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Research

Citizens' attitudes toward the protection of flying squirrels in urban areas

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ABSTRACT. The Siberian flying squirrel (*Pteromys volans*) is included among the strictly protected species of the Habitats Directive (92/43/EC) of the European Union, which is one of the key instruments for biodiversity preservation in Europe. Strict protection of the species has a potential to cause conflicts in areas where forest management and urban development compete for the same space with the flying squirrel. This study examined attitudes of Finnish citizens toward the protection of flying squirrels in urban areas using survey data collected in three cities: Espoo, Jyväskylä, and Kuopio. Two samples (random and self-selection samples) were collected to investigate how the specific process of giving "voice" to citizens by polls in urban planning affects the results. The analysis was conducted by integrating factor and cluster analysis and multinomial logistic regression modeling. Four attitude groups of citizens were identified and named: "neutral on protection" (share of respondents: 33%), "strongly in favor of protection" (32%), "somewhat against protection" (26%), and "strongly against protection" (9%). Several individual-specific factors were found to be associated with the probability of belonging to different attitude groups. For example, female respondents had a higher probability of belonging to the group that was strongly in favor of protection, and older respondents had a higher probability of belonging to groups against protection. Respondents of the self-selection sample had a higher probability of belonging to the "strongly in favor of protection" group. They therefore had a more positive attitude toward the protection of flying squirrels than the other respondents. This finding indicates that cities may gain an overly positive view of citizens' attitudes toward the protection of flying squirrels through current public participation methods based on self-selection procedures, such as public hearings used in land use planning.

Key Words: *biodiversity conservation; conflict resolution; forest management; habitats directive; human-environment relationship; land use planning*

INTRODUCTION

The Siberian flying squirrel (*Pteromys volans*; henceforth flying squirrel) is included among the strictly protected species of the Habitats Directive (92/43/EC) of the European Union (EU). Because the directive is one of the key instruments for biodiversity preservation in Europe, deterioration and destruction of any of the flying squirrel's breeding sites or resting places is prohibited. Strict protection of the species has potential to cause conflicts in areas where forest management and urban development compete with the flying squirrel for the same space.

Flying squirrels are herbivorous, nocturnal, and arboreal rodents that live principally in boreal forests (Hanski et al. 2000). The ecology and occupancy patterns of flying squirrels are well studied (see Selonen and Mäkeläinen 2017 for a review). Flying squirrels are found only in Finland and Estonia among EU member countries. In Finland, its primary habitats are mature mixed forests dominated by Norway spruce (*Picea abies*), where the spruce provides cover and deciduous trees provide essential food sources (Hanski 1998, Reunanen et al. 2000, 2002). These habitat types have been either qualitatively changed, fragmented, or lost because of forest management (Selonen et al. 2001, Lampila et al. 2009). As a consequence, flying squirrel populations have declined from 140,000 in 2006 (Hanski 2006) by 23% in 2015 (Ministry of the Environment 2022), and their conservation status was moved from nearly threatened (NT) to vulnerable (VU) in the latest threat status assessment in Finland (Liukko et al. 2019).

Flying squirrels also live in urban green areas less intensively managed for timber production. For "urban" flying squirrels, forest edges near residential areas and forest fragments within suburbs (Mäkeläinen et al. 2015), parks and forested recreational areas, and even private gardens may act as part of their living habitat if the overall amount of suitable habitat is large enough (Haila et al. 2007).

The flying squirrel has been used as an indicator species for sustainable forestry (Vierikko et al. 2010) and for high ecological value of habitats (Kangas et al. 2016). Interest conflicts have arisen, however, between the need to protect flying squirrels, to manage forests, and to enforce urban development (Haila et al. 2007). Probability of the occurrence of flying squirrels increases unpredictability to planning (Nygren and Peltola 2020), and findings of existing habitats have occasionally hampered or slowed down development projects (Haila et al. 2007). In peri-urban areas (i.e., adjacent to a city or another urban area) and rural areas, protection of flying squirrels has caused loss of harvest income for forest owners, raising feelings that strict protection violates property rights (Jokinen et al. 2018) and may be affecting attitudes toward the species and its protection. The lost freedom for logging has even been found to provoke claims of harming the species (Jokinen et al. 2018).

Attitudes typically are composed of several values and beliefs related to a certain object (Rokeach 1973) and can be regarded as evaluation ranging from negative to positive, from liking to disliking, from love to hate, or in favor to against (e.g., Dressel et al. 2015). Citizens' attitudes may also play an important role in protecting flying squirrels in urban areas. The species is frequently framed as physically attractive and is formally classified as vulnerable, which may increase citizens' support toward protection (for the role of above-mentioned frames, see Gunnthorsdottir 2001). Protection may also be supported among

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citizens whose direct material self-interests are not at stake (Sears and Funk 1991, Lau and Heldman 2009). Positive attitudes toward flying squirrels and their protection may therefore result in active resistance to activities perceived as threatening to the species, or in open opposition to specific development proposals. In contrast, strongly negative attitudes to flying squirrels can undermine public trust in urban governance and land use planning.

In most European countries, citizens can participate in local governance, including land use planning (European Committee of the Regions 2019). Public participation may provide valuable local information and is expected to increase sustainable decisions and acceptability of urban planning (Kahila-Tani et al. 2016). For example, in Finland, urban planning and guiding legislation enable a set of participation opportunities at different stages of the process. The Land Use and Building Act (132/1999) provides opportunities for landowners and other parties to participate and state opinions, with substantial impacts on preparing the plan and in estimating its impact. In the case of flying squirrels, this could mean the breeding and resting sites are located within the planning area. Citizens can give their opinions at the introductory phase of planning, to the draft plans, and eventually they can even complain about the approved plan. The Forest Act (1093/1996) requires forest owners to inform authorities about their intentions for managing a forest with breeding and resting sites and enables forest owners to receive consultation from the authorities. The Act on the Environmental Impact Assessment Procedure (252/2017), in turn, requires the authority to ensure that the necessary statements on the assessment program (e.g., building project, possibly concerning breeding and resting sites) are requested and that there is an opportunity to submit opinions.

Regardless of being broadly inclusive to citizens, public participation in the planning process may require personal effort. It may also include the types of discursive practices, competence, skills, and practices of participation that affect who participates. In the case of land use planning affecting flying squirrels, public hearings or self-selected polls may not represent citizens' perceptions in general. From the point of view of the acceptability of plans and measures, it may be necessary, at least from time to time, to survey views in more representative ways (e.g., by surveys based on random samples) and to explore the role that self-selection of participation plays in it.

Peoples' attitudes toward species protection have been studied in different contexts in previous studies (e.g., Liordos et al. 2017, Cerri et al. 2020, Dunn et al. 2021, Basak et al. 2022). The findings show, for example, that aesthetic and moralistic attitudes may predict the level of support for protection. Demographic characteristics, such as age, gender, and education level, have also been found to be important factors influencing attitudes toward species protection. However, attitudes of lay citizens in relation to flying squirrels have not yet been quantitatively explored, to our knowledge, in research literature. This research aims to understand factors influencing citizens' attitudes toward flying squirrels to help decision makers and planners reconcile various needs, in particular for protection and economic development. The research questions were: (1) How do attitudes toward the protection of flying squirrels differ among groups of residents? (2) How are individual-specific factors, including variables related to the socioeconomic characteristic of respondents (e.g., gender, age, education) and the type of personal interest in the issue (here: forest ownership), associated with the attitudes of residents? and (3) How does the specific process of giving "voice" to citizens by polls (i.e., self-selection or random sampling) affect the results? It is expected that citizens have different views on the protection of the flying squirrel that are associated with respondent-specific factors. In particular, self-selected respondents are expected to have stronger opinions and stronger motivation to participate than randomly selected respondents. A survey for the analysis was conducted in three cities in southern and central Finland. The attitudes of citizens were measured by a set of statements regarding the values and beliefs about the protection of flying squirrels and its consequences.

METHODS

Study areas

According to the Finnish Biodiversity Information Facility (laji.fi), observations on the flying squirrel, based principally on droppings, were concentrated in the capital region, Jyväskylä and Kuopio areas, as well as around other cities in southern Finland. In these regions three cities (Espoo, Jyväskylä and Kuopio) were chosen as case locations for the study (Fig. 1). Espoo, Finland's second largest city, is situated next to the capital city of Helsinki (60°20′ N, 24°65′ E), within the southern boreal zone. The city of Jyväskylä is situated in central region of Finland (62°24′ N, 25°74′ E), within the middle boreal zone. The city of Kuopio is located in the region of Northern Savonia (62°53′ N, 27°40′ E), within the middle boreal zone. Hence, Espoo represents a densely populated, large Finnish city in southern Finland, whereas Jyväskylä and Kuopio represent medium-sized Finnish cities in central Finland (Table 1). The proportion of land area covered by forests and semi-natural areas is lower in Espoo than in Jyväskylä and Kuopio. All of these cities have several parks and recreational facilities that are popular for various outdoor activities, such as walking, running, cycling, commuting, and skiing during the winter.

Data collection

This study was carried out in a project that aimed at promoting the protection of flying squirrels in Europe by safeguarding the essential habitat networks for the species' survival. The aim was also to develop and harmonize policies to reconcile the needs of land use and the protection of flying squirrels. The data were collected as a part of a Public Participation Geographic Information System (PPGIS) survey that was conducted in the three above-mentioned cities. The main purpose of the survey was to collect data on specific places that are important for residents from the viewpoint of outdoor recreation within cities. However, information about respondents' background and relationship with and attitude toward flying squirrels and their protection were also collected. Respondents' attitudes toward the protection of flying squirrels were queried with 21 statements by using a 5-point Likert scale, from "strongly disagree" to "strongly agree." The statements consisted of both object statements and statements of beliefs about consequences of the

Fig. 1. Location map of study areas in Finland.

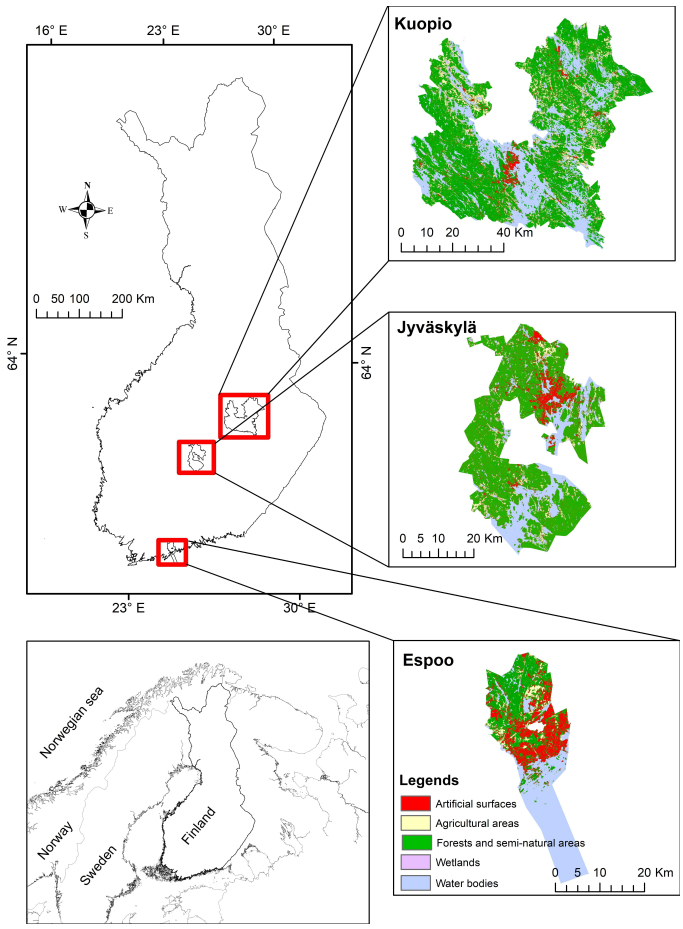


Table 1. Area, human population density, green area cover, and temperature of the study areas.

	Espoo	Jyväskylä	Kuopio
Area, km²	528	1466	1127
Human population density, population per area (km²)	549	96	106
Green area cover, %	33	67	63
Annual mean temperature, °C	5.5	3.7	3.6

Source: City of Espoo (2021), City of Jyväskylä (2021), City of Kuopio (2021).

protection. The web-based survey was pretested before launching by a test group (land use experts and citizens) and usability of the survey was improved on the basis of their feedback.

To explore the role of specific process of giving "voice" to citizens by polls, the survey was targeted at two types of samples. The first sample consisted of 18- to 80-year-old citizens who were invited by using a random quota sampling (hereafter, random sample) of 1500 households per city. Their addresses were drawn from the Finnish Population Information System provided by the Population Register Centre. Minors were not included because they cannot manage their affairs without the consent of their guardians. In Finland, 18-year-olds are considered to be adults, with the right to vote. A reminder was sent a few weeks after the first invitation letter. The second sample (hereafter, self-selection sample) was collected by advertising an open survey through social media (Facebook and Twitter), print media, and webpages of the three cities. The latter sample enabled us to explore which segment of the population shows special interest toward flying squirrel management (i.e., participation indicates "revealed relevance") and how it is associated with the attitude grouping. The survey for both sample groups was open for three months, from November 2020 to February 2021.

Statistical analyses

To identify whether there are several attitude groups among citizens and to explore covariates that predict belonging to each of them, the two samples were pooled for the analysis. The analysis was conducted by integrating factor and cluster analysis and multinomial logistic regression modeling. In the multinomial regression modeling, the samples were controlled with a dummy variable for the self-selection sample.

The responses to the 21 attitude statements were combined as latent attitude factors by using factor analysis. Descriptive statistics stated that not all statement-specific response frequencies followed a normal distribution and thus, generalized least square was chosen as a factor extraction method (e.g., Tabachnick and Fidell 2007). Factor analyses were conducted in three phases to simplify the interpretation of results and represent strong effects of the statements. In the first phase, all statements (n = 21) were included. In the second phase, statements with a communality value (proportion of variance) less than 0.3 were removed from the list. In the third phase, a loading value (i.e., the contribution of each statement to the factor) higher than 0.50 was used to screen the statements (a total of 16 statements) for K-means cluster analysis. During the factor analysis, the oblique promax rotation was chosen as a rotation method that allows factors to be correlated (e.g., Koskela and Karppinen 2020). Cronbach's alpha (Tavakol and Dennick 2011) estimates were calculated to describe factors' internal consistency, i.e., to show how well the set of statements on a factor measures the same concept. The Kaiser-Meyer-Olkin test was used to measure sampling adequacy and Bartlett's test ($p < 0.01$) was used to assess the data suitability for factor analysis.

The factor scores were used as input for the K-means cluster analysis, which was utilized to classify respondents into groups on the basis of their attitudes toward the protection of flying squirrels (e.g., Kuuluvainen et al. 1996, Hujala et al. 2013). Using the identified attitude groups as a dependent variable, a multinomial logistic regression model was then applied to test whether respondents' characteristics were associated with membership of specific attitude groups (Hosmer et al. 2013). Notice that one group is used as a reference category for the dependent variable in the parameter estimations when applying a multinomial regression model. The signs of the estimated coefficients must therefore be interpreted in relation to the reference group. In addition, the results of the multinomial logistic regression model cannot be interpreted in terms of magnitude of coefficients. Hence, to facilitate the interpretation,

Table 2. Explanatory variables used to model attitude groups.

Variable[†]	Description (dummy = 1)	Mean	n[‡]
OPEN	A respondent is included in the self-selection sample	0.246	569
MALE	A respondent is male	0.455	565
OVER60	A respondent is over 60 years old	0.240	563
FORESTER	A respondent is a forest owner	0.196	565
EFFECT_YES	The presence of the flying squirrel has had an impact on the use and maintenance of property of respondent	0.042	565
CITY_YES	A respondent agreed with the statement that the city provides adequate information on the protection of the flying squirrel	0.160	568
OCCINF_YES	A respondent has had information about the occurrence of flying squirrel in the forests of the city	0.568	567

[†] Variables are dummy coded.
[‡] Because of item non-responses, the number of observations varied among the variables. After dropping out the item non-responses, the number of observations used in the multinominal logistic regression model was 553.

a marginal effect analysis was also conducted (Economic Software 2020). The factor and cluster analysis were conducted by SPSS software (IBM SPSS Statistics 2022) and the multinomial analysis by NLOGIT software (Economic Software 2020).

After explorative investigation, seven explanatory variables were included in the final multinomial logistic regression model. The variables used to model the attitude groups included background characteristics and socio-demographic factors of respondents (e.g., type of sample, gender, age class, forest owning status), perceived effects of flying squirrels on property, and knowledge about the species and its protection (Table 2). Importantly, dummy variables for the cities were also tested, but these were not significant and therefore were not included in the final model specification. The variables for type of residence (e.g., apartment building or detached house), education, and professional status (employee, entrepreneur, unemployed, retired, etc.) also did not have a statistically significant effect.

RESULTS

Respondent characteristics

A total of 941 responses were received, of which 626 were from the random sample. The city-specific number of responses in Espoo, Kuopio, and Jyväskylä were 234 (response rate: 16%), 173 (12%), and 219 (15%) for random samples, respectively. Not all respondents answered all of the questions. The number of responses used in the final analysis was 569 (60%), after excluding the responses of persons who did not respond to the complete set of attitude statements. The proportions of the remaining respondents in the final analysis were relatively evenly distributed among the cities. Espoo held the highest number with 36%, whereas the proportion of Kuopio was 34% and Jyväskylä 30%. However, the number of respondents in the self-selection sample had more variation among the cities than in the random sample.

Most of the statistically significant differences between the average population and respondents appeared in the self-selection sample (Table 3). In this sample, the proportion of females was notably higher than in the population in each city, but the difference was found to be statistically significant only in Espoo and Kuopio. Notice that the number of responses for self-selection sample of Jyväskylä was only 19, which is why it was difficult to find statistical significance. The age class of 30- to 39-year-old respondents was over-represented in the self-selection sample, but the difference was statistically significant only in Kuopio, where 40- to 49-year-olds held a notable share as well. In addition, the self-selection sample under-represented citizens over 70 years old. The highest level of education differed significantly between the respondents and the average population in every city and both samples. Basic education was remarkably under-represented among respondents, whereas academic degree was over-represented. The distribution of present occupation in the random sample followed relatively well the population characteristics, whereas the share of employed responders was higher in the self-selection sample compared with the average population.

Respondents' attitudes toward the protection of flying squirrels

A relatively high proportion of positive attitudes toward the protection of flying squirrels was observed overall. For most of the statements (14 out of 21), more than 50% of responses belonged to the categories "somewhat agree" and "strongly agree" or to the categories "somewhat disagree" and "strongly disagree" in the case of positive and negative statement formats, respectively (Fig. 2). For example, respondents typically had little personal negative experience with the protection of the squirrels and did not experience specific hazards related to their protection, because they disagreed (≥ 80%) with the statements "Protection of flying squirrel has caused me harm" and "The protection of flying squirrel poses dangerous situations to humans" (statements 21 and 18 shown in Fig. 2). In addition, respondents typically considered the protection of the squirrels to be justified, because most of them disagreed (≥ 69%) with the statement "There are so many flying squirrels that there is no need to protect the species" and agreed (≥ 81%) with the statement "Protection of the flying squirrel is important because the survival of the species is threatened" (statements 15 and 19). Normative motives also emerged, because the majority of respondents agreed (≥ 66%) with the statements "Future generations will benefit from the protection of the flying squirrel" and "Human beings have a duty to protect the flying squirrel" (statements 11 and 14). The attitudes of respondents were more diverse with the statements related to the effects of protection of flying squirrels on forestry and urban development (statements 5–8).

Table 3. Population and responder characteristics by city and by sample type (i.e., self-selection and random sample).

	Espoo			Jyväskylä			Kuopio		
	Population average[†]	Self-selection sample	Random sample	Population average[†]	Self-selection sample	Random sample	Population average[†]	Self-selection sample	Random sample
Gender (%)		n = 46***	n = 152*		n = 19	n = 152		n = 73***	n = 119
Female	50.5	71.7	43.4	50.9	73.7	46.7	51.5	72.6	56.3
Male	49.5	28.3	56.6	49.1	26.3	53.3	48.5	27.4	43.7
Age class (%)		n = 48	n = 151		n = 19[‡]	n = 154		n = 72***	n = 119
18–29	20.9	16.7	18.5	27.5	5.3	22.1	23.3	15.3	21.0
30–39	20.9	33.3	19.9	18.1	52.6	19.5	16.9	25.0	14.3
40–49	19.0	16.7	15.2	14.6	5.3	14.9	13.9	30.6	15.1
50–59	16.8	18.8	20.5	14.6	15.8	20.1	16.7	15.3	16.8
60–69	12.6	12.5	13.2	14.1	15.8	14.9	16.8	8.3	19.3
70–79	9.8	2.1	12.6	11.0	5.3	8.4	12.4	5.6	13.4
Highest education (%)		n = 47***	n = 152***		n = 19[¶]	n = 153[§]***		n = 73***	n = 118***
Basic education	19.2	0.0	3.9	16.9	0.0	3.9	18.4	0.0	5.1
Upper secondary school	10.4	6.4	9.2	9.7	10.5	11.1	7.6	11.0	7.6
Vocational school	29.8	12.8	19.7	44.2	10.5	32.0	48.9	15.1	35.6
Lower academic degree	16.0	21.3	26.3	15.4	26.3	24.2	13.6	26.0	26.3
Higher academic degree	24.6	59.6	40.8	13.8	52.6	28.8	11.4	47.9	25.4
Present occupation (%)		n = 48[|]**	n = 152		n = 19[|]	n = 154**		n = 73***	n = 119
Employed	59.5	77.1	55.3	51.0	57.9	53.2	50.6	71.2	50.4
Unemployed	4.8	4.2	2.0	7.3	5.3	7.8	5.8	5.5	5.0
Student	9.8	6.3	13.8	12.4	21.1	18.8	10.6	9.6	14.3
Retired	20.9	8.3	22.4	25.8	5.3	16.9	30.2	11.0	26.9
Other	5.0	4.2	6.6	3.5	10.5	3.2	2.8	2.7	3.4

***, **, * statistical significance for the test of differences between population and self-selection/random sample, χ^2-test at 1%, 5%, 10% level (some categories were reshaped to meet the requirements of the test).
[†] Open data by postal code area, Statistics Finland, source: https://www.stat.fi/org/avoindata/paikkatietoaineistot/paavo_en.html.
[‡] To calculate statistical significance, reshaped age class = 18–39, 40–59, 60–79.
[§] To calculate statistical significance, reshaped highest education = basic education level, lower academic degree, higher academic degree.
[|] To calculate statistical significance, reshaped present occupation = employed, other.
[¶] Unable to calculate statistical significance because of a small number of observations in basic education levels.

Attitude groups of respondents

As results of factor analysis, two factors were determined on the basis of eigenvalues (larger than 1) that were labeled as positive attitudes toward protection (first factor) and negative attitude toward protection (second factor; Table 4). Cronbach's alpha proposed internally consistent factors with the estimates of 0.94 and 0.88 for the first and second factors. The first factor explained 54% variability of the data.

The classification of respondents into four attitude groups turned out to be most clearly interpretable, and the groups were labeled as "strongly against protection" measures, "somewhat against protection" measures, "neutral" on protection measures, and "strongly in favor" of protection measures (Table 5).

The largest share of respondents (33%) belonged to the attitude group with neutral or ambivalent opinions on flying squirrels' protection (Table 5). They had a somewhat positive attitude but also considered flying squirrels to be causing some adverse effects. The second largest group (32%) of the respondents strongly supported the species and its protection measures. The rest of the groups were clearly against protection, with 26% considering the measures somewhat negative and 9% having steep opinions on undesirable effects.

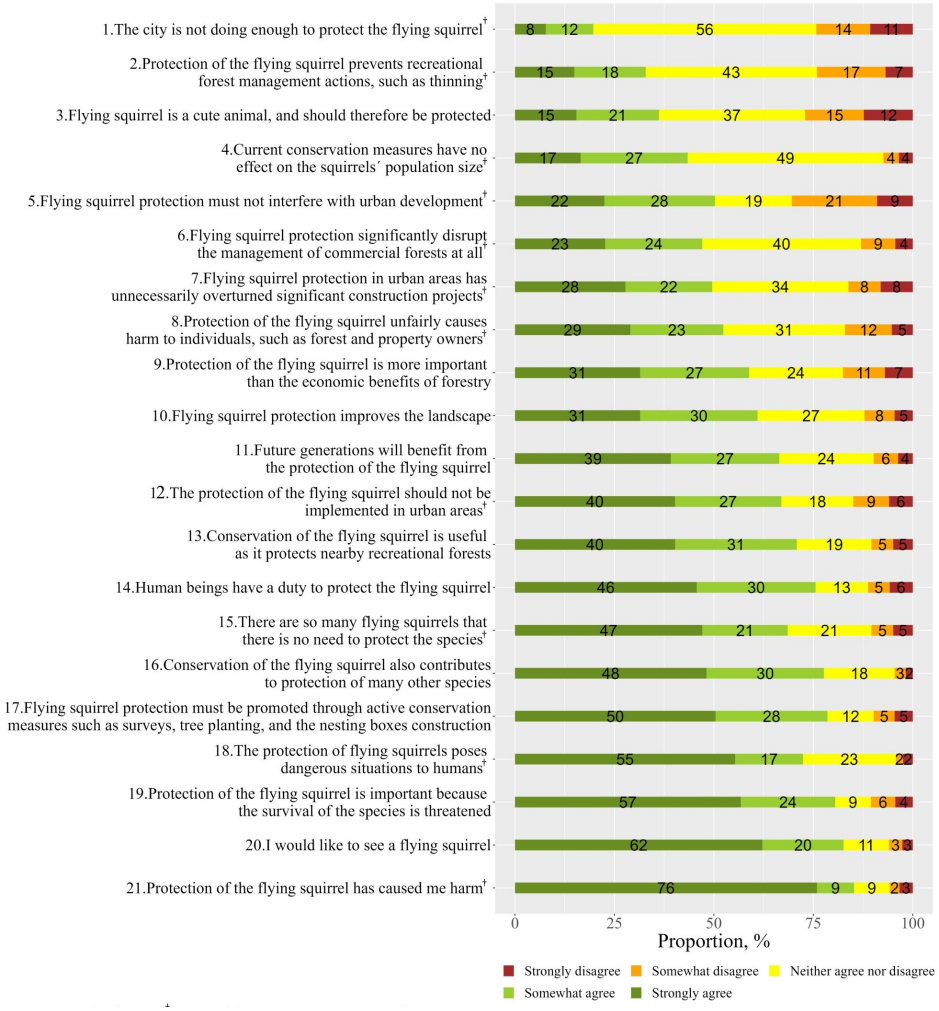
Individually specific factors associated with the attitude groups

According to the results of the multinomial logistic regression model, respondents of the self-selection sample (variable OPEN) belonged less probably to the attitude groups "somewhat against" or "neutral" on flying squirrels' protection than to the "strongly against" group, which was the reference category for the dependent variable (Table 6). The marginal effect analysis showed that respondents of the self-selection sample belonged more probably to the group "strongly in favor of protection" and less probably to the groups "somewhat against protection" and "neutral on protection" (Table 7).

Being male (MALE) was not a statistically significant attribute in any group (Table 6), but marginal effects analysis showed a weak indication that male respondents belonged less probably to the "strongly in favor of protection" group than did female respondents (Table 7).

Respondents who were over 60 years old (OVER60) were more likely to belong to the "strongly against protection" group than any other group, according to the negative coefficients, but the group with the neutral attitude was the only statistically significant one (Table 6). Notice, however, that according to the

Fig. 2. Distribution of unweighted responses to the attitude statements. The dagger (†) symbol depicts that the original Likert scale of responses was inverted, because the statement was in negative format.



results of marginal effects, the probability of belonging to the two groups opposing protection was larger for over-60-year-old respondents (Table 7).

Forest owners (as self-interest persons, FORESTER) were most likely to be included in the "strongly against protection" attitude group (Tables 6 and 7). The perceived impact of flying squirrels on their own property (i.e., having experience of direct effect, EFFECT_YES) was negative and significant in the "somewhat against protection" group (Table 6). This implies that responders who had experienced some negative effects on their property because of the protection of flying squirrels were more likely to be classified in the attitude group that strongly opposed protection (Table 7).

The clearest influence among the explanatory variables was related to the statement on city's adequate information on protection (CITY_YES). Negative signs and statistical significance indicated that responders who considered the current information level being sufficient were more likely to belong to the "strongly against protection" group than any other group (Table 6). The marginal effects analysis also revealed that these respondents more likely belonged to the two groups that are against protection and less likely to groups that are neutral toward or strongly in favor of protection (Table 7). Instead, respondents who had information on the occurrence of flying squirrels (OCCINF_YES) were more likely to belong to the "strongly in favor" group than the reference group (Tables 6 and 7). In addition, the marginal effects of this variable were negative for the two groups against protection (Table 7).

The marginal effects analysis revealed that the type of sample (OPEN) and occurrence information (OCCINF_YES) had the most substantial and statistically significant positive effects among the groups who strongly favor flying squirrels' protection (Table 7). In turn, the type of sample had negative and significant marginal effects for the attitude groups "somewhat against protection" and "neutral on protection." Adequate protection information provided by the city had positive marginal effects

Table 4. Results of factor analysis.

	Factors	
	Positive attitude toward protection	Negative attitude toward protection
Statement (n = 16)		
Protection of the flying squirrel is important because the survival of the species is threatened	1.042	
Flying squirrel protection must be promoted through active conservation measures such as surveys, tree planting, and the nesting boxes construction	0.886	
Humans have a duty to protect the flying squirrel	0.781	
I would like to see a flying squirrel	0.718	
Conservation of the flying squirrel also contributes to protection of many other species	0.693	
Future generations will benefit from the protection of the flying squirrel	0.668	
Conservation of the flying squirrel is useful as it protects recreational forests nearby	0.662	
There are so many flying squirrels that there is no need to protect the species[†]	0.596	
Protection of the flying squirrel is more important than the economic benefits of forestry	0.578	
Protection of the flying squirrel has caused me harm[†]	0.525	
Flying squirrel protection significantly disrupt the management of commercial forests		0.814
Flying squirrel protection in urban areas has unnecessarily overturned significant construction projects		0.787
Protection of the flying squirrel prevents recreational forest management actions, such as thinning		0.764
Protection of the flying squirrel unfairly causes harm to individuals, such as forest and property owners		0.743
Flying squirrel protection must not interfere with urban development		0.666
The protection of the flying squirrel should not be implemented in urban areas		0.528
Eigenvalue	9.213	1.271
Variance explained (%)	53.794	4.862
Cronbach's alpha	0.939	0.883

Note: The statements with factor loadings below 0.30 at the first phase and 0.50 at the second phase not included. Kaiser-Mayer-Olkin measure of sampling adequacy 0.963, Barlett's test for sphericity $p < 0.001$.
[†] Inverted scale of responses for the third phase of factor analysis.

Table 5. Results of K-means cluster analysis.

		Mean of factor score (standard deviation)	
	%	Positive attitude toward protection	Negative attitude toward protection
Groups			
Somewhat against protection	26	−0.642 (0.449)	0.729 (0.434)
Strongly in favor of protection	32	0.790 (0.230)	−1.064 (0.326)
Neutral on protection	33	0.321 (0.321)	0.013 (0.354)
Strongly against protection	9	−2.297 (0.541)	1.670 (0.657)
F value (df = 565)		1237.192	881.074
P-value		<0.001	<0.001

for groups against protection and negative marginal effects for groups who favor it and those who are neutral. The marginal effects of other explanatory variables on the probability of belonging to different attitude groups were relatively small.

DISCUSSION AND CONCLUSIONS

Four attitude groups of urban citizens were identified in this study. The three largest groups of fairly equal size (26%–33%) were named "neutral on protection," "strongly in favor of protection," and "somewhat against protection." The smallest (9%) fourth group was named "strongly against protection." Hence, just over half of citizens of the studied Finnish cities seem to have a neutral or positive attitude toward flying squirrels and their protection and the rest have a negative attitude. However, it is important to keep in mind that two types of samples (the random and self-selection samples) were used in the analysis. The latter was less representative of the city population and included many respondents with strongly positive attitudes toward the protection of flying squirrels. It can be assumed that this bias will not affect the group identification, but the actual share of citizens classified into the negative attitude group may be slightly higher than that shown in the results of this study.

Prior to our study, citizens' attitudes have not been examined in the context of Siberian flying squirrel, but some research literature exists on European ground squirrel (*Spermophilus citellus*) in Greece (Liordos et al. 2017), red squirrel (*Sciurus vulgaris*) in Britain (Dunn et al. 2018, 2021) and in Poland (Basak et al. 2022), gray squirrels (*Sciurus carolinensis*) in Britain (Dunn et al. 2018), and Siberian chipmunks (*Eutamias sibiricus*) in Italy (urban parks, Cerri et al. 2020). Citizens viewed these four species positively, although the last two species were invasive in the study area. The attitude surveys made in Finland also indicate that attitudes toward red squirrels are very positive among Finnish adult citizens (age category of 18 to 79 years; Natural Resources Institute Finland, unpublished report): 84% of women and 66% of men report encountering the species as enjoyable to a large or very large extent. Notably, the red squirrel is a species commonly found in Finland, and therefore does not need protection and has no notable role in land use conflicts.

One interesting detail in the results was that a relatively low proportion of the respondents (20%) disagreed or strongly disagreed with the statement, "The city is not doing enough to protect the flying squirrel." The proportion of responses "neither agree nor disagree" for this statement was, however, surprisingly large (56%). Hence, the respondents either did not believe in the effectiveness of current measures or they could

Table 6. Results of multinomial logistic regression model. The abbreviation "s.e." denotes standard error.

	Somewhat against protection		Strongly in favor of protection		Neutral on protection	
Variable	Coefficient	s.e.	Coefficient	s.e.	Coefficient	s.e.
CONSTANT	2.073***	0.385	1.750***	0.397	2.518***	0.382
OPEN[†]	−1.026**	0.450	0.499	0.414	−0.901**	0.434
MALE[‡]	0.045	0.367	−0.426	0.372	−0.146	0.365
OVER60[§]	−0.206	0.381	−0.659	0.401	−0.798**	0.391
FORESTER[|]	−0.651*	0.393	−0.997**	0.407	−0.703*	0.397
EFFECT_YES[¶]	−1.838**	0.864	−0.816	0.654	−0.830	0.679
CITY_YES[#]	−1.501***	0.389	−2.448***	0.429	−2.428***	0.421
OCCINF_YES[††]	0.233	0.377	1.343***	0.389	0.576	0.376
Log likelihood	−628.169					
McFadden Pseudo R^2	0.122					
n	553					

Notes: “Strongly against protection” is the reference category for the dependent variable. ***, **, * significance at 1%, 5%, 10% level.
[†] A respondent is included in the self-selection sample (dummy = 1).
[‡] A respondent is male (dummy = 1).
[§] A respondent is over 60 years old (dummy = 1).
[|] A respondent is a forest owner (dummy = 1).
[¶] The presence of the flying squirrel has had an impact on the use and maintenance of property of respondent (dummy = 1).
[#] A respondent agreed with the statement that the city provides adequate information on the protection of the flying squirrel (dummy = 1).
[††] A respondent has had information about the occurrence of flying squirrel in the forests of the city (dummy = 1).

not express their views on the matter (as distant, not personal, etc.). In addition, only 16% of respondents considered that the cities provide adequate information on the protection of flying squirrels. These findings indicate that the cities may not have succeeded in communicating conservation measures to the citizens in the best possible way. To improve the situation the cities could more actively publicize or articulate their conservation policies and organize education programs to introduce the public to the realities of wildlife conflict prevention (Lindsey 2016).

Several individual-specific factors were found to be associated with the probability of belonging to different attitude groups. Female respondents had a higher probability of belonging to the group that is strongly in favor of protection. It therefore appears that female citizens are more positive about nature protection than men, as has also been found in previous studies (Nielsen et al. 2007, Liordos et al. 2017, Tolvanen et al. 2020). In contrast, older respondents had a higher probability of belonging to groups against protection. This result also is in line with previous studies (Lehtonen et al. 2003). Forest owners had a higher probability of belonging to the group that is strongly against protection. Jokinen et al. (2018) studied the attitudes of forest owners toward protection of flying squirrels and found that the attitudes mostly reflect political discourse on conservation policy and not experienced harm. Our results show, however, that the respondents whose property had been adversely affected by the protection of flying squirrels also were more likely to belong to the group strongly against protection. Thus, citizens who have experienced or may experience harm from the protection of flying squirrels are more likely to be opponents of their protection (Basak et al. 2022). The magnitude of the influence of the above-mentioned individual specific factors was not, however, strong.

The respondents' views of how the city informs about the protection of flying squirrels had, instead, a much stronger effect. Interestingly, respondents who agreed that the city provides adequate information on the protection of flying squirrels were more likely to belong to the two groups that were against protection and less likely to belong to the other two groups. Opponents of flying squirrel protection, therefore, do not seem to want the city to provide more information on the protection of the squirrels, unlike proponents of protection. Similarly, respondents' knowledge about the occurrence of flying squirrels in the forests of the city had a relatively strong effect. Respondents with knowledge about the occurrence of flying squirrels were more likely to be in favor of their protection and less likely to belong to the groups against protection.

The tendency to strengthen democracy within land use planning practice (e.g., Sager 2005) may call for inclusive methods that support finding context-specific planning solutions. Our results suggest that cities may gain a biased view of citizens' attitudes toward the protection of flying squirrels through current inclusive methods, such as public hearings used in land use planning. The respondents of the self-selection sample had a higher probability of belonging strongly in favor of protection.

Some methodological issues were encountered in the present research. The factor structure of the citizen's attitude toward flying squirrels was examined in large samples from three cities, which helps to validate the results. However, neither the self-selection nor random sample fully represented the average population characteristics (e.g., gender, age, education, and occupation) as have been found also in many previous survey studies (e.g., Tolvanen et al. 2013, Westin et al. 2023). One approach to improve representativeness is to use a weighting method based on auxiliary variables (Kish 1992, Juutinen et al. 2022). The samples, however, may also be biased in terms of attitudes and over-represent the proportion of citizens with positive attitudes toward protection of flying squirrels. It is difficult to correct this type of bias in representatives with the

Table 7. Marginal effects of explanatory variables.

Variable	Somewhat against protection, probability 26%	Strongly in favor of protection, probability 32%	Neutral on protection, probability 36%	Strongly against protection, probability 6%
OPEN[†]	−0.154***	0.295***	−0.167***	0.026
MALE[‡]	0.058	−0.079*	0.011	0.010
OVER60[§]	0.091**	−0.034	−0.090	0.033*
FORESTER[|]	0.023	−0.081	0.013	0.044**
EFFECT_YES[¶]	−0.209	0.071	0.077	0.062*
CITY_YES[#]	0.143**	−0.126*	−0.139*	0.122***
OCCINF_YES[††]	−0.121***	0.205***	−0.043	−0.041**

Notes: See Table 2 for the variable descriptions. ***, **, * significance at 1%, 5% and 10% level.
[†] A respondent is included in the self-selection sample (dummy = 1).
[‡] A respondent is male (dummy = 1).
[§] A respondent is over 60 years old (dummy = 1).
[|] A respondent is a forest owner (dummy = 1).
[¶] The presence of the flying squirrel has had an impact on the use and maintenance of property of respondent (dummy = 1).
[#] A respondent agreed with the statement that the city provides adequate information on the protection of the flying squirrel (dummy = 1).
[††] A respondent has had information about the occurrence of flying squirrel in the forests of the city (dummy = 1).

weighting method because the weights are not known. In addition, response rates were relatively low, probably because the data were collected as a part of PPGIS survey that may have had a high cognitive burden for respondents (Brown and Kyttä 2014, Tolvanen et al. 2020). Because of these limitations, care must be taken in generalizing the results of this study.

To conclude, attitudes were highly variable and many citizens were neutral or ambivalent toward the protection of flying squirrels in the urban areas. The finding indicates that the cities should better communicate about flying squirrels and their protection because this could turn neutral attitudes into positive ones and thus increase the acceptability of protection. Negative attitudes toward the protection of flying squirrels may be more difficult to change, because they were associated, e.g., with respondents' property damages caused by the protection of flying squirrels. Therefore, cities should communicate and coordinate especially well with landowners when the protection is detrimental to their property. Related to the protection of flying squirrels, a facilitated dialogue process for stakeholders has been observed to be an efficient approach for unlearning (i.e., discarding old knowledge, beliefs, and routines that no longer meet the current challenges; Nygren et al. 2017). Also, two-way communication models and interactive learning tools can play a crucial role for reaching and engaging forest owners (Wilkes-Allemann et al. 2021). Hence, in addition to traditional methods used in urban planning for public participation, there is a need for complementary methods to reach a wide range of citizens with all their interests. In developing and applying these new methods, special care must be taken to ensure that the feedback received from the citizens is representative of the population.

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Data Availability:

The data that support the findings of this study are available on request from the corresponding author (AJ). None of the data are publicly available because of their containing information that could compromise the privacy of research participants.

LITERATURE CITED

Basak, S. M., M. S. Hossain, D. T. O'Mahony, H. Okarma, E. Widera, and I. A. Wierzbowska. 2022. Public perceptions and attitudes toward urban wildlife encounters - a decade of change. Science of the Total Environment 834:155603. https://doi.org/10.1016/j.scitotenv.2022.155603

Brown, G., and M. Kyttä. 2014. Key issues and research priorities for public participation GIS (PPGIS): a synthesis based on empirical research. Applied Geography 46:122-136. https://doi.org/10.1016/j.apgeog.2013.11.004

Cerri, J., E. Mori, R. Zozzoli, A. Gigliotti, A. Chirco, and S. Bertolino. 2020. Managing invasive Siberian chipmunks Eutamias sibiricus in Italy: a matter of attitudes and risk of dispersal. Biological Invasions 22:603-616. https://doi.org/10.1007/s10530-019-02115-5

City of Espoo. 2021. Web publications. https://www.espoo.fi/en/city-espoo

City of Jyväskylä. 2021. Web publications. https://www.jyvaskyla.fi/en/node/7638/welcome-city-jyvaskyla

City of Kuopio. 2021. Web publications. https://www.kuopio.fi/es/kuopio-tietoa

Dressel, S., C. Sandström, and G. Ericsson. 2015. A meta-analysis of studies on attitudes toward bears and wolves across Europe 1976-2012. Conservation Biology 29(2):565-574. https://doi.org/10.1111/cobi.12420

Dunn, M., M. Marzano, and J. Forster. 2021. The red zone: attitudes towards squirrels and their management where it matters most. Biological Conservation 253:108869. https://doi.org/10.1016/j.biocon.2020.108869

Dunn, M., M. Marzano, J. Forster, and R. M. A. Gill. 2018. Public attitudes towards "pest" management: perceptions on squirrel management strategies in the UK. Biological Conservation 222:52-63. https://doi.org/10.1016/j.biocon.2018.03.020

Economic Software, Inc. 2020. NLOGIT version 6, reference guide. New York, New York, USA.

European Committee of the Regions, Commission for Natural Resources. 2019. From local to European: putting citizens at the centre of the EU agenda. Publications Office of the European Union. https://doi.org/10.2863/597145

Gunnthorsdottir, A. 2001. Physical attractiveness of an animal species as a decision factor for its preservation. Anthrozoös 14 (4):204-215. https://doi.org/10.2752/089279301786999355

Haila, Y., M. Kousis, A. Jokinen, N. Nygren, and K. Psarikidou. 2007. Building trust through public participation: learning from conflicts over the implementation of the habitats directive. PAGANINI Work-package 4. Participatory governance and institutional innovation.

Hanski, I. K. 1998. Home ranges and habitat use in the declining flying squirrel *Pteromys volans* in managed forests. Wildlife Biology 4(1):33-46. https://doi.org/10.2981/wlb.1998.013

Hanski, I. K. 2006. Liito-oravan *Pteromys volans* Suomen kannan koon arviointi. [In Finnish]. Report for the Ministry of Environment.

Hanski, I. K., P. C. Stevens, P. Ihalempiä, and V. Selonen, 2000. Home-range size, movements, and nest-site use in the Siberian Flying Squirrel, Pteromys volans. Journal of Mammalogy 81 (3):798-809. https://doi.org/10.1644/1545-1542(2000)0812.3.CO;2

Hosmer, D. W., Jr., S. Lemeshow, and R. X. Sturdivant. 2013. Applied logistic regression. Third edition. John Wiley & Sons, Hoboken, New Jersey, USA. https://doi.org/10.1002/9781118548387

Hujala, T., M. Kurttila, and H. Karppinen. 2013. Customer segments among family forest owners: combining ownership objectives and decision-making styles. Small-scale Forestry 12:335-351. https://doi.org/10.1007/s11842-012-9215-1

IBM SPSS Statistics. 2022. IBM SPSS Statistics 28 Documentation.

Jokinen, M., T. Hujala, R. Paloniemi, and A. Vainio. 2018. Private landowners and protecting species: what sort of noncompliance should we be worried about? Global Ecology and Conservation 15:e00407. https://doi.org/10.1016/j.gecco.2018.e00407

Juutinen, A., B. Immerzeel, E. Pouta, T. Lankia, J. Artell, A. Tolvanen, H. Ahtiainen, and J. Vermaat. 2022. A comparative analysis of the value of recreation in six contrasting Nordic landscapes using the travel cost method. Journal of Outdoor Recreation and Tourism 39:100528. https://doi.org/10.1016/j.jort.2022.100528

Kahila-Tani, M., A. Broberg, M. Kyttä, and T. Tyger. 2016. Let the citizens map—public participation GIS as a planning support system in the Helsinki master plan process. Planning Practice & Research 31(2):195-214. https://doi.org/10.1080/02697459.2015.1104203

Kangas, K. M., A. Tolvanen, O. Tarvainen, A. Nikula, V. Nivala, E. Huhta, and A. Jäkäläniemi. 2016. A method for assessing ecological values to reconcile multiple land use needs. Ecology and Society 21(3):5. https://doi.org/10.5751/ES-08590-210305

Kish, L. 1992. Weighting for unequal p_i. Journal of Official Statistics 8:183-200.

Koskela, T., and H. Karppinen. 2020. Forest owners' willingness to implement measures to safeguard biodiversity: values, attitudes, ecological worldview and forest ownership objectives. Small-scale Forestry 20:11-37. https://doi.org/10.1007/s11842-020-09454-5

Kuuluvainen, J., H. Karppinen, and V. Ovaskainen. 1996. Landowner objectives and nonindustrial private timber supply. Forest Science 42(3):300-309. https://doi.org/10.1093/forestscience/42.3.300

Lampila, S., R. Wistbacka, A. Mäkelä, and M. Orell. 2009. Survival and population growth rate of the threatened Siberian flying squirrel (Pteromys volans) in a fragmented forest landscape. Ecoscience 16:66-74. https://doi.org/10.2980/16-1-3184

Lau, R. R., and C. Heldman. 2009. Self-interest, symbolic attitudes, and support for public policy: a multilevel analysis. Political Psychology 30:513-537. https://doi.org/10.1111/j.1467-9221.2009.00713.x

Lehtonen, E., J. Kuuluvainen, E. Pouta, M. Rekola, C.-Z. Li. 2003. Non-market benefits of forest conservation in southern Finland. Environmental Science & Policy 6:195-204. https://doi.org/10.1016/S1462-9011(03)00035-2

Lindsey, K. J. 2016. Human dimensions of urban wildlife management. Pages 401-434 in C. E. Adams, editor. Urban wildlife management. Third edition. CRC Press, Boca Raton, Florida, USA. https://doi.org/10.1201/9781315371863-15

Liordos, V., V. J. Kontsiotis, M. Anastasiadou, and E. Karavasias. 2017. Effects of attitudes and demography on public support for endangered species conservation. Science of the Total Environment 596:25-34. https://doi.org/10.1016/j.scitotenv.2017.03.241

Liukko, U.-M., H. Henttonen, K. Kauhala, I. Kojola, E-M. Kyheröinen, and J. Pitkänen. 2019. Mammals. Pages 571-576 in E. Hyvärinen, A. Juslén, E. Kemppainen, A. Uddström, and U.-M. Liukko, editors. The 2019 red list of Finnish species. Ministry of the Environment & Finnish Environment Institute, Helsinki, Finland.

Ministry of the Environment. 2022. Liito-oravan suojelu. [Protection of flying squirrel, in Finnish]. https://www.ymparisto.fi/fi-fi/luonto/lajit/lajiensuojelutyo/yksittaisten_lajien_suojelu/liitooravan_suojelu

Mäkeläinen, S., M. Schrader, and I. K. Hanski. 2015. Factors explaining the occurrence of the Siberian flying squirrel in urban

forest landscape. Urban Ecosystems 18:223-238. https://doi.org/10.1007/s11252-014-0381-0

Nielsen, A. B., S. B. Olsen, and T. Lundhede. 2007. An economic valuation of the recreational benefits associated with nature-based forest management practices. Landscape and Urban Planning 80(1-2):63-71. https://doi.org/10.1016/j.landurbplan.2006.06.003

Nygren, N. V., and T. Peltola. 2020. Surprise, surprise—a flying squirrel! Learning to protect the unexpected. Conservation and Society 18(4):378-386. https://doi.org/10.4103/cs.cs_19_105

Nygren, N. V., A. Jokinen, and A. Nikula. 2017. Unlearning in managing wicked biodiversity problems. Landscape and Urban Planning 167:473-482. https://doi.org/10.1016/j.landurbplan.2017.06.019

Reunanen, P., M. Mönkkönen, and A. Nikula. 2000. Managing boreal forest landscapes for flying squirrels. Conservation Biology 14:218-226. https://doi.org/10.1046/j.1523-1739.2000.98387.x

Reunanen, P., M. Mönkkönen, and A. Nikula. 2002. Habitat requirements of the Siberian flying squirrel in northern Finland: comparing field survey and remote sensing data. Annales Zoologici Fennici 39(1):7-20.

Rokeach, M. 1973. The nature of human values. Free Press, New York, New York, USA.

Sager, T. 2005. Communicative planners as naive mandarins of the neo-liberal state? European Journal of Spatial Development 3(8):1-9. https://doi.org/10.5281/zenodo.5148554

Sears, D. O., and C. L. Funk. 1991. The role of self-interest in social and political attitudes. Advances in Experimental Social Psychology 24:1-91. https://doi.org/10.1016/S0065-2601(08)60327-5

Selonen, V., I. K. Hanski, P. C. Stevens. 2001. Space use of the Siberian flying squirrel *Pteromys volans* in fragmented forest landscapes. Ecography 24:588-600. https://doi.org/10.1111/j.1600-0587.2001.tb00493.x

Selonen, V., and S. Mäkeläinen. 2017. Ecology and protection of a flagship species, the Siberian flying squirrel. Hystrix - the Italian Journal of Mammalogy 28(2):134-146.

Tabachnick, B. G., and L. S. Fidell. 2007. Using multivariate statistics. Pearson international edition. Fifth edition. Pearson, Allyn and Bacon, Boston, Massachusetts, USA.

Tavakol, M., and R. Dennick. 2011. Making sense of Cronbach's alpha. International Journal of Medical Education 2:53-55. https://doi.org/10.5116/ijme.4dfb.8dfd

Tolvanen, A., A. Juutinen, and R. Svento. 2013. Preferences of local people for the use of peatlands: the case of richest peatland region in Finland. Ecology and Society 18(2):19. https://doi.org/10.5751/ES-05496-180219

Tolvanen A., K. Kangas, O. Tarvainen, E. Huhta, A. Jäkäläniemi, M. Kyttä, A. Nikula, V. Nivala, S. Tuulentie S., and L. Tyrväinen. 2020. The relationship between people's activities and values with the protection level and biodiversity. Tourism Management 81:104141. https://doi.org/10.1016/j.tourman.2020.104141

Vierikko, K., J. Pellikka., I. K. Hanski, T. Myllyviita, J. Niemelä, S. Vehkamäki, and H. Linden. 2010. Indicators of sustainable forestry: the association between wildlife species and forest structure in Finland. Ecological Indicators 10(2):361-369. https://doi.org/10.1016/j.ecolind.2009.06.019

Westin, K., A. Bolte, E. Haeler, E. Haltia, R. Jandl, A. Juutinen, K. Kuhlmey, G. Lidestav, R. Mäkipää, L. Rosenkranz, et al. 2023. Forest values and application of different management activities among small-scale forest owners in five EU countries. Forest Policy and Economics 146:102881. https://doi.org/10.1016/j.forpol.2022.102881

Wilkes-Allemann, J., P. Deuffic, R. Jandl, K. Westin, E. Lieberherr, C. Foldal, G. Lidestav, G. Weiss, A. Zabel, I. Živojinivić, et al. 2021. Communication campaigns to engage (non-traditional) forest owners: a European perspective. Forest Policy and Economics 133:102621. https://doi.org/10.1016/j.forpol.2021.102621