaño mínimo de este sitio, y aplicamos la métrica a un estudio de caso en la UE. Creemos que éste sería un enfoque realista y práctico y que incentivaría a las Partes en el CDB a evaluar posibles nuevos sitios OECM incluso en unidades territoriales muy fragmentadas.

RÉSUMÉ

Pour atteindre l'objectif 3 du cadre mondial pour la biodiversité (CMB), à savoir conserver et gérer efficacement au moins 30 % des zones terrestres, aquatiques intérieures, côtières et marines d'ici à 2030, il faudra augmenter le nombre de sites de haute qualité importants pour la biodiversité. Les autres mesures de conservation efficaces par zone (OECM) sont de plus en plus reconnues au niveau mondial et devraient jouer un rôle important dans la réalisation de l'objectif 3 du GBF. À la suite d'une décision adoptée par la Conférence des parties à la Convention sur la diversité biologique (CDB) en 2018, l'évaluation de nouveaux sites candidats aux OECM peut être réalisée en appliquant un outil de l'UICN au niveau du site, publié en 2023 et basé sur huit critères. Les critères ne spécifient pas de taille minimale pour les sites candidats à l'OECM. Nous suggérons ici que les Parties à la CDB considèrent une métrique sur le niveau de fragmentation de l'unité territoriale plus large d'un site candidat à l'OECM pour aider à définir la taille minimale de ce site, et nous appliquons la métrique à une étude de cas dans l'UE. Nous pensons qu'il s'agit d'une approche réaliste et pratique qui inciterait les parties à la CDB à évaluer de nouveaux sites OECM potentiels, même dans des unités territoriales très fragmentées.