land

MDPI

Article

Using Landscape Change Analysis and Stakeholder Perspective to Identify Driving Forces of Human–Wildlife Interactions

Mihai Mustățea [1],* and Ileana Pătru-Stupariu [2,3]

[1] Faculty of Geography, Doctoral School Simion Mehedinti, University of Bucharest, 1 Bd. N. Bălcescu, 010041 Bucharest, Romania
[2] Department of Regional Geography and Environment, Faculty of Geography, University of Bucharest, 1 Bd. N. Bălcescu, 010041 Bucharest, Romania; ileana.stupariu@geo.unibuc.ro
[3] Institute of Research of University of Bucharest, ICUB, 050095 Bucharest, Romania
* Correspondence: mihai.mustatea@drd.unibuc.ro

Abstract: Human–wildlife interactions (HWI) were frequent in the post-socialist period in the mountain range of Central European countries where forest habitats suffered transitions into built-up areas. Such is the case of the Upper Prahova Valley from Romania. In our study, we hypothesized that the increasing number of HWI after 1990 could be a potential consequence of woodland loss. The goal of our study was to analyse the effects of landscape changes on HWI. The study consists of the next steps: (i) applying 450 questionnaires to local stakeholders (both citizens and tourists) in order to collect data regarding HWI temporal occurrences and potential triggering factors; (ii) investigating the relation between the two variables through the Canonical Correspondence Analysis (CCA); (iii) modelling the landscape spatial changes between 1990 and 2018 for identifying areas with forest loss; (iv) overlapping the distribution of both the households affected by HWI and areas with loss of forested ecosystems. The local stakeholders indicate that the problematic species are the brown bear (*Ursus arctos*), the wild boar (*Sus scrofa*), the red fox (*Vulpes vulpes*) and the grey wolf (*Canis lupus*). The number of animal–human interactions recorded an upward trend between 1990 and 2018, and the most significant driving factors were the regulation of hunting practices, the loss of habitats, and artificial feeding. The landscape change analysis reveals that between 1990 and 2018, the forest habitats were replaced by built-up areas primarily on the outskirts of settlements, these areas coinciding with frequent HWI. The results are valid for both forest ecosystems conservation in the region, wildlife management, and human infrastructures durable spatial planning.

Keywords: human–wildlife interactions; landscape changes; Canonical Correspondence Analysis; Romanian Carpathians

Citation: Mustățea, M.; Pătru-Stupariu, I. Using Landscape Change Analysis and Stakeholder Perspective to Identify Driving Forces of Human–Wildlife Interactions. *Land* **2021**, *10*, 146. https://doi.org/10.3390/land10020146

Academic Editor: Eva Papastergiadou

Received: 14 December 2020
Accepted: 29 January 2021
Published: 2 February 2021

1. Introduction

The potential impact of landscape spatial characteristics induced by human activities over interactions with wildlife (HWI) has been globally studied. In developed countries, a large amount of public land went under private ownership and the interest for urban areas and road and energy infrastructures have massively changed the ecological landscape and triggered numerous wildlife intrusions into human habitat, which led to numerous conflicts [1,2]. In underdeveloped countries where the wildlife population still thrives, human demographics growth and connected anthropogenic activities encroach on once-wild areas, sometimes resulting in fatal animal attacks [3]. Habitat loss due to the expansion of road and transport infrastructures is one of the main causes of vehicle collisions with large mammals and it is responsible for severe human and animal injuries and expensive property damage [4]. Similarly, grazing activities favoured increasing rates of livestock being preyed on by large felids [5–7]. Habitat loss induced by agricultural practices generated conflicts between farmers and wildlife thus producing crop damage to farmlands [8]. In underdeveloped rural regions, natural resources extraction (primary wood for fuel) increased conflicts in wildlife corridors which connected protected areas [9]. The impact of habitat loss, tourism activities over HWI, and the changes in animal behaviour are the causes of public insecurity and affect the economic incomes of leisure areas in North America [10].

The analysis of local stakeholders' perspectives regarding HWI characteristics represents a wide-spread approach and plays a crucial role in improving long-term conservation of biodiversity and reducing risks to human security and economic activities [11–13]. The local stakeholders' attitude towards the potential management approaches of HWI (conservation approach vs. economic and traditional hunting practice) is important in understanding if these interactions are perceived as problems, as potential benefits or as sources of income. In developed countries, the economic, social and scientific progress have offered possibilities for a higher standard of living and influenced how people behave and understand wildlife interactions by shifting local stakeholders' perceptions toward conservation and protection of wildlife, to the detriment of raw economic use and mass resource extraction [14]. Through local stakeholders' level of interest concerning the subject, the significance of HWI can be outlined. The deficient communication and the negative attitude of locals concerning the decision-making authorities sometimes materialized through lack of trust and rebellion against their low implication and response to the problem [15].

HWI has increased significantly in post-socialist European countries, as in Romania's case, favoured by the presence of some of the "last remaining pockets of wilderness" (temperate primaeval forests), rich biodiversity, numerous forested habitats disturbances even inside protected areas due to high logging rates (generated by rapid ownership and stiff changes in institutional management), low effectiveness wildlife management and unregulated tourism development which imputed constant pressure on natural resources [16]. The Carpathian Mountains are famous for the high rate of HWI, where large predatory mammals, especially brown bears, are by far the most controversial [17]. Several studies were assessed to better understand and manage brown bear conflicts from different perspectives, such as the typology of the relationship with humans in the protected areas of Harghita County [18], followed by the perception of locals regarding the coexistence with brown bears within settlements located in high brown bear density areas in Brașov and Covasna counties [19]. The importance of institutional collaboration for achieving coexistence between wildlife and humans has also been discussed [20]. Furthermore, Dorresteijn et al. [21] analysed the threats and opportunities concerning a potential peaceful coexistence between humans and brown bears in Central Romania. Human attitude towards interactions with grey wolves in Romania has been described by Chiriac et al. [22]. Other assessments were dedicated to identifying the behaviour of wild boars towards human activities within the rural landscapes of Covasna County [23]. Pătru-Stupariu et al. [24] highlighted the presence of numerous wildlife species within the touristic areas of Prahova County, commonly involved in interactions with humans, such as brown bears, wild boars and red foxes, and sporadic ones, namely grey wolves, stone martens (*Martes foina*), European polecats (*Mustela putorius*), European roe deers (*Capreolus capreolus*) and common vipers (*Vipera berus*).

The South-Eastern Carpathians represent one of the areas with the most intense study of the HWI situation from Romania. Here, the most representative conflict hotspots are represented by the popular touristic resorts within the Upper Prahova Valley, located in the counties of Brasov and Prahova [25]. The valley offers proper conditions for a high intensity of HWI, based on the presence of favourable landscape characteristics: (a) protected wild areas which shelter old-growth forests and support high biodiversity habitats (Figure 1A,B); (b) numerous human settlements characterised by a compact urban fabric in the central areas and a sprawled periphery where vacation houses are surrounded by degraded forests habitats (Figure 1C), and (c) increasing pressure over the natural resources and wildlife habitats triggered by deforestations and intensive tourism practices (Figure 1D).

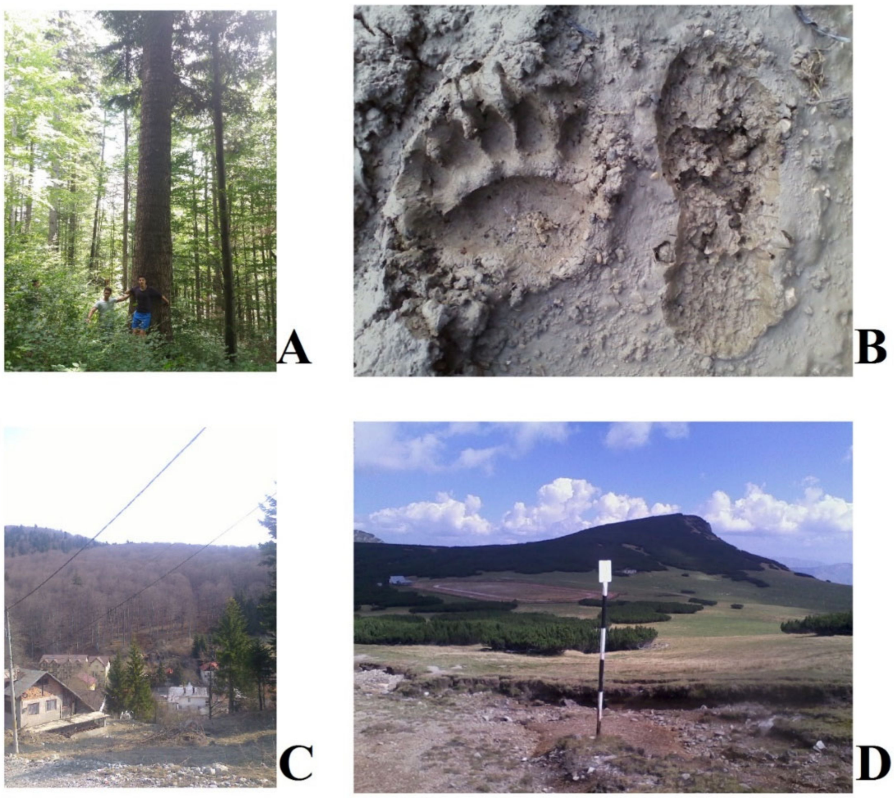

Figure 1. Landscape characteristics of the Prahova Valley which favour HWI—old growth forests and high quality large carnivore habitats on the eastern slopes of the Bucegi Mountains (**A**,**B**), sprawled periphery with households, yards and forest patches in the city of Bușteni (**C**), and degraded heathlands due to intensive tourism activities on the Bucegi Plateau (**D**).

As a consequence of the complex aspects characterizing HWI and the acuteness of the phenomenon within the Upper Prahova Valley, we developed the next hypothesis: (i) "the upper Prahova valley suffered in the post-socialist period both a major loss of forest ecosystems and an increasing HWI conflict", and (ii) "local stakeholders could provide deep insights regarding the potential triggering factors of HWI". Therefore, the aim of the study is to identify the effects of landscape change on HWI. The objectives of our assessment are: (i) to quantify the local landscape spatial and temporal dynamics in the post-socialist period (after 1990), and (ii) to analyse the potential causes of HWI within the study area based on local stakeholders' perspective.

2. Materials and Methods

2.1. Study Area

The study was developed in three major settlements within the Upper Prahova Valley (Sinaia, Bușteni and Predeal), popularly known as some most important winter tourism centres of Romania. The valley is located in the Southern Carpathians and it is bordered by mountain massifs: Bucegi (west), Baiului (east) and Clăbucetele Predealului (north) (Figure 2).

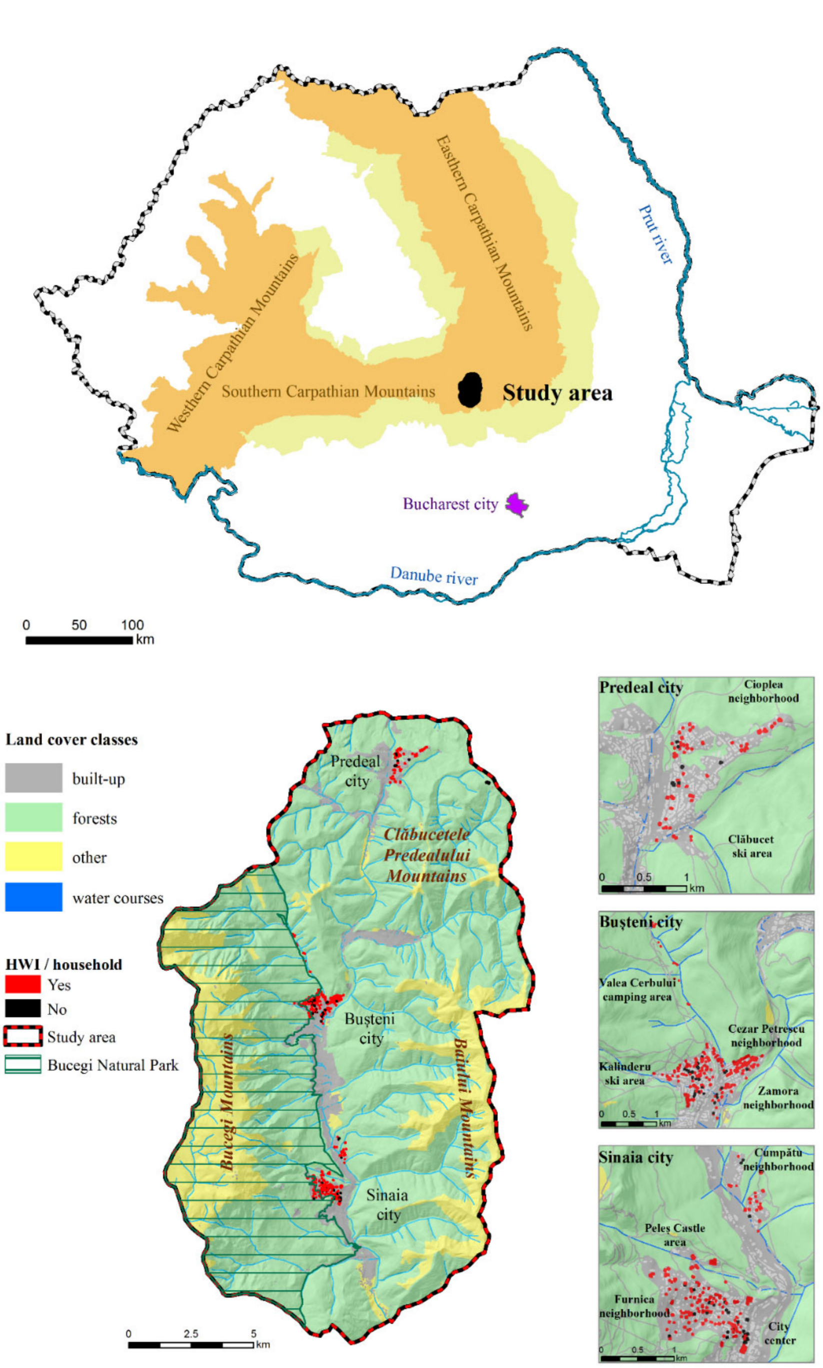

Figure 2. Location of the study area and sampling sites.

The valley lies in the Alpine biogeographical region. Mixed forests composed by European beech (*Fagus sylvatica*), European silver fir (*Albies alba*), European spruce (*Picea abies*), European larch (*Larix decidua*), and common yew (*Taxus baccata*) dominate the landscape, with several large patches of intact old-growth forests still being preserved in areas where forest exploitation and management is difficult [26]. These habitats host one of the largest populations of large carnivores within Europe, the main species being the intensively studied brown bear, grey wolf, and Eurasian lynx (*Lynx lynx*). Other rare and protected wildlife species include the European wild cat (*Felis silvestris*), black goat (*Rupicapra rupicapra*) and several bird species. The Eurasian capercaillie (*Tetrao urogallus*) and common raven (*Corvus corax*) are the most representative. The area hosts a dense concentration of protected areas, such as the Bucegi Natural Park (designated in 2003), a homonymous Natura 2000 site of community importance (designated in 2007), and numerous scientific reserves, established in order to preserve both geological natural wonders and valuable botanical elements, such as the edelweiss (*Leontopodium nivale*) [27]. Despite the fact that in the post-socialist period the number of residential settlements decreased, the periphery expanded, and numerous vacation homes and accommodation units were built on areas occupied by forest until 1990. The phenomenon was driven by uncontrolled tourism expansion [28]. Due to these factors, the protected regions are facing unprecedented pressure on the natural environment and the increasing number of interactions with wildlife leads to frequent conflicts.

2.2. Landscape Change Analysis

In order to quantify local landscape spatial and temporal dynamics in the post socialist period, we have conducted a landscape change analyses through the Binary model [29] and the Markov model [30]. In our study, the Binary model is used to identify the areas where the landscape under study suffered changes within different periods of time, while the Markov chains model adopts a much more complex approach, aiming to highlight transitions of specific land cover classes within the respective time periods. We preferred these approaches for several reasons: (a) they allow for the quantification of landscape changes and even the development of evolutionary scenarios and can be implemented through any available GIS software; (b) they are discrete models in terms of time coordinate (by taking into consideration a finite number of maps of the same area with respect to different time periods); (c) they can be applied on both discrete or continuous spatial data (in our case we used discrete data represented by land cover classes types) and (d) they have a broad range of applications in numerous fields, primarily in natural sciences, geography, landscape ecology [31] and even biology [32].

For the application of the two models, we extracted the Corine Land Cover data from the European Environmental Agency website, for all available years, such as 1990, 2000, 2006, 2012 and 2018 [33]. Since the models are used to highlight changes between different years, we have selected 3 time periods for our assessment: 1990–2000, 2000–2006, and 2006–2018. We preferred a detailed time period approach at the expense of a general one (as in the case of 1990–2018) as our intention was to identify particular land cover class conversions that, although they took place after 1990, did not persist until 2018, yet could be a primal cause for wildlife disturbance.

The study area is characterised by the presence of 13 types of land cover classes with similar features. We chose the reclassification into three major categories, namely built-up, forests and other land cover classes (Table A1 in Appendix A). The reclassification system encompasses the prevailing land cover types within the study area based on the occupied area and the level of human intervention, from areas with high intensity (built-up), to land shared with wildlife (other classes—pastures, grasslands, shrubs etc.) and primary wildlife habitats (forests). Therefore, we were interested in analysing the spatial and temporal dynamics of the landscape between land cover classes which support permanent wildlife habitats and the ones with intensive or extensive human activity. The transitions between these categories are much more relevant as potential triggering factors for conflicts between people and wild animals [34].

We conducted a matrix encompassing all the possible transitions between the reclassified land cover for all the time periods mentioned above and calculated their surface expressed in hectares. Also, we quantified the areas for the unchanged land cover classes, followed by the total changed and unchanged land for the same periods. Nevertheless, because between 2012 and 2018, at the Corine Land Cover broad data scale (Minimum Mapping Unit of 25 hectares for areal phenomena and a minimum width of 100 m for linear), the models did not reflect any landscape changes, we amalgamated 2012–2018 with 2006–2012 into one single period, 2006–2018. Finally, the geographical coordinates of the households involved in HWI were overlapped with the general forest loss map for the entire time period assessed (1990–2018), in order to identify possible spatial correlation between the areas with HWI and the ones where wildlife habitats were removed in order to provide space for built-up areas or other land cover classes.

2.3. Assessing Local Stakeholders' Perspective on HWI

In order to analyse the local stakeholders' perspective concerning the triggering factors of HWI within the Upper Prahova Valley, we conceived a questionnaire comprising two questions: (a) the first, developed for extracting factual information regarding the main wildlife implicated in HWI and the temporal dynamics of their descends into settlements: "What are the main species implicated in HWI and when do they descend more often?", and (b) the second, aiming to reveal the locals' perception concerning the causes of wildlife descends in settlements within the study area: "What are the potential triggering factors of HWI?". For the first question, the potential answer options were represented by several time periods, with an emphasis on the post—socialist period, when HWI was expected to be much more frequent (2015—present, 2010–2015, 2000–2010, 1990–2000, and before 1990). For the second question, we set potential answer options based on preliminary knowledge concerning the HWI problem within the study area, fundamental through discussions with the local stakeholders and our own personal field observations concerning the phenomenon, from previous years [24].

The sites we used for the survey were selected based on a couple of criteria: (a) the presence of landscape features which could potentially favour HWI (abundance of households located at the outskirts of settlements, where built-up has increased after 1990 and has replaced initial forest habitats); (b) a long term notoriety as conflict areas where HWI are common, characteristic revealed by previous discussions with locals and mass media articles; and (c) the field presence of already applied measures regarding HWI management, such as reinforced fences or warning signs. Also, the selected sites were located on both sides of the Prahova Valley (Bucegi, Baiului and Clăbucetele Predealului Mountains). The two mountain massifs possess a different level of anthropization. Our interest was to highlight whether this aspect influences the manifestation of HWI. Therefore, we have conducted our research within the next sites: (a) Sinaia City Centre, Furnica neighbourhood and Peleș Castle area (Sinaia), Valea Cerbului camping area, Kalinderu ski area and Cezar Petrescu neighbourhood (Bușteni)—Bucegi Montains; (b) Cumpătu neighbourhood (Sinaia), Zamora neighbourhood (Bușteni), Cioplea neighbourhood and Clăbucet ski area (Predeal)—Baiului and Clăbucetele Predealului Mountains (Table A2, Figure 2).

We applied 449 questionnaires, between September 2018 and August 2019, to three categories of local stakeholders: residents and owners of guest houses, employees of the local leisure industry and seasonal or occasional tourists (Table A3). For all the respondents, we solely collected information concerning their interaction with wild animals which took place in the proximity of their households, apartment blocks, touristic houses or caravans, so that we could extract the geographical coordinates of every single type of settlement where HWI had been witnessed. We excluded from the assessment the households where, due to different reasons, we could not interact with the owners in order to apply questionnaires. Similarly, the households where the respondents suggested that they had never been involved in HWI, were kept in our analysis as investigated, yet lacking HWI.

The information was assessed after obtaining the respondents' verbal consent and the required data was processed in the same manner as it was initially explained to them. The process of applying the questionnaires and processing the data took into account the provisions of the GDPR regarding the anonymity of the respondents. In addition, the questionnaires were applied only after the respondents agreed to provide information. Also, the data provided by the respondents were processed exactly as previously specified.

2.4. Statistical Approach

We analysed the relation between the two variables (time period when HWI were most common and potential triggering factors) through the Canonical Correspondence

Analysis (CCA) approach, a method of multivariate statistics commonly used in ecology and social sciences [35]. The algorithm is available within software R, version 3.1.2., where the Vegan package provides the function mod.cca. Should one of the respondents of a specific household leave out an answer to at least one of the two questions, the respective household would be eliminated from the statistical analyses, therefore resulting in a total of just 368 interviews registered for the application of the CCA. The data were codified with 0 and 1, (binary coded—1 for the presence and zero for the absence of species) and divided in two categories Site 1 (Bucegi Mountains) and Site 2 (Baiului and Clăbucetele Predealului Mountains). The two sites clearly differ. Site 1 is more populated and with a higher density of houses than Site 2. Also, the CCA data is grouped in two categories: explanatory variables and response variables [36]. The explanatory variables are driving forces, whereas the response variables represent the presence and absence of species within a specific time period [24] (Table A4).

3. Results

The landscape change analysis revealed an increase of 47% in built-up between 1990 and 2018, starting from approximately 1180 hectares (1990 and 2000), and reaching 1321 hectares (2006), respectively 1746 (2012 and 2018 (Table 1)). In this case, the most important expansions took place between 2006 and 2012, due to the loss of 295 hectares of other classes and 140 hectares of forest. In a similar manner, notable areas of both other classes (120 hectares) and forests (141 hectares) have transitioned into built-up areas between 2000 and 2006 (Table 2).

Table 1. Reclassified land cover classes areas dynamics between 1990 and 2018.

Land Cover Classes	Area (Hectares)				
	1990	**2000**	**2006**	**2012**	**2018**
Built-up	1183	1182	1321	1746	1746
Forests	19,674	19,753	18,920	18,601	18,601
Other	5208	5130	5824	5718	5718

Table 2. Reclassified land cover classes transition areas dynamics between 1990 and 2018.

Land Cover Classes Transitions	Area (Hectares)		
	1990–2000	**2000–2006**	**2006–2018**
Unchanged built-up	1176	1060	1311
Forest to built-up	6	141	140
Other classes to built-up	0	120	295
Unchanged forests	19,660	18,806	18,590
Built-up to forests	7	31	10
Other classes to forests	86	83	1
Unchanged other classes	5122	4927	5528
Built-up to other classes	0	91	0
Forests to other classes	8	806	190
Total unchanged	25,958	24,793	25,429
Total changed	107	1272	636

In both cases, the main causes are represented by the expansion of the outskirts of the three major touristic resorts meant to provide space for leisure facilities, followed by the development of a major high altitude infrastructure for sportsmen training on the Bucegi Plateau (Figure 3).

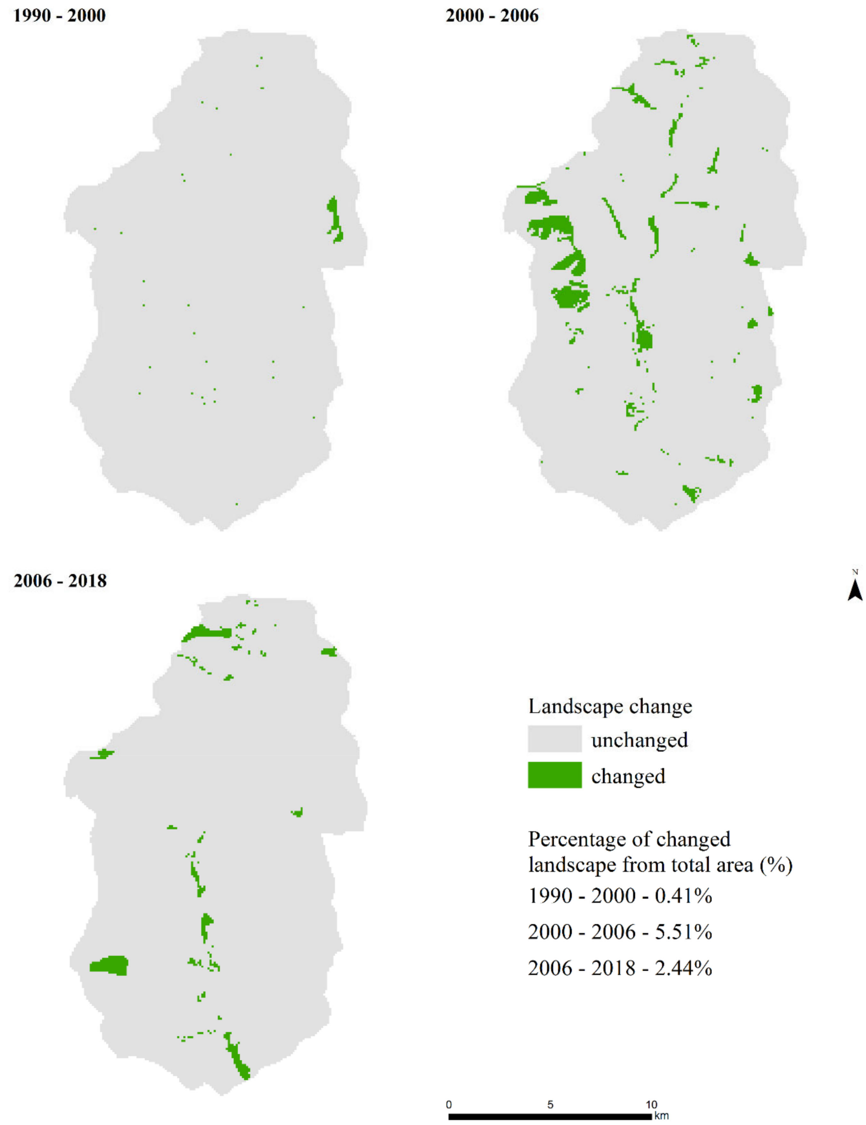

Figure 3. Landscape change map based on a Binary model developed over three time periods (1990–2000, 2000–2006, 2006–2018).

The other classes expanded from 5208 hectares in 1990, and 5130 hectares in 2000, to 5824 hectares in 2006, and 5718 hectares in 2012 and 2018. The most significant increase was registered between 2000 and 2006 (13%), when 806 hectares of forests were transformed into meadows (as in case of Valea Cerbului camping area) and grasslands (especially within the upper sections of the eastern slopes of Bucegi Mountains). Furthermore, 190 hectares of forest located mainly west of Predeal were replaced by meadows (2006–2012) (Table 2, Figure 4). At the opposite pole, in case of the forested areas, after a slight increase of 0.4% between 1990 and 2000 (loss of 86 hectares of grasslands located in the northern section of the Baiului Mountains), the values decreased by 5.8% between 2000 and 2018. An additional 83 hectares of alpine grassland within the Baiului Mountains were also replaced by forests between 2000 and 2006 (Table 2, Figure 4). Overall, the most extended conversions took place between 2000–2006 (representing 5.5% of the total landscape), followed by 2006–2012 (2.4%) and 1990–2000 (0.4%). There were no landscape changes identified between 2012 and 2018 (Table 1, Figure 3).

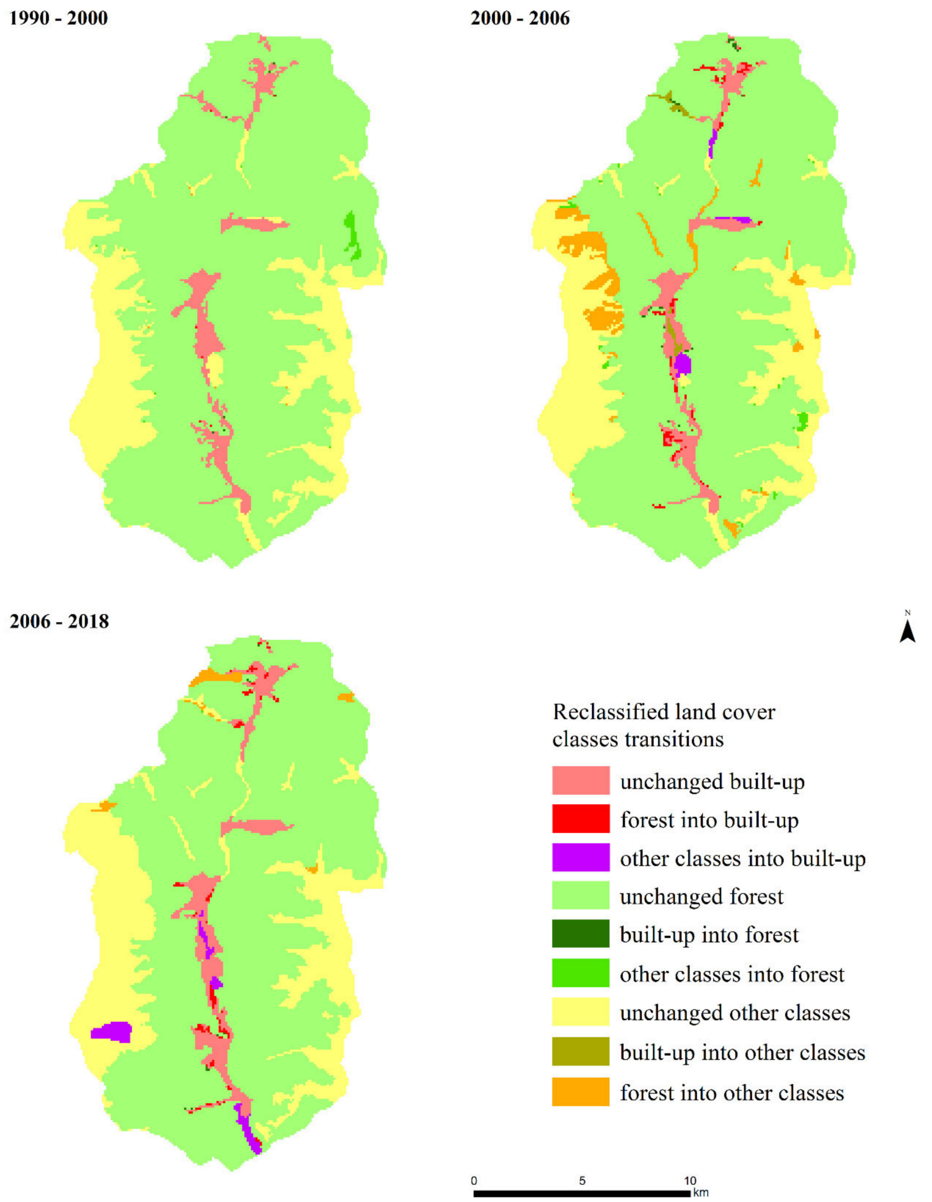

Figure 4. Reclassified land cover classes transition map based on a Markov chains model developed over 3 time periods (1990–2000, 2000–2006, 2006–2018).

Finally, we identified several hotspots where households frequently involved in HWI (after 1990) were developed on areas previously occupied by forests (before 1990) (Figure 5).

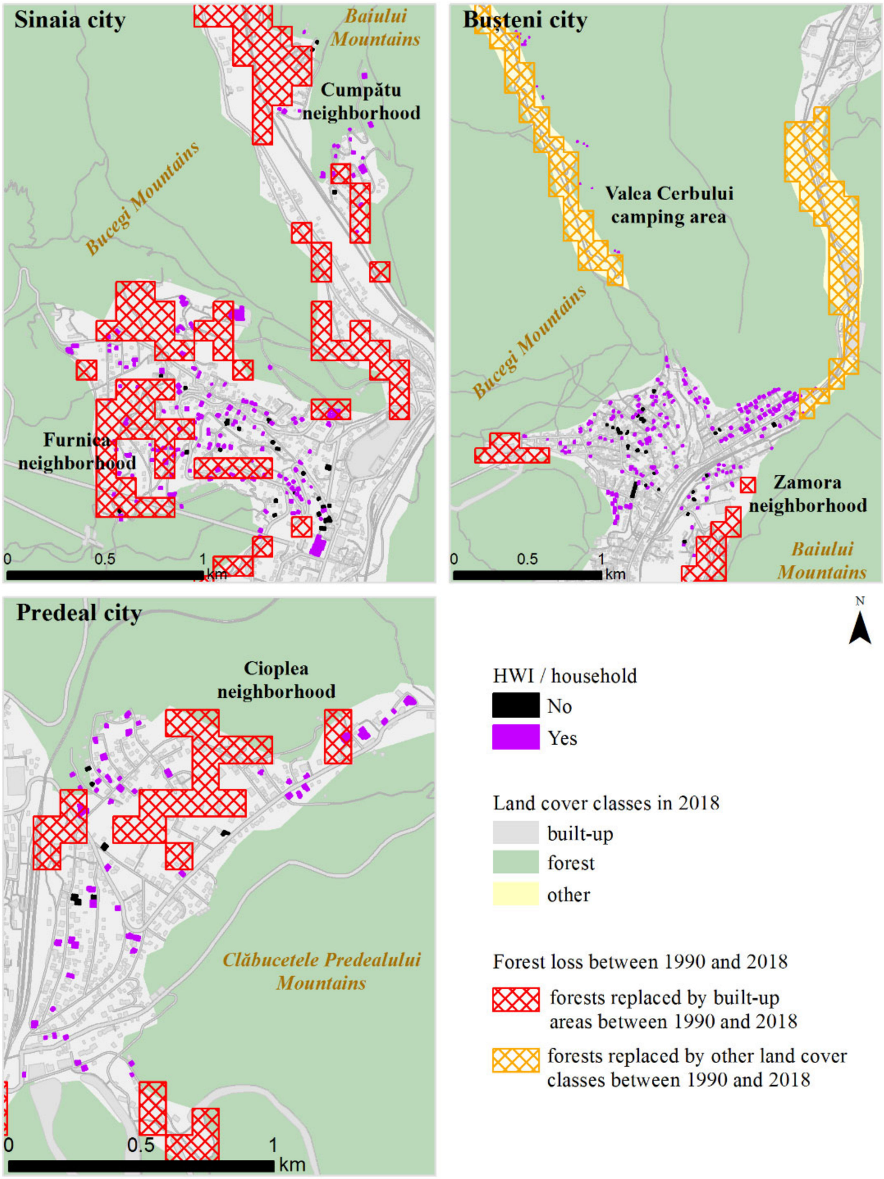

Figure 5. Map consisting in overlapping the location of households where HWI took place according to the respondents with the areas where forests were replaced by built-up and other land cover classes between 1990 and 2018 according to the Markov chains model.

These are the Furnica neighbourhood (which lies within the Bucegi Mountains slopes), respectively the Cumpătu neighbourhood (Baiului Mountains, Romania) from Sinaia, where deforestations took place between 1990 and 2018 and cleared space for built-up areas. In a similar manner, in the case of Bușteni city, Valea Cerbului camping area, where brown bear descends are common, was initially a forested area converted into a local pasture (1990–2000), followed by a campsite (2000–2006). Several deforestations took place after 1990 meant to expand the Zamora neighbourhood (Baiului Mountains, Romania). Nevertheless, in Predeal, the Cioplea neighbourhood, where HWI are frequent, mainly involving brown bears and red foxes, was visibly developed after 1990 on initially forested landscapes.

The data obtain from stakeholders emphasized the presence of three wildlife species which often descend into settlements: the brown bear, the wild boar and the red fox. 75.2% of the total investigated households suggested that the brown bear interactions with humans were much more frequent in the last five years (after 2015). Only 2.6% of the cases pinpointed a high frequency of brown bear HWI until 1990. The wild boar was much more common after 2015 (in 30% of the cases). The red fox was much more frequently involved in HWI after 2015 (19.5%). The grey wolf was usually observed between 2010 and 2015 (Table 3).

Table 3. Number (percent) of households which were engaged in HWI with a species, from the total number of households within Sinaia (166), Bucegi (226), Predeal (57) and entire Prahova Valley (449) sampling sites.

Time Period	Wildlife				Location
	Brown Bear	**Wild Boar**	**Red Fox**	**Grey Wolf**	
(a) after 2015	99 (59.6%)	95 (57.2%)	34 (20.4%)	0	Sinaia
	181 (80%)	36 (15.9%)	32 (14.1%)	0	Bușteni
	49 (86%)	4 (7%)	22 (38.5%)	1 (1.7%)	Predeal
	338 (75.2%)	135 (30%)	88 (19.5%)	1 (0.2%)	Overall
(b) 2010–2015	61 (36.7%)	32 (19.2%)	18 (10.8%)	0	Sinaia
	108 (47.7%)	2 (0.8%)	6 (2.6%)	0	Bușteni
	20 (35%)	0	4 (7%)	0	Predeal
	189 (42%)	34 (7.5%)	28 (6.2%)	0	Overall
(c) 2000–2010	10 (0.6%)	2 (1.2%)	3 (1.8%)	0	Sinaia
	38 (16.8%)	3 (1.3%)	4 (1.7%)	0	Bușteni
	9 (15.7%)	0	3 (5.2%)	0	Predeal
	57 (12.7%)	5 (1.1%)	10 (2.2%)	0	Overall
(d) 1990–2010	2 (1.2%)	1 (0.6%)	2 (1.2%)	2 (1.2%)	Sinaia
	20 (8.8%)	0	2 (0.8%)	0	Bușteni
	10 (17.5%)	0	3 (5.2%)	0	Predeal
	32 (7.1%)	1 (0.2%)	7 (1.5%)	2 (0.4%)	Overall
(e) until 1990	3 (1.8%)	0	0	1 (0.6%)	Sinaia
	4 (1.7%)	0	0	0	Bușteni
	5 (8.7%)	0	2 (3.5%)	0	Predeal
	12 (2.6%)	0	2 (0.4%)	1 (0.2%)	Overall

The CCA offers us a deeper analysis than the clustering and it is specifically useful in understanding the relation between the driving forces and the presence or absence of species in the context of landscape change during 1990 until the present (Figure 6).

The statistical significance of the CCA analysis was tested through permutation tests (999 permutations, alpha = 0.05), [37]. The answers of the local people in site 1 and site 2 are mostly related to variables (F = 10.01, $p < 0.001$). CCA1 (axis 1) is 2.9 and CCA 2 (axis 2) is 1.09. The variables (explanatory variables) which significantly contributed to a better understanding of the changes that had influenced the presence or absence of species, are as follows: DF1 = 1.8; DF2 = 6.04; DF3 = 1.6; DF4 = 1.3; DF5 = 2.0; DF6 = 2.5; DF7 = 0.8; DF8 = 0.6; DF9 = 0.5; DF10 = 0.8; DF11 = 0.29; DF12 = 0.3; DF13 = 0.6. The most significant are: DF2-Banning of hunting; DF6-Humans have invaded their habitat due to the construction of houses, roads or touristic infrastructures; DF5- The animals are accustomed to artificial feeding; DF1-Poaching; DF3-The park rangers do not feed the animals; DF4-There are too many wild animals compared to how much the habitat can support. We concluded there are no differences between the two sites in terms of presence or absence of species although the two sites are different in terms of human population and household density.

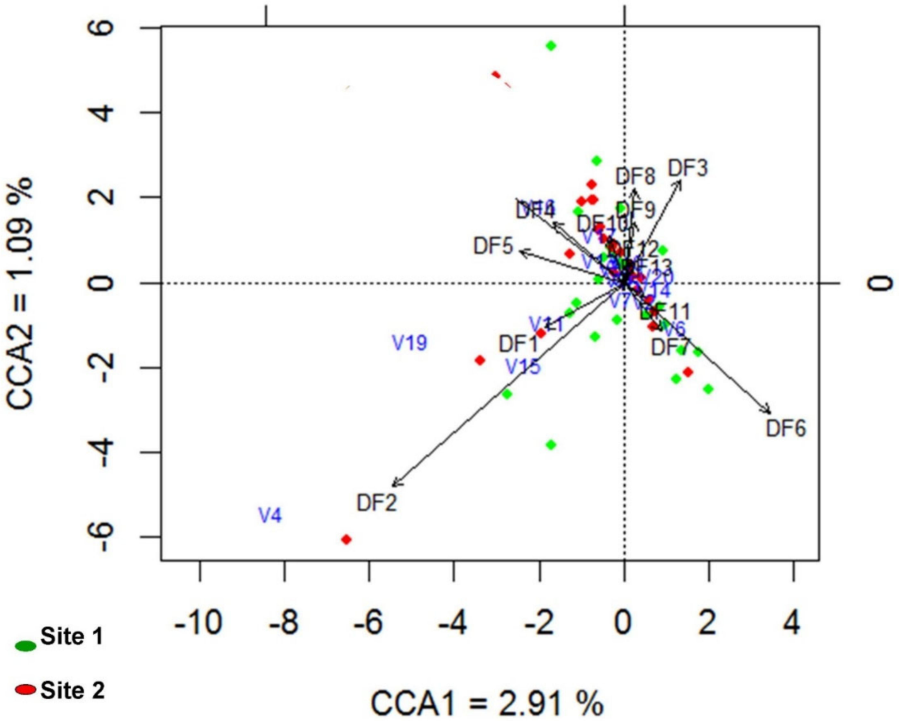

Figure 6. Scatter plot of Canonical Correspondence Analysis (CCA) representing points in green, site1, points in red, site 2. The response variables are plotted as labels (V1—2015—present/brown bear; V2—2015—present/wild boar; V3—2015—present/red fox; V4—2015—present/grey wolf; V5-2010—2015/brown bear; V6-2010—2015/wild boar; V7-2010—2015/red fox; V8-2010—2015/grey wolf; V9-2000—2010/brown bear; V10-2000—2010/wild boar; V11-2000—2010/red fox; V12-2000—2010/grey wolf; V13-1990—2000/brown bear; V14-1990—2000/wild boar; V15-1990—2000/red fox; V16-1990—2000/grey wolf; V17-before 1990/brown bear; V18-before 1990/wild boar; V19-before 1990/red fox; V20-before 1990/grey wolf), while the explanatory variables are represented as arrows (DF1-Poaching; DF2-Banning of hunting; DF3-The park rangers do not feed the animals; DF4-There are too many wild animals compared to how much the habitat could support; DF5-The animals are accustomed to artificial feeding; DF6-Humans have invaded their habitat due to the construction of houses, roads or touristic infrastructures; DF7-Wildlife habitats offer less food due to recent deforestation actions; DF8-Wildlife are affected by the intensive exploitation of mushrooms and berries; DF9-Relocations; DF10-The presence or absence of sheepfolds; DF11-The removal of the local dumpsite; DF12-Forest privatization leading to higher management intensities/shorter rotation periods; DF13-Lack of herbivores or natural enemies).

4. Discussion

4.1. The Loss of Habitats Is Related to Human–Wildlife Interactions (HWI)

The landscape change models revealed that the Upper Prahova Valley suffered considerable forest loss, especially after 2000, when the outskirts of the major resorts sprawled into the forest and numerous vacation houses were constructed. Furthermore, within the same time period, significant forest conversions into meadows and camping areas were registered. At the opposite pole, between 2000 and 2006, the models pinpointed forest transitions into grasslands in highly inaccessible sloped areas [38]. Landscape changes that were registered after 2000 materialized through a persistent urban sprawl and were favoured by several political and economic events. First, the expansion of residential areas took place, probably caused by planning policies and poor role of State regulation [39]. Secondly, the mountain areas of Central Europe were affected by an economic trend of increasing touristic pressure and aggressive development of leisure facilities [40].

The Bucegi Mountains represent a traditional touristic attraction with large infrastructure and a high flow of tourists. However, the Baiului Mountains lack such popularity among tourists. Nevertheless, the statistical analyses indicated that HWI temporal patterns do not seem to be influenced by anthropization levels. Conversely, the chaotic expansion of medium and small accommodation units rapidly developed after 1990 within both mountain massifs, seems to be a plausible triggering factor for HWI. Therefore, we overlapped the location of households where HWI took place, according to the respondents, with the areas where forests were replaced by built-up areas and other land cover classes. The results suggest that wildlife habitat loss and disturbance could potentially influence the manifestation of HWI. In conclusion, the households affected by HWI from the outskirts of the three major settlements that were analysed, whether located on the slopes of Bucegi or Baiului Mountains, were built on the land that used to be a forest before 1990.

These above mentioned hotspots represent the result of several distinct space-based phenomena, such as development of suburbanization, development of recreational buildings and development of camping areas. The expansion of recreational buildings is, by far, the most common and widely spread process of space changes which characterises the outskirts of the study area, and it is specific to Furnica neighbourhood in Sinaia and Cioplea neighbourhood in Predeal. Here, a wide variety of recreational buildings, such as pensions, vacation houses, hotels and touristic villas, have spread into a once natural habitat, by replacing large forest areas and incorporating the smaller remaining patches into built-up areas. Cumpătu neighbourhood in Sinaia and Zamora neighbourhood in Bușteni are both located on the slopes of the Baiului Mountains and clearly reflect the development of suburbanization. In these cases, initial forest habitats were replaced due to expansion of residential areas and private households, whereas touristic facilities are usually scarcer. Also, the new built-up areas possess a much more compact distribution, by comparison with the recreational areas from the Bucegi Mountains which are characterised by a more scattered pattern. Lastly, the development of camping areas can be found on the periphery of Bușteni. Here, a dense concentration of caravans occupies large pastures from late spring to the beginning of autumn. The area is completely surrounded by forests which sustained a continuous wildlife habitat until the development of the pasture.

Overall, our analyses indicate that HWI has increased in the outskirts of the settlements within the Upper Prahova Valley after 1990. Furthermore, after 1990, in the same areas, accommodation units and camping sites expansion have degraded forest habitats. The temporal and spatial correlation of the two variables (HWI and forest transition into built-up areas) could suggest that HWI are o potential cause of continuous shrinking of natural habitats and chaotic tourism activities. The results correspond with Dorresteijn et al. [21], who analysed the different ways in which local people perceive interactions with brown bears in Central Transylvania and concluded that deforestation and land-use change were perceived as major wildlife disturbing factors with the potential to increase future conflicts. According to Rozylowicz et al. [34], between 1990 and 2006, in the Eastern Carpathians Mountains, 45% of the forest per mapping unit was clear-cut without any landscape-scale management or ecologically oriented principles. By consequence, numerous wildlife habitats were disturbed. Similarly, despite the increasing area of natural reserves, forest habitat disturbances inside protected areas and even within core reserve areas were consistent after 1995 and 2005. This happened primarily because of massive logging rates and stiff ownership changes [16]. Conversely, a different perspective belongs to Chapron et al. [41]. He considers that the decline of human land-use activities materialized through the abandonment of agricultural land, followed by the migration of people from rural to urban areas in search of a higher life standard, has decreased pressure over the environment and allowed wildlife habitats to successfully recover.

Our results highlight the need for a better regulation of the activities allowed by the Management Plan of the Bucegi Natural Park. The Management Plan of the Bucegi Natural Park was elaborated by the Park Administration during 2005–2007 according to the specific legislation regarding the regime of protected natural areas, conservation of natural habitats, wild flora and fauna. It was updated according to the provisions of Government Emergency Ordinance no. 57/2007 on the regime of protected natural areas, conservation of natural habitats, wild flora and fauna, with subsequent amendments and completions [27]. According to the management plan, the internal zoning system of the Bucegi Natural Park encompasses four functional areas, which allow the following activities: sustainable development, sustainable management, integral protection and strict protection. Based on our models, the post-socialist expansion of recreational building within the park boundaries is located in the areas of sustainable management. These areas have been designated precisely to allow the development of tourist activities. Yet, at the same time, the sustainable management areas occupy large portions of forests that extend from the periphery of settlements to regions with wild habitats, included in the integral or even strict protection zones. We argue that the areas of touristic development should be delineated by the ones of strict protection through a buffer zone, in order to reduce the potential ecological disfunctions generated by mass tourism and to prevent conflicts between humans and wild animals. Furthermore, we plead for redesigning the spatial arrangement of the tourism development areas as specified in the management plan, by focusing on a stricter limitation of their extension for minimising the pressure on adjacent natural ecosystems. Lastly, the areas of strict protection, which are characterised by the highest conservation value and scientific interest, should be mapped out once more, taking into account alternatives that avoid superimposing major leisure facilities and intensively used tourism trails [12].

4.2. The Perception of Local Stakeholders Could Help Us Understand the HWI Phenomenon

According to the local stakeholders, the other species that frequently interacted with humans (the brown bear and the red fox) were involved in an increasing number of descends into settlements after 1990, reaching a peak within the last five years. The grey wolf represents an exception, as it has been implicated in several sporadic interactions with humans between 2010 and 2015. This trend characterises all the surveyed sites. The wild boar was almost absent until 2015 when the number of interactions with humans increased abruptly. Our study reveals that species with generalist feeding habits and a wide-ranging diet are much more involved in HWI within major touristic areas than the pure carnivores, such as the wolf. The low number of households implicated in breeding grazing domestic animals within the studied settlements could explain the insignificant number of grey wolf interactions since this species enters in conflicts with humans for livestock depredation [22]. Besides the diet of the species, another explanation for our results would be the size factor. By comparison to grey wolves, brown bears are bigger and more powerful. They do not always fear or avoid humans and they engage in conflicts much more frequently [19].

The statistical model highlighted that after 1990, the most significant HWI driving forces perceived by locals are represented by two types of management practices, namely: (a) the conservation approach, which allows the increase of wildlife effectiveness and it is supported by active management and restrictive hunting legislation, followed by (b) the economic approach, characterised by a disturbing impact on wildlife natural behaviour, poor management practices of forest administration authorities (lack of food supply from forest rangers and illegal hunting) and rapidly increasing tourism generating habitat loss and wildlife habituation induced by artificial feeding. The conservation practices used to explain the increase of HWI were supported by Stăncioiu et al. [19], who revealed that conflicts are a negative side effect of wildlife conservation which affects the coexistence between humans and animals. These conflicts could be prevented by controlling wildlife effectively through sustainable hunting. However, this aspect is not possible. Conflict generating species such as large carnivores are strictly protected after Romania joined the European Union in 2007. According to Chapron et al. [41], Romania shelters a large number of brown bears, around 6000. Its population is characterised by high stability and active management in the past, due to the avoidance of institutional collapse following the post-communist transition. These aspects led to proper wildlife conservation and allowed a massive increase of large predatory mammals after World War II (1945). Popescu et al. [17] states that, through an unprecedented move in 2016, the Romanian government temporary restricted the traditional old practices of hunting and offered the change to reset wildlife conservation and to develop a scientific-conservation approach. Also, the large populations of wild ungulate from Europe could be a cause for the wellbeing of predatory mammals [41]. In the case of the wild boar, Geisser and Reyer [42] consider that the European effectiveness has increased, as it was favoured by changes in crops, the reintroduction of specimens in areas where they were initially exterminated, reduced the effectiveness of natural enemies (primarily grey wolves) and restricted hunting practices. Conversely, Vetter et al. [43] suggests that one of the main factors concerning wild boar population increase in Europe over the last decade is represented by changes in climate conditions, namely less severe winters and higher temperatures, which allow a higher survival rate of individuals over the winter season. The economic approach concerning increasing HWI highlights that, in the case of the brown bear, the total number of the animals is much lower than official data. The so-called very high number is used as a cover for authorizing hunting campaigns, where both Romanian and foreign citizens participate [44]. According to Linnell et al. [45], based on the continuous loss and high fragmentation of habitat triggered by the economic and social development of post-socialist Romania, the Carpathian brown bear population was considered a vulnerable species which required strict protection. The impact of touristic activities on HWI was analysed by Fortin et al. [46], who noted that the habitat of brown bears is increasingly intersecting the rapidly expanding area of tourism infrastructures. The study concluded that a consistent proportion of the peripheral specimens was influenced by tourist feeding the animals with artificial food.

The overall importance of our study is represented by the fact that the results strengthen the scientific knowledge concerning a few topics of interest within the field of wildlife conservation and management. These are the influences of landscape changes over HWI spatial and temporal pattern in mountain areas with major tourism resorts and high pressure on natural ecosystems, followed by their potential to develop into major sources of ecosystem disservices [47]. Landscape change analyses prove efficient in assessing the potential of human-induced spatial and structural dynamics of complex landscapes to trigger ecological dysfunctions materialized through increasing conflict interactions between local citizens, tourists and wild animals [48]. Also, these maps are relevant in highlighting the negative impact of sporadic and poor regulated economic activities, especially tourism, over the natural environment. They may reveal critical areas in a timely manner, so decision making authorities could implement urgent resolutions, such as the case of built-up development in strictly protected areas [49]. If correlated with wildlife habitat favourability maps (areas with high density, food resources or habitat connectivity maps), landscape change models could help improve the zoning system of protected areas by adapting the scientific integral protection areas to regions with high conservation value ecosystems and the ones destined for resource exploitation to sectors already suffering by disturbances [50,51]. Our maps can support local authorities to enhance their wildlife management practices by identifying unaltered natural habitats suitable for the location of wildlife feeding points or even to improve sustainable touristic practices through developing systems of trails and wildlife observation towers [52]. In Romania, studies were focused on assessing wildlife habitat requirements in human-dominated mountain landscapes [53,54]. The increasing HWI problem was usually handled through studies dedicated on describing conflict characteristics and human attitude towards large carnivores, especially brown bears [18,19], while few types of research focused on revealing and explaining potential triggering factors of HWI [21,55]. The conflict drivers of HWI phenomenon were usually attributed to legislation and connected management practices of forest administration institutions triggered by post-socialist changes [17,34], whereas the impact of landscape spatial changes due to capitalist economy and mass resource exploitation of natural resources on HWI magnitude and dynamics have been poorly linked. The usefulness of improving wildlife habitats connectivity through a system of protected areas in order to decrease livestock depredation by large carnivores and prevent conflicts with shepherds has been studied in the Western Carpathians [56]. The utility of decreasing human pressure over the wildlife habitats by restricting human activity in the proximity of protected areas has been proposed in the Rocky Mountains as a proper HWI management tool [57]. Furthermore, in order to effectively understand and reduce conflicts between black bears (*Ursus americanus*) and people in the USA, Atwood and Breck [58] developed a framework with the emphasis on data regarding both social and economic factors and wildlife habitat loss. In a similar manner, Koening et al. [59] proposed a conceptual framework aiming to understand and manage various dimensions of HWI through an interdisciplinary and transdisciplinary approach, focusing on agricultural landscapes, where habitat loss represents one of the main triggers for problematic interactions.

In the Upper Prahova Valley of Romania, post-communist transformations have led to the development of suburbanization and excessive tourism activities in the proximity of areas with high conservation natural value ecosystems and wildlife habitats. This phenomenon has favoured the degradation of natural environment, it has developed artificial feeding habits among wild animals, and it has intensified interactions between humans and wildlife, exposing both parties to conflicts. In addition to the expansion of built-up areas, other factors that have contributed to the increase of human–wildlife interactions have been the recovery of wildlife population due to hunting regulations and the lack of food supply in wildlife feeding points by forest staff.

The results indicate that the development of a network of protected areas in Romania has still to achieve all its objectives, especially to improve the acceptance of locals and tourists concerning the protection of large predatory mammals, such as brown bears and grey wolves. Moreover, the internal zoning system of protected areas planned by the authorities is being contested by locals, who are dissatisfied with the fact that protected areas extend to the vicinity of human settlements and there is no form of fencing that could hinder the entry of wild animals into inhabited areas. Lastly, the locals vehemently contest tourist activities allowed by local authorities on protected area territories. The most relevant example is the one of Bușteni City Hall administration that permitted the construction of a large camping area in the proximity of the city, after 1990. The residents consider that tourists who camp there from spring to autumn are responsible for leaving large amounts of trash. All these have led to a change in the feeding habits of wild animals.

These driving forces can be controlled by increasing the collaboration among a complex range of entities involved in managing interactions with wild animals, such as decision–making authorities, researchers, conservationists, environmental activists, tourists and locals. Authorities should adapt upper-level decisions and regulations to both researchers or environmental conservationists' indications, and local stakeholders' needs [24]. In order to do so, a complex management must be elaborated. It must focus on a diverse pallet of methods which could take into account wildlife conservation, human welfare and economic development. These methods should include redesigning the internal zoning system of protected areas by regulating mass tourism development in the proximity of high conservation value natural habitats [57], enhancing landscape connectivity in areas where forest habitats were fragmented by developing ecological corridors for wild animals [56] and fostering efficient waste management in order to minimize wildlife habituation induced by artificial feeding [24].

5. Conclusions

The conclusion of this study states that it is vital to investigate the potential triggering factors and driving forces of negative HWI into depth in order to promote a sustainable economic and environment-friendly wildlife management.

The perception of local stakeholders plays a crucial role in understanding and enhancing the HWI problem. The attitude of the communities regarding HWI, be it positive or negative, is essential in balancing wildlife benefits determined by ecological management (focus on nature preservation, low impact tourism activities and wildlife effective control through organized hunting is preferred).

Also, landscape change models could represent an efficient and robust tool, suitable for revealing the potential landscape dysfunctions in terms of wildlife habitat loss, degradation or other human-induced disturbances. Further studies could indicate linkage with the HWI spatial and temporal manifestation pattern. The results could reveal hidden major HWI driving forces, by correlating the spatial distribution of HWI with landscape change models consisting in land cover conversions between natural classes which could potentially shelter wildlife habitats (such as forests) and built-up areas.

We consider that a highly connected collaboration between decision-making authorities, environmental research, conservationists and local stakeholders is crucial in order to sustain the healthy ecological recovery of viable wildlife population in human-dominated landscapes.

This approach could be enhanced through higher education and awareness of locals in terms of understanding the ecological and economic cohabitation with vulnerable and protected wildlife species. This could be achieved through awareness-raising events and science-based educational campaigns.

Author Contributions: *Ideas and conceptualization*, I.P.-S.; *methodology* I.P.-S.; *software*, M.M.; *validation*, M.M., *formal analysis*, I.P.-S. and M.M.; *investigation* M.M.; *writing* M.M. and I.P.-S.; *supervision*, I.P.-S., M.M. and I.P.-S. contributed equally to this work. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by grant provided by Doctoral School Simion Mehedinti, Faculty of Geography, University of Bucharest.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: Mihai Mustățea acknowledges the financial support received from the Doctoral School Simion Mehedinti, Faculty of Geography, University of Bucharest.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Reclassification of Corine Land Cover data.

Land Cover Classes from Corine Land Cover Data Set	Categories That Resulted from the Reclassification
Discontinuous urban fabric/Industrial or commercial units/Sport and leisure facilities	Built-up
Broad-leaved forest/Coniferous forests/Mixed forest	Forests
Pastures/Complex cultivation patterns/Natural grassland/Moors and heathland/Transitional woodland shrub/Beaches, dunes and sand plains/Bare rock	Other

Table A2. The location of survey sites where questionnaires have been applied within settlements and mountain massifs.

Survey Site Location (Settlement/Mountain Massif)	Bucegi Mountains	Baiului—Clăbucetele Predealului Mountains
Sinaia city	City centre Furnica neighbourhood Peleș Castle area	Cumpătu neighbourhood
Bușteni city	Valea Cerbului camping area Kalinderu ski area Cezar Petrescu neighbourhood	Zamora neighbourhood
Predeal city	-	Cioplea neighbourhood Clăbucet ski area

Table A3. Characteristics of the respondents.

Survey Site		Bucegi	Baiului—Clăbucetele Predealului
Gender of Respondent	M	161	42
F	140	49	
Type of household	Houses and apartment blocks	221	40
	Holiday houses	58	51
	Seasonal caravans	22	0
Social—economic status of respondent	Student	1	0
	Employee	182	62
	Retired	118	29

Table A4. The explanatory variables (driving forces) and response variables (presence and absence of species within a specific time period) used for the CCA analysis.

Driving Forces—Explanatory Variables
DF1-Poaching; DF13-Lack of herbivores or natural enemies DF2-Banning of hunting; DF3-The park rangers do not feed the animals; DF4-There are too many wild animals compared to how much the habitat can support; DF5-The animals are accustomed to artificial feeding; DF6-Humans have invaded their habitat due to the construction of houses, roads or touristic infrastructures; DF7-Wildlife habitats offer less food due to recent deforestation actions; DF8-The are affected by the intensive exploitation of mushrooms and berries; DF9-Relocations; DF10-The presence or absence of sheepfolds; DF11-The removal of the local dumpsite; DF12-Forest privatization leading to higher management intensities/shorter rotation periods; DF13-Lack of herbivores or natural enemies

Table A4. *Cont.*

Presence and Absence of Species within a Specific Time Period—Response Variables
V1-2015—present/brown bear; V2-2015—present/wild boar; V3-2015—present/red fox; V4-2015—present/grey wolf; V5-2010—2015/brown bear; V6-2010—2015/wild boar; V7-2010—2015/red fox; V8-2010—2015/grey wolf; V9-2000—2010/brown bear; V10-2000—2010/wild boar; V11-2000—2010/red fox; V12-2000—2010/grey wolf; V13-1990—2000/brown bear; V14-1990—2000/wild boar; V15-1990—2000/red fox; V16-1990—2000/grey wolf; V17-before 1990/brown bear; V18-before 1990/wild boar; V19-before 1990/red fox; V20-before 1990/grey wolf.

References

1. Carter, N.; Williamson, M.A.; Gilbert, S.; Lischka, S.A.; Prugh, L.R.; Lawler, J.J.; Metcalf, L.A.; Jacob, A.L.; Beltrán, B.J.; Castro, A.J.; et al. Integrated spatial analysis for human-wildlife coexistence in the American West. *Environ. Res. Lett.* **2020**, *15*, 021001. [CrossRef]
2. Barnes, M.; Craigie, I.; Harrison, L.; Geldmann, J.; Collen, B.; Whitmee, S.; Balmford, A.; Burgess, N.D.; Brooks, T.; Hockings, M.; et al. Wildlife population trends in protected areas predicted by national socio-economic metrics and body size. *Nat. Commun.* **2016**, *7*, 12747. [CrossRef] [PubMed]
3. Singh, N.; Sonone, W.; Dharaiya, N. Sloth bear attacks on humans in central India: Implications for species conservation. *Hum. Wildl. Interact.* **2018**, *12*, 338–347. [CrossRef]
4. Gagnon, J.W.; Loberger, C.D.; Sprague, S.C.; Ogren, K.S.; Boe, S.L.; Schweinsburg, R.E. Cost-effective approach to reducing collisions with Elk by fencing between existing highway structures. *Hum. Wildl. Interact.* **2015**, *9*, 248–264. [CrossRef]
5. Thornton, C.; Quinn, M.S. Coexisting with cougars: Public perceptions, attitudes, and awareness of cougars on the urban-rural fringe of Calgary, Alberta, Canada. *Hum. Wildl. Interact.* **2009**, *3*, 282–295. [CrossRef]
6. Kala, C.P.; Kothari, K.K. Livestock predation by common leopard in Binsar Wildlife Sanctuary, India: Human-wildlife conflicts and conservation issues. *Hum. Wildl. Interact.* **2013**, *7*, 325–333. [CrossRef]
7. Mponzi, B.P.; Lepczyk, C.A.; Kissui, B.M. Characteristics and distribution of live-stock losses caused by wild carnivores in Maasai steppe of Northern Tanzania. *Hum. Wildl. Interact.* **2014**, *8*, 218–227. [CrossRef]
8. Ceauşu, S.; Graves, R.A.; Killion, A.K.; Svenning, J.C.; Carter, N.H. Governing trade-offs in ecosystem services and disservices to achieve human–wildlife coexistence. *Conserv. Biol.* **2019**, *33*, 543–553. [CrossRef]
9. Malviya, M.; Ramesh, K. Human-felid conflict in corridor habitats: Implications for tiger and leopard conservation in terai arc landscape, India. *Hum. Wildl. Interact.* **2015**, *9*, 48–57. [CrossRef]
10. Rogers, L.L. Does diversionary feeding create nuisance bears and jeopardize public safety? *Hum. Wildl. Interact.* **2011**, *5*, 287–295. [CrossRef]
11. Sakurai, R.; Jacobson, S.K. Public perceptions of bears and management interventions in Japan. *Hum. Wildl. Interact.* **2011**, *5*, 123–134. [CrossRef]
12. Borah, J.; Bora, P.J.; Sharma, A.; Dey, S.; Sarmah, A.; Vasu, N.K.; Sidhu, N. Livestock depredation by bengal tigers at fringe areas of Kaziranga tiger reserve, Assam, India: Implications for large carnivore conservation. *Hum. Wildl Interact.* **2018**, *12*, 186–197. [CrossRef]
13. Biset, A.; Mengesha, G.; Girma, Z. Human-wildlife conflict in and around Borena Sayint National Park, Northern Ethiopia. *Hum. Wild. Interact.* **2019**, *13*, 111–124. [CrossRef]
14. Bruskotter, J.T.; Vucetich, J.A.; Karns, G.; Manfredo, M.J.; Wolf, C.; Ard, K.; Carter, N.H.; Lopez-Bao, J.; Gehrt, S.; Ripple, W.J. Modernization, risk and conservation of the world's largest carnivores. *Bioscience* **2017**, *67*, 646–655. [CrossRef]
15. Dickman, A.J. Complexities of conflict: The importance of considering social factors for effectively resolving human-wildlife conflict. *Anim. Conserv.* **2010**, *13*, 458–466. [CrossRef]

16. Knorn, J.; Kuemmerle, T.; Radeloff, V.C.; Szabo, A.; Mîndrescu, M.; Keeton, W.S.; Abrudan, I.; Griffiths, P.; Gancz, V.; Hostert, P. Forest restitution and protected area effectiveness in post-socialist Romania. *Biol. Conserv.* **2012**, *146*, 204–212. [CrossRef]
17. Popescu, V.; Pop, I.M.; Chiriac, S.; Rozylowicz, L. Romanian carnivores at a crossroads. *Science* **2019**, *364*, 1041. [CrossRef]
18. Manea, G.; Tișcovschi, A.; Vijulie, I.; Matei, E.; Cuculici, R.; Preda, M.; Cocoș, O. Inter-specific relationships within protected areas of Romania—Case study: The cohabitation between Homo sapiens sapiens and Ursus arctos arctos in Harghita Mountains. *J. Environ. Tour. Anal.* **2018**, *6*, 5–18. [CrossRef]
19. Stancioiu, P.T.; Dutca, I.; Bălăcescu, M.C.; Ungurean, Ș.V. Coexistence with bears in Romania: A local community perspective. *Sustainability* **2019**, *11*, 7167. [CrossRef]
20. Hartel, T.; Scheele, B.C.; Vanak, A.K.; Rozylowicz, L.; Linnell, J.D.C.; Ritchie, E.G. Mainstreaming human and large carnivore coexistence through institutional collaboration. *Conserv. Biol.* **2019**, *33*, 1256–1265. [CrossRef]
21. Dorresteijn, I.; Milcu, A.I.; Leventon, J.; Hanspach, J.; Fischer, J. Social factors mediating human–carnivore coexistence: Understanding thematic strands influencing coexistence in Central Romania. *Ambio* **2016**, *45*, 490–500. [CrossRef] [PubMed]
22. Chiriac, S.; Pop, M.I.; Sin, T.; Gazzola, A.; Berde, L.G.; Szabó, S. *Lupul Mit, Realitate, Conservare*; Green Steps: Brașov, Romania, 2017; ISBN 978-606-8484-74-7.
23. Janoska, F.; Farkas, A.; Marosan, M.; Fodor, J.T. Wild boar (sus scrofa) home range and habitat use in two Romanian habitats. *Acta Silv. Lign. Hung.* **2018**, *14*, 51–63. [CrossRef]
24. Pătru-Stupariu, I.; Niță, A.; Mustătea, M.; Huzui-Stoiculescu, A.; Fürst, C. Using social network methodological approach to understand human-wildlife interactions. *Land Use Policy* **2020**, *99*, 105009. [CrossRef]
25. Ionescu, O. Managementul Carnivorelor Mari în România. Ph.D. Thesis, University of Transylvania, Brașov, Romania, 2016. Available online: http://old.unitbv.ro/Portals/31/Abilitare/Teze/Teza/05-%20Ionescu-teza%20abilitare%20RO.pdf (accessed on 29 January 2021).
26. Pătru-Stupariu, I.; Angelstam, P.; Elbakidze, M.; Huzui, A.; Andersson, K. Using spatial patterns and forest history to identify potential high conservation value forests in Romania. *Biodivers. Conserv.* **2013**, *22*, 2023–2039. [CrossRef]
27. Bartók, A.; Irimia, I. New location of the critically endangered astragalus penduliflorus lam. in Bucegi Nature Park (Bucegi Mts., Southeastern Carpathians). *Analele Stiintifice ale Universitatii Al. I. Cuza din Iasi* **2015**, *61*, 57–65. Available online: http://www.bio.uaic.ro/publicatii/anale_vegetala/anale_veg_index.html (accessed on 29 January 2021).
28. Pătru-Stupariu, I.; Stupariu, M.S.; Cuculici, R.; Huzui, A. Understanding landscape change using historical maps. Case study Sinaia, Romania. *J. Maps* **2011**, *7*, 206–220. [CrossRef]
29. Pătru-Stupariu, I. *Peisaj și Gestiunea Durabilă a Teritoriului. Aplicații la Culoarul Transcarpatic Bran-Rucăr-Dragoslavele*; University of Bucharest Publishing House: Bucharest, Romania, 2011; ISBN 978-606-16-0011-3. (In Romanian)
30. Van Eetvelde, V.; Käyhkö, N. The applicability of quantitative techniques for assessing spatio-temporal patterns of landscape changes. In Proceedings of the European IALE Conference, Salzburg, Austria, 12–16 July 2009; pp. 379–382.
31. Peña, J.; Bonet, A.; Bellot, J.; Sánchez, J.R.; Eisenhuth, D.; Hallett, S.; Aledo, A. Driving forces of land-use change in a cultural landscape of Spain. A preliminary assessment of the human-mediated influences. In *Modeling Land Use-Change. Progress and Applications*; Koomen, E., Stillwell, J., Bakema, A., Scholten, H., Eds.; Springer: Dordrecht, Germany, 2007; Volume 90, pp. 97–115.
32. Solow, A.; Smith, W. Using Markov chain successional models backwards. *J. Appl. Ecol.* **2006**, *43*, 185–188. [CrossRef]
33. European Environmental Agency. Corine Land Cover 1990, 2000, 2006, 2012, 2018. Available online: https://land.copernicus.eu/pan-european/corine-land-cover/clc2018 (accessed on 15 June 2020).
34. Rozylowicz, L.; Popescu, V.D.; Pătroescu, M.; Chisamera, G. The potential of large carnivores as conservation surrogates in the Romanian Carpathians. *Biodiv. Conserv.* **2011**, *20*, 561–579. [CrossRef]
35. Pătru-Stupariu, I.; Pascu, M.; Bürgi, M. Exploring tangible and intangible heritage and its resilience as a basis to understand the cultural landscapes of Saxon communities in Southern Transylvania (Romania). *Sustainability* **2019**, *11*, 3102. [CrossRef]
36. Legendre, P.; Legendre, L. *Numerical Ecology*, 2nd ed.; Elsevier: New York, NY, USA, 1999; ISBN 9780080523170.
37. Niță, A.; Buttler, A.; Rozylowicz, L.; Pătru-Stupariu, I. Perception and use of landscape concepts in the procedure of Environmental Impact Assessment; case study—Switzerland and Romania. *Land Use Policy* **2015**, *44*, 145–152. [CrossRef]
38. Griffiths, P.; Müller, D.; Kuemmerle, T.; Hostert, P. Agricultural land change in the Carpathian ecoregion after the breakdown of socialism and expansion of the European Union. *Environ. Res. Lett.* **2013**, *8*, 045024. [CrossRef]
39. Suditu, B. Urban sprawl and residential mobility in the Bucharest area—Reconfiguration of a new residential geography. *Hum. Geogr.* **2009**, *3*, 79–93. Available online: http://humangeographies.org.ro/articles/32/326_Suditu.pdf (accessed on 29 January 2021).
40. Turnock, D. Ecoregion-based conservation in the Carpathians and the land-use implications. *Land Use Policy* **2002**, *19*, 47–63. [CrossRef]
41. Chapron, G.; Kaczensky, P.; Linnell, J.D.C.; von Arx, M.; Huber, D.; Andrén, H.; Lopez-Bao, J.V.; Adamec, M.; Alvares, F.; Anders, O.; et al. Recovery of large carnivores in Europe's modern human-dominated landscapes. *Science* **2014**, *346*, 1517–1519. [CrossRef] [PubMed]
42. Geisser, H.; Heinz-Ulrich, R. The influence of food and temperature on population density of wild boar Sus scrofa in the Thurgau (Switzerland). *J. Zool.* **2005**, *267*, 89–96. [CrossRef]
43. Vetter, S.G.; Ruf, T.; Bieber, C.; Arnold, W. What is a mild winter? Regional differences in within-species responses to climate change. *PLoS ONE* **2015**, *10*, e0132178. [CrossRef]

44. Popescu, V.D.; Artelle, K.A.; Pop, M.I.; Manolache, S.; Rozylowicz, L. Assessing biological realism of wildlife population estimates in data-poor systems. *J. App. Ecol.* **2016**, *53*, 1248–1259. [CrossRef]
45. Linnell, J.; Salvatori, V.; Boitani, L. *Guidelines for Population Level Management Plans for Large Carnivores in Europe. A Large Carnivore Initiative for Europe Report Prepared for the European Commission*; Contract nr. 070501/2005/424162/MAR/B2; European Commission: Brussels, Belgium, 2008.
46. Fortin, J.K.; Rode, K.D.; Hilderbrand, G.V.; Wilder, J.; Farley, S.; Jorgensen, C.; Marcot, B. Impacts of human recreation on brown bears (Ursus arctos): A review and new management tool. *PLoS ONE* **2016**, *11*, e0141983. [CrossRef]
47. Pătru-Stupariu, I.; Hossu, C.A.; Gradinaru, S.R.; Nita, A.; Stupariu, M.S.; Huzui-Stoiculescu, A.; Gavrilidis, A.A. A Review of changes in mountain land use and ecosystem services: From theory to practice. *Land* **2020**, *9*, 336. [CrossRef]
48. Kretser, H.E.; Curtis, P.D.; Knuth, B.A. Landscape, social, and spatial influences on perceptions of human-black bear interactions in the Adirondack Park, NY. *Hum. Dimens. Wildl.* **2009**, *14*, 393–406. [CrossRef]
49. Ghosal, S.; Skogen, K.; Krishnan, S. Locating human-wildlife interactions: Landscape constructions and responses to large carnivore conservation in India and Norway. *Conservat. Soc.* **2015**, *13*, 265–274. [CrossRef]
50. Gimmi, U.; Radeloff, V.C. Assessing naturalness in Northern great lakes forests based on historical land-cover and vegetation changes. *Environ. Manag.* **2013**, *52*, 481–492. [CrossRef] [PubMed]
51. Paviolo, A.; DeAngelo, C.; Ferraz, K.M.P.M.B.; Morato, R.G.; Pardo, J.M.; Srbek-Araujo, A.C.; Beisiege, B.; Lima, F.; Sana, D.; Xavier da Silva, M.; et al. Biodiversity hotspot losing its top predator: The challenge of jaguar conservation in the Atlantic Forest of South America. *Sci. Rep.* **2016**, *6*, 37147. [CrossRef] [PubMed]
52. Dubois, S.; David Fraser, D. A Framework to evaluate wildlife feeding in research, wildlife management, tourism and recreation. *Animals* **2013**, *3*, 978–994. [CrossRef]
53. Ruben, I.; Pop, M.I.; Chiriac, S.; Sandu, R.M.; Berde, L.; Rozylowicz, L.; Popescu, V. Den structure and selection of denning habitat by brown bears in the Romanian Carpathians. *Ursus* **2020**, *31e5*, 1–13. [CrossRef]
54. Roellig, M.; Dorresteijn, I.; von Wehrden, H.; Hartel, T.; Fischer, J. Brown bear activity in traditional wood-pastures in Southern Transylvania, Romania. *Ursus* **2014**, *25*, 43–52. [CrossRef]
55. Dorresteijn, I. Human-carnivore coexistence in a traditional rural landscape. *Landsc. Ecol.* **2014**, *29*, 1145–1155. [CrossRef]
56. Goldthorpe, G. Human-Wildlife Conflict Mitigation Toolkit. EU LIFE + Project. Enhancing Landscape Connectivity for Brown Bear and Wolf through a Regional Network of NATURA 2000 Sites in Romania. 2017. Available online: http://connectcarpathians.ro/wp-content/uploads/2017/06/Human-wildlife-conflict-mitigation-toolkit.pdf (accessed on 29 January 2021).
57. Proctor, M.F.; Kasworm, W.F.; Annis, K.M.; MacHutchon, A.G.; Teisberg, J.E.; Radandt, T.G.; Servheen, C. Conservation of threatened Canada-USA trans-border grizzly bears linked to comprehensive conflict reduction. *Hum. Wildl. Interact.* **2018**, *12*, 348–372. [CrossRef]
58. Atwood, T.C.; Breck, S.W. Carnivores, conflict, and conservation: Defining the landscape of conflict. In *Carnivores: Species, Conservation, and Management*; Álvares, F.I., Guilherme, E.M., Eds.; University of Nebraska: Lincoln, NB, USA, 2012. Available online: https://digitalcommons.unl.edu/icwdm_usdanwrc/1620 (accessed on 29 January 2021).
59. König, H.J.; Kiffner, C.; Kramer-Schadt, S.; Fürst, C.; Keuling, O.; Ford, A.T. Human-wildlife coexistence in a changing world. *Conserv. Biol.* **2020**, *34*, 786–794. [CrossRef]