

Assessment of habitat quality for the wisent in the context of Ukraine's Natural Zonation

Vitaliy Smagol¹, Pavlo Khoyetsky²

¹ Schmalhausen Institute of Zoology of National Academy of Sciences of Ukraine, Kyiv, Ukraine

² National Forestry University of Ukraine, Lviv, Ukraine

Abstract: Science-based approaches have been developed to assess the quality and suitability of habitats for the wisent in Ukraine. The habitat-rating methodology considers the forage productivity and protective properties of biotopes, which are classified into five site-quality classes. Original habitat-rating tables are presented for three natural zones. For the Forest and Forest-Steppe zones of Ukraine, the classification is based on habitat typology, taking into account forest species composition, forest stand age, and the presence of advance growth (young growth) and undergrowth. The highest site-quality classes (I and II) are represented by mature broadleaved and mixed forests with a rich understory, dry meadows, and agricultural land with a dense network of shelterbelts. In the Mountain-Carpathian zone, altitudinal zonation and the associated diversity of woody vegetation are the key criteria for site-quality assessment. The most suitable habitats (site-quality class I) in the Carpathians are oak forests and mixed spruce-beech-fir forests in the foothills (at elevations of 200–600 m above sea level), as well as mountain meadows. The proposed methodology provides a practical basis for selecting promising sites for wisent re-acclimatization.

Key words: wisent, habitat, quality assessment, Carpathians, Forest zone, Forest-Steppe zone

Introduction

The information for this article has been collected over a period of 20 years in the Forest, Forest-Steppe, and Ukrainian Carpathian Mountain Natural Zone, as documented in a number of scientific publications (Derkach *et al.* 2023; Khoyetsky 2002; 2003; 2007; 2009; 2010; 2012; Sagaidak *et al.* 2006; Sharapa *et al.* 2010; Smagol *et al.* 2011; Smagol, Gavris 2013; Smagol, Cherevatov 2014; Smagol 2019; Smagol, Slivinska 2022; Smagol *et al.* 2022). Currently, wisent inhabit the following areas in Ukraine: the National Nature Park (NNP) “Zalissia” (Forest Zone), the Forestry Enterprise (FE) “Kivertsivske” (Forest Zone), the Forestry Enterprise “Brodivske” (Forest Zone),

the Forestry Enterprise “Vinnytske” (Forest-Steppe Zone), the Forestry Enterprise “Konotopske” (Forest-Steppe Zone), the National Nature Park “Skolivski Beskydy” (Mountain-Carpathian Zone), and the adjacent territory of the Forestry Enterprises “Berehometske” and “Chernivetske” (Mountain-Carpathian Zone) (Fig. 1). In some areas, wisent are regularly present throughout the year; other areas become priority habitats during certain seasons; still others are visited by wisent only occasionally, either year-round or during specific periods.

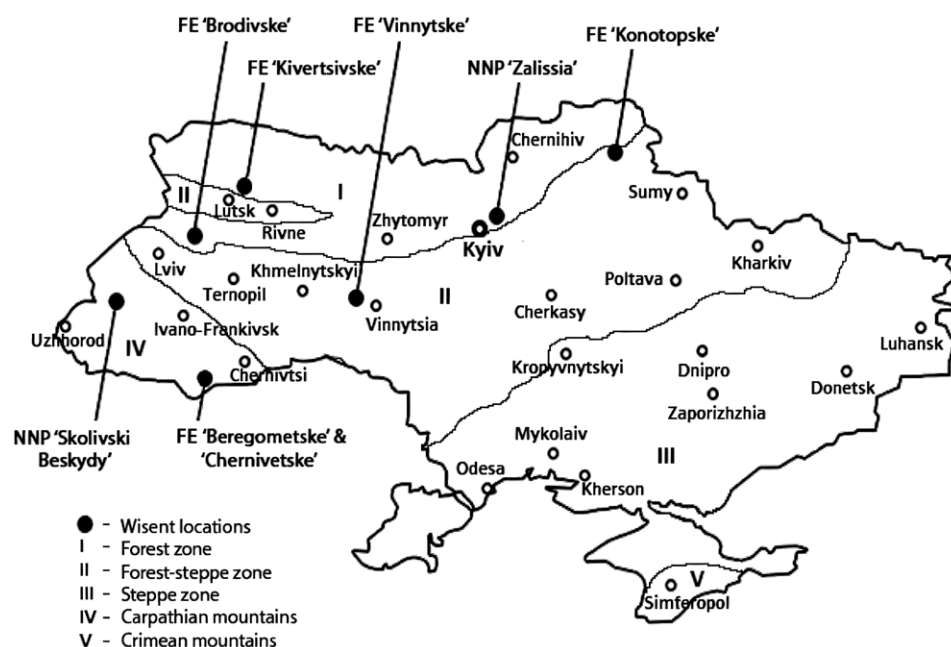


Fig. 1. The deployment of wisent groups on the territory of Ukraine

Depending on this, we can determine the priority of a particular section of forest, meadow, or field for this species. The attractiveness of a habitat type can be artificially increased through winter feeding, planting forage plants, creating artificial reservoirs, preventive sanitary measures, and intensifying the fight against poaching. At the same time, logging, as well as visits by tourists and hunters, disturb the animals, thereby reducing the attractiveness (and, consequently, the quality) of these habitats.

In principle, the aforementioned disturbance factors are relatively familiar to wisents and, in the absence of a direct threat, they do not provoke panic responses followed by displacement of the animals. An exception was the impact of Russian military aggression in the spring of 2022, when mis-

sile strikes, landmine contamination, and the movement of large numbers of civilians and military equipment in northern Ukraine resulted in animal mortality and displacement into atypical biotopes within the territory of the National Nature Park “Zalissia” and the Forestry Enterprise “Konotopske” (Perzanowski, Smagol 2022; Smagol *et al.* 2023). However, this factor had a temporary effect, and by 2023 the wisents had returned to their customary habitats.

Research methods

In Ukraine, habitat quality for most ungulate species is assessed in accordance with the “Guidelines for the Management of Hunting Grounds” (2002). Unfortunately, there is no separate regulatory document governing habitat assessment within the nature reserve fund. This is also true for species such as the wisent, which is not classified as a game species.

Nevertheless, the general approach to determining habitat quality is based on two main indicators: forage productivity and protective properties (Guidelines for the Management of Hunting Grounds, 2002). Assessing habitats for a particular animal species is referred to as site class determination, and based on their productivity, habitats are classified into five site (quality) classes:

- **Site class I** includes areas characterized by high-quality forage and protective properties, and they are populated at high densities. Such habitats do not require artificial measures aimed at their improvement.
- **Site class II** includes habitats of above-average quality, whose productivity can reach optimal levels with minimal improvement measures (occasional seasonal supplemental feeding, reduction of forestry and recreational activities, etc.).
- **Site class III** comprises habitats of medium quality whose productivity has been depleted due to irrational use but can be restored through intensified measures (regular year-round supplementary feeding, preventive sanitary actions, prohibition of any economic activities, etc.).
- **Site class IV** comprises habitats of below-average quality with low suitability for the existence of a given animal species. Measures aimed at improving habitat productivity in this case require excessively large-scale interventions and a very long time span, making their feasibility questionable. Such habitats are occupied by a particular species at very low population densities.
- **Site class V** represents habitats of poor quality, where a given animal species occurs only sporadically. In fact, such habitats are unsuitable for the existence of the species.

The basis for determining site classes of habitats for game fauna in the Forest and Forest-Steppe natural zones is their typology. The main criteria used to distinguish habitat types are presented below (Guidelines for the Management of Hunting Grounds, 2002):

- **Coniferous forest.** This type includes pure coniferous stands of varying ages or stands with a minor admixture (up to 20%) of broad-leaved species. The undergrowth is sparse and often entirely absent. The herbaceous layer has low species diversity. Small shrubs occur sporadically.
- **Broad-leaved forest.** This type includes stands of broad-leaved tree species, sometimes with a mixture of conifers (up to 20%). The undergrowth and herbaceous layer are diverse, denser at forest edges and sparse under the forest canopy.
- **Mixed forest.** This category includes coniferous-broad-leaved stands in which subsidiary tree species constitute at least 30% of the composition. Mixed forests are characterized by considerable diversity in undergrowth and herbaceous vegetation.
- **Arable lands.** This category includes all lands used for the cultivation of agricultural crops: vineyards, orchards, vegetable gardens, fields, melon fields, and similar areas.
- **Meadows.** This category includes lands where natural or sown grasses grow and are used as hayfields or pastures.
- **Shrubbery.** Continuous or sparse thickets of various shrub species.
- **Wetlands.** This type comprises eutrophic, oligotrophic, and transitional bogs covered with reed, willow, and sedge vegetation.
- **Ravines.** This type includes ravines, gullies, and other local synclinal formations.

In addition, forest land types are classified into the following subtypes:

- young stands (up to 20 years),
 - middle-aged stands (21 to 60 years),
 - mature stands (over 61 years),
- and the following types:
- forest stands without young growth (saplings) and undergrowth,
 - forest stands with young growth (saplings) and undergrowth present.

Results

Taking into account the aforementioned characteristics, we developed tables for assessing habitats for wisent in the Forest (Tabl. 1) and Forest-Steppe (Tabl. 2) natural zones of Ukraine.

Table 1. Classification of wisent habitats in the Forest natural zone

Habitat type	Subtype, habitat type	Site class
1. Coniferous forest (pine)	1.1. Young stands	5
	1.2. Middle-aged stands	
	1.2.1. Forest stands with young growth and undergrowth	4
	1.2.2. Forest stands without young growth and undergrowth	4
	1.3. Mature stands	
	1.3.1. Forest stands with young growth and undergrowth	3
	1.3.2. Forest stands without young growth and undergrowth	3
	1.4. Sparse forests	4
2. Coniferous forest (spruce)	2.1. Young stands	5
	2.2. Middle-aged stands	4
	2.3. Mature stands	5
3. Broad-leaved forest	3.1. Young stands	4
	3.2. Middle-aged stands	
	3.2.1. Forest stands with young growth and undergrowth	3
	3.2.2. Forest stands without young growth and undergrowth	3
	3.3. Mature stands	
	3.3.1. Forest stands with young growth and undergrowth	1
	3.3.2. Forest stands without young growth and undergrowth	2
	3.4. Sparse forests	2
4. Mixed forest	4.1. Young stands	4
	4.2. Middle-aged stands	
	4.2.1. Forest stands with young growth and undergrowth	3
	4.2.2. Forest stands without young growth and undergrowth	3
	4.3. Mature stands	
	4.3.1. Forest stands with young growth and undergrowth	1
	4.3.2. Forest stands without young growth and undergrowth	2
	4.4. Sparse forests	2
5. Shrubbery		3
6. Arable lands	6.1. Arable lands, orchards, and vineyards	4
7. Meadows	7.1. Dryland habitats	1
	7.2. Waterlogged	2
8. Wetlands	8.1. Clear (with up to 20% shrub cover)	5
	8.2. Overgrown (with more than 20% shrub cover)	4

Table 2. Classification of wisent habitats in the Forest-Steppe natural zone

Habitat type	Subtype, habitat type	Site class
1. Coniferous forest (pine)	1.1. Young stands	5
	1.2. Middle-aged stands	
	1.2.1. Forest stands with young growth and undergrowth	4
	1.2.2. Forest stands without young growth and undergrowth	4
	1.3. Mature stands	
	1.3.1. Forest stands with young growth and undergrowth	4
	1.3.2. Forest stands without young growth and undergrowth	4
	1.4. Sparse forests	4
2. Broad-leaved forest	2.1. Young stands	4
	2.2. Middle-aged stands	
	2.2.1. Forest stands with young growth and undergrowth	3
	2.2.2. Forest stands without young growth and undergrowth	3
	2.3. Mature stands	
	2.3.1. Forest stands with young growth and undergrowth	1
	2.3.2. Forest stands without young growth and undergrowth	2
	2.4. Sparse forests	2
3. Mixed forest	3.1. Young stands	4
	3.2. Middle-aged stands	
	3.2.1. Forest stands with young growth and undergrowth	3
	3.2.2. Forest stands without young growth and undergrowth	3
	3.3. Mature stands	
	3.3.1. Forest stands with young growth and undergrowth	1
	3.3.2. Forest stands without young growth and undergrowth	2
	3.4. Sparse forests	2
4. Shrubbery		3
5. Arable lands	5.1. Arable lands, orchards, and vineyards	3
	5.2. Agricultural crops with a dense network of forest shelterbelts	1
	5.2. Agricultural crops with a sparse network of forest shelterbelts	2
6. Meadows	6.1. Dryland habitats	1
	6.2. Waterlogged	2
7. Wetland	7.1. Clear (with up to 20% shrub cover)	5
	7.2. Overgrown (with more than 20% shrub cover)	5
8. Ravines	9.1. Clear	3
	9.2. Overgrown with woody and shrub vegetation.	2

In the Carpathian region, the distribution of wisent is governed primarily by altitudinal zonation, which in turn reflects the species diversity of woody vegetation (Holubets 2008; Hrodzynsky 1993). Based on this, we propose a table for the Carpathian region that differs in content from the previous two.

Table 3. Classification of wisent habitats in the Ukrainian Carpathians Mountain natural zone

Habitat type	Forest stands up to 20 years of age	Forest stands aged 21–60 years	Forest stands older than 61 years	Sparse forest
Spruce forests at elevations above 1,000 m	5	5	5	5
Spruce forests at elevations from 600 to 1,000 m	3	5	4	3
Beech forests at elevations from 600 to 1,000 m	2	5	4	3
Spruce-beech-fir forests at elevations from 600 to 1,000 m	1	4	3	1
Foothill fir forests (200–600 m)	3	5	4	3
Foothill beech forests (200–600 m)	2	5	4	3
Foothill oak forests (200–600 m)	1	4	2	1
Other foothill broad-leaved and mixed forests (200–600 m)	2	5	4	2
Arable land, vegetable gardens, orchards (200–600 m)	4			
Hayfields, mountain meadows, pastures, and clearings (200–600 m)	1			

The proposed materials may be used to assess habitat quality (forage-protective properties) when selecting sites for the species' reacclimatization.

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Ocena jakości siedisk żubra w kontekście stref przyrodniczych Ukrainy

Streszczenie: Opracowano naukowe metody oceny jakości i przydatności obwodów łowieckich na Ukrainie dla żubra. Metodyka klasyfikacji uwzględnia zasobność pokarmową i cele ochronne biotopów z podziałem na pięć klas. Przedstawiono oryginalne tabele klasyfikacji dla trzech stref przyrodniczych: Leśnej, Leśno-Stepowej i Górsko-Karpackiej. Dla strefy Leśnej i Leśno-Stepowej klasyfikacja opiera się na typologii obwodów łowieckich, uwzględniając skład gatunkowy i wiek drzewostanów, a również obecność podrostu i podszytu. Ustalono, że najwyższa (1 i 2) klasa obejmuje dojrzałe lasy liściaste i mieszane z obfitym podszytem, łąki oraz grunty rolne z gęstą siecią pasów leśnych. Dla strefy Górsko-Karpackiej kluczowy kryterium klasyfikacji jest wysokość nad poziomem morza oraz związana z nią różnorodność gatunkowa drzew. Stwierdzono, że w Karpatach najbardziej odpowiednią klasę (1) cechuje obecność lasu dębowego oraz mieszanego świerkowo-bukowo-jodłowego na przedgórzu (wysokość 200–600 m n.p.m.), a także łąki górskie. Zaproponowana metodyka stanowi praktyczną podstawę do wyboru perspektywicznych obszarów reintrodukcji gatunku.
