

1 **Can forestry schools contribute to the recruitment and retention of**  
2 **hunters to mitigate game damage in Japan?**

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14 **hunters to mitigate game damage in Japan?**

15 Human–wildlife conflicts by ungulates have become a major problem worldwide.  
16 Deer populations are increasing in many temperate areas of developed countries,  
17 significantly affecting forest vegetation. Hunting is a widely employed method for  
18 mitigating game damage; however, hunting participation has decreased in Japan  
19 and many Western countries. Therefore, the recruitment and retention of hunters  
20 are crucial. This study highlights challenges and evaluates approaches to teaching  
21 hunting at 22 forestry schools in Japan. The main wildlife damage mitigation  
22 technique taught at forestry schools was plant shielding (with protective nets).  
23 Some schools provided opportunities to interact with actual hunters by inviting  
24 local hunters as lecturers or organizing group-hunting trips for students. Analysis  
25 of hunting license examinations across eight prefectures revealed that, although  
26 forestry students were only a minority of successful applicants overall, they  
27 achieved the highest passing rate among teenagers. Therefore, forestry schools  
28 with diverse curricula can contribute to the recruitment of young hunters. Strategic  
29 and integrated implementation of game and forest management is essential to  
30 maximize the positive impacts and mitigate the negative impacts of game ungulates  
31 on forest ecosystems. The forestry schools can play an essential role in preparing  
32 frontline personnel with expertise in both forestry and hunting.

33 Keywords: human–wildlife conflict; sika deer; clearcutting; reforestation; forest  
34 worker

35 **Introduction**

36 Human–wildlife conflict (HWC) poses a pervasive global challenge, driving the  
37 extinction and decline of numerous species, resulting in countless human fatalities, and  
38 inflicting substantial economic losses on agriculture and forestry (Nyhus 2016). Wild  
39 animals, including game ungulates such as deer (*Cervidae*) and wild boars (*Sus scrofa*),  
40 are involved in HWC. Damage to agriculture by game animals is the most notable and  
41 frequent HWC worldwide (Bleier et al. 2012). These game ungulates also significantly  
42 affect vegetation and forest regeneration (Ammer 1996; Kuiters and Slim 2002). In

43 addition, ungulate–vehicle collisions by deer and wild boars are reported in many  
44 countries (e.g., Rodríguez-Morales et al. 2013; Acharya et al. 2023). Furthermore, wild  
45 deer can cause various livestock and human diseases by hosting pathogens and spreading  
46 disease via various transmission routes (Böhm et al. 2007; Mallapaty 2002).

47         Japan has three wild ungulate species: sika deer (*Cervus nippon*), Japanese serow  
48 (*Capricornis crispus*), and wild boar (Takatsuki 2009). The areas of occupancy of sika  
49 deer have approximately tripled during the last 40 years owing to factors such as  
50 depopulation and decreasing hunter numbers (TASC 2023). Ungulates damage farm  
51 crops and disrupt transportation systems, causing collisions with cars and trains (Soga et  
52 al. 2015; Iijima et al. 2023). In addition, the sika deer carry ticks that cause a severe fever  
53 with thrombocytopenia syndrome (Suzuki et al. 2022). Moreover, intense browsing by  
54 sika deer significantly affects vegetation in both agricultural and forested habitats  
55 (Takatsuki 2009). Loss of understory vegetation because of sika deer browsing leads to  
56 increased soil erosion in forests (Abe et al. 2024; Katayama et al. 2023), further degrading  
57 soil ecosystem functions (Chen et al. 2023). In the fiscal year 2021, approximately 4,900  
58 ha of forest were damaged by wildlife in Japan, 70% of which was caused by deer  
59 (FAMAFF 2023a). As of November 4, 2022, 45 of 47 prefectures in Japan had designated  
60 sika deer as a Category 2 Specified Wildlife and had established the Category 2 Specified  
61 Wildlife Protection Plan<sup>1</sup> (MOE 2022).

62         To date, various social, behavioral, and technical approaches have been employed  
63 to reduce negative interactions with wildlife (Nyhus 2016), such as fencing (Smith et al.  
64 2020; Honda et al. 2020). In the forestry sector, protection of saplings with plastic tubing  
65 or wire mesh is used to reduce damage caused by sika deer (Takatsuki 2009). Additionally,  
66 culling and hunting are widely used for damage control (Brown et al. 2000; Krausman et  
67 al. 2014). In Japan, hunting is the most effective, practical, and realistic method for

68 controlling sika deer populations and reducing damage to forests. However, the number  
69 of hunters in Japan is declining. The total number of hunting license holders was  
70 >500,000 in the 1970s, but it declined to approximately 200,000 in 2000 and plateaued  
71 thereafter (NCF 2022; Ueda et al. 2010; MOE [date unknown]). Hunters are aging, and  
72 currently, approximately 60% are aged >60 years (NCF 2022). Essentially, weakened  
73 hunting pressure due to the decreased number of hunters has increased the numbers of  
74 sika deer (Takatsuki 2009). Therefore, the recruitment and retention of hunters is essential  
75 for limiting sika deer numbers and reducing forest vegetation damage in Japan.

76         Hunting participation is also declining in many Western countries. Consequently,  
77 hunter recruitment deserves more scholarly and political attention (Hansson-Forman et  
78 al. 2020). To date, studies on hunter recruitment and retention have been conducted in  
79 Sweden (Hansson-Forman et al. 2020), Norway (Andersen et al. 2010), Denmark  
80 (Hansen et al. 2012), and the United States (Ryan and Shaw 2011), and much of the  
81 knowledge on hunter recruitment and retention is confined to Western countries  
82 (Lovelock et al. 2022). Reimoser F and Reimoser S (1997) emphasized the importance  
83 of implementing game management and silvicultural measures more consciously and  
84 specifically to enhance the positive impacts and mitigate the negative impacts of game  
85 ungulates on forest structure. In recent years, in response to the increasing demand for  
86 skilled forestry workers and the necessity for safe and efficient forestry operations, new  
87 forestry schools have been established in numerous prefectures in Japan (FAMAFF  
88 2023b). Therefore, this study explores the role of the forestry schools in recruiting and  
89 retaining hunters.

## 90 **Materials and methods**

### 91 *Forestry schools*

92 Established by local governments under the School Education Act, forestry schools  
93 generally offer a year-long program (1,200 hours or more) equipping students with the  
94 skills and knowledge necessary for employment in the forestry industry (FAMAFF  
95 2023b). Forestry schools are established within the training institutes of municipal  
96 governments, professional junior colleges, specialized training colleges, or other schools.  
97 As of March 2023, Japan has 24 forestry schools (Figure 1). Of these, 18 are run by  
98 prefectures, and 6 are run by Public Interest Incorporated associations or by General  
99 Incorporated foundations. The length of study and training was either 1 or 2 years,  
100 represented almost equally.

101         The Kumamoto Forestry College, established in 2019, conducts a one-year  
102 program to foster the next generation of forestry leaders in Kumamoto Prefecture, which  
103 is one of the leading forestry prefectures in Japan. Students can obtain 13 forestry-related  
104 qualifications, including hunting license (traps). The subject of “Forest Protection”  
105 provides classes on activities to prevent wild animal damage, and students acquire a  
106 hunting license (traps) as part of their class work. The school recognized the significance  
107 of forestry workers as community members controlling and trapping wild animals and  
108 incorporated hunting license preparation classes into its schedule. In addition, the school  
109 has been offering a program conducted by an actual hunter as an adjunct lecturer since  
110 fiscal year 2022 to raise awareness on hunting as an essential activity among the students.  
111 The lecturer demonstrates the use of remote sensing and computer technologies to capture  
112 wild animals, as well as the use of game meat (*gibier*).

113 ***Data collection***

114 We conducted this study in the following steps: first, we accessed the websites of 24  
115 forestry schools and collected information on their syllabi. Then, we conducted telephone  
116 interviews with 24 forestry schools between September and October 2022. The interview  
117 items included (1) the specific contents of each class, (2) whether the classes include  
118 preparation for hunting license examinations, and (3) financial support for obtaining  
119 hunting licenses. Eventually, 23 forestry schools accepted telephone interviews.

120         Second, we interviewed all 20 students from the fourth batch (entering 2022) of  
121 Kumamoto Forestry College between October and November 2022 to understand their  
122 perceptions of forestry schools on hunting licenses. Simultaneously, we developed a  
123 questionnaire based on website surveys and telephone interviews and distributed it to 24  
124 forestry schools via email between December 2022 and January 2023. The questionnaire  
125 comprised three sections pertaining to information about the school, classes on hunting  
126 license preparation, and other classes on hunting or wildlife damage measures. We  
127 received responses from 22 forestry schools.

128         We also emailed the hunting license examination offices in each prefecture where  
129 forestry school students could obtain hunting licenses and collected data on the number  
130 of people who passed the hunting license examination in 2021. The collected data were  
131 filtered according to age groups.

132 **Results**

133 ***Curriculum of forestry schools in Japan***

134 *Subjects on hunting licenses*

135 Figure 2 shows the position of hunting subjects in the curriculum of the 22 forestry  
136 schools. Notably, 13 forestry schools included classes on hunting licenses, of which

137 obtaining a hunting license was compulsory and optional for students in 8 and 5 schools,  
138 respectively.

139 Figure 3 presents the reasons for not including classes on hunting licenses in the  
140 curriculum of nine schools. The strongest reason was “*Because we think hunting licenses*  
141 *are less important licenses for training forestry workers*” (four schools). Three schools  
142 chose “Others” as the first reason, and one school selected it as the second. The reasons  
143 included:

- 144 • “*Forestry damage caused by wildlife in Yamagata Prefecture is mainly bark*  
145 *stripping caused by bears, and the amount of damage is on the increase. However,*  
146 *it is judged that the school is unable to provide licenses for hunting bears. We are*  
147 *also seeing damage from field mice and hares in young forests, but we are not*  
148 *considering any specific hunting measures to deal with that damage.*” (Yamagata  
149 *Prefectural College of Agriculture & Forestry*)
- 150 • “*Hunting licenses are under the jurisdiction of a different organization.*”  
151 (*Forestry Academy Fukushima*)
- 152 • “*In our prefecture, trap hunting is mainly conducted by the forestry cooperative.*  
153 *It is acquired if a person works for a forestry cooperative. In college, basic*  
154 *courses on wildlife damage are provided.*” (*Fukui Forestry College*)
- 155 • “*Because the renewal period is short (three years), and those who wish to obtain*  
156 *the license may do so at their own expense.*” (*Nagano Prefectural College of*  
157 *Forestry*)

158 All three schools (Iwate, Wakayama, and Ehime) that chose “*Because we have*  
159 *time constraints and it makes it difficult to include hunting license classes in our*  
160 *curriculum*” conduct a 1-year program.

161 Figure 4 presents the reasons for including hunting license classes in the  
162 curriculum. The strongest reason for including the acquisition of a hunting license in the  
163 curriculum was “*Because we think hunting is necessary knowledge for forestry workers*”  
164 (13 schools), and 8 schools chose this as their first choice. This was followed by “*Because*  
165 *we want students, who are residents of rural areas, to engage in the capture of game*  
166 *animals to reduce game damage*” or “*Because we want students to engage in the capture*  
167 *of game animals to reduce the deer population.*” No school chose “*Because we want*  
168 *students to have advantages in finding jobs after graduation*” and “*Because we want*  
169 *students to become members of ageing hunting clubs*” as the first choice. Three schools  
170 chose “Other” as their first (two schools) and fifth choices. These include the following  
171 responses:

- 172 • “*Because learning about wildlife (e.g., ecology) will enable us to take appropriate*  
173 *measures regardless of license possession.*” (Gifu Academy of Forest Science and  
174 *Culture*)
- 175 • “*Because we want students to learn about trapping as one of the measures*  
176 *(prevention measures [e.g., protective fences], habitat management [e.g.,*  
177 *appropriate forest management], and population management [e.g., trapping]) to*  
178 *reduce forestry damage such as bark stripping.*” (Kyoto Prefectural Forestry  
179 *School*)
- 180 • “*To focus on the effective use of wild game after the capture of wildlife.*”  
181 *(Tokushima Forestry Academy)*

182 *Classes on hunting and wildlife damage measures (other than hunting license)*

183 Schools also offer other hunting classes as classroom lectures and practical field training  
184 as part of their wildlife damage management curricula. The majority of 22 schools had



185 “Overview of game damage in prefectures” (20 schools) and “Overview and methods of  
186 game damage controls” (19 schools) in the classroom lecture format (Figure 5). The  
187 “Others” included subjects on “How to utilize *gibier*” (*Yamanashi Prefectural College of*  
188 *Agriculture and Forestry*), “Deciphering game size and characteristics from behavior,  
189 ecology, and stuffed animals” (*Gifu Academy of Forest Science and Culture*), “Learning  
190 about traps and guns by using samples of leg snare trap, box trap, and mock guns in the  
191 classroom” (*Kyoto Prefectural Forestry School*), and “We have training for the Miyazaki  
192 Prefecture Wildlife Damage Measures Meister accreditation organized by the prefecture”  
193 (*Miyazaki Forestry College*).

194 Practical training covered major skills such as “Setting up of protective nets” (12  
195 schools) and “Surveying deer tracks (e.g., feeding traces, droppings, and animal trails)”  
196 (8 schools) (Figure 6). Few schools provided training on trap installation in the field, such  
197 as “Setting up leg snare traps” (four schools) and “Setting up box traps” (one school).  
198 The “Utilization after capture” (five schools) included “Visit to a facility processing Ezo  
199 deer meat” (*Hokkaido College of Northern Forestry*), “Disassembling, skull specimens  
200 and fur-tanning at the school's processing facility” (*Gifu Academy of Forest Science and*  
201 *Culture*), and “Introduction to *gibier* cuisine” (*Miyazaki Forestry College*). Several  
202 schools selected “Others” and listed subjects: “Observation of protective fences and  
203 enclosure traps” (*Hokkaido College of Northern Forestry*), “Habitat identification using  
204 trail cameras” (*Gifu Academy of Forest Science and Culture*), “Practical training on tape  
205 winding methods for bear bark-stripping prevention” (*Forestry Academy Fukushima*),  
206 “Study visits to advanced countermeasure areas,” and “In the second-year elective course,  
207 more specialized classroom lectures and practical training on how to conduct telemetry  
208 surveys, Specified Wildlife Control Plan, *gibier* use, etc. were conducted” (*Nagano*  
209 *Prefectural College of Forestry*).

210 Figure 7 presents the challenges faced in class planning, with the major challenges  
211 being “Motivating students” (eight schools) and “Securing practical training sites” (seven  
212 schools). Challenges listed in “Others” included “Capturing living creatures can be  
213 difficult, especially in limited classroom time.” (*Gifu Academy of Forest Science and*  
214 *Culture*) and “Few students practice wildlife damage measures after graduation”  
215 (*Miyazaki Forestry College*).

#### 216 *Activities outside the curriculum*

217 Of 22 schools, 8 had activities on hunting or wildlife damage control beyond the regular  
218 curriculum. Those activities included “Observing hunting as an extra-curricular activity”  
219 (*Hokkaido College of Northern Forestry*), “A practical class in which some interested  
220 students patrol and inspect traps and disassemble game animals as a club activity” (*Gifu*  
221 *Academy of Forest Science and Culture*), “Encouraging participation in Japan Deer  
222 Society events” (*Shizuoka Professional University Junior College of Agriculture*), and  
223 “Our charcoal-making instructor is an avid hunter. He informally introduces students to  
224 hunting at lunchtime while eating wild boar meat. Occasionally, rare meats, such as that  
225 of badger, are served” (*Nichinan Chugoku-sanchi Forestry Academy*), “Extra-curricular  
226 hunting (trapping and disassembling) is provided for interested students” (*Kochi*  
227 *Prefectural Forestry College*), “Individual advice and measures are provided for those  
228 who wish to obtain a hunting license” (*Iwate Forestry Academy*), “License acquisition  
229 courses, members' introductions to hunting club, and engagements with hunting group  
230 are available for those who wish to obtain a license” (*Nagano Prefectural College of*  
231 *Forestry*), “If there is anyone in particular who wishes to obtain a license, we will  
232 introduce them to a hunting club” (*Nanyo Forest Academy*). In addition, *Gifu Academy*  
233 *of Forest Science and Culture* had activities, in which students hunted and processed deer  
234 at a processing facility inside the campus constructed by the students of the architecture

235 department. The school had also conducted training at the *Rottenburg Forestry School* in  
236 Germany (under a cooperation agreement), including a tour of hunting-related facilities.

### 237 *Support for hunting license examination*

238 Figure 8 shows the preparation for the hunting license examination at 13 schools, with  
239 subjects related to hunting licensing in their curriculum. All 13 schools prepared for  
240 hunting license examinations, namely: “Exam preparation provided by internal lecturers”  
241 (seven schools), “Participation in seminars organized by hunting clubs” (six schools), and  
242 “Exam preparation provided by external lecturers” (four schools). In addition, six of the  
243 15 schools, which included subjects on hunting licenses in their curriculum, provided  
244 financial support (Table 1).

### 245 *Student perceptions of hunting and hunting license acquisition in Kumamoto*

#### 246 *Forestry College*

247 The interviewed students included 18 men and 2 women, with 6 in their teens, 7 in their  
248 20s, 4 in their 30s, and 3 in their 40s. Eleven interviewees owned plots of forested land.

#### 249 *Awareness of forest damage and hunting licenses before enrollment*

250 Regarding the question, “*Were you aware of the seriousness of forest damage caused by*  
251 *deer and other animals before you entered the school?*” 18 of 20 students answered that  
252 they were aware of it. Many students were involved in forestry before entering the school  
253 and were highly aware of forest damage.

254 Subsequently, when we asked, “*Were you aware that the curriculum included*  
255 *hunting license exam preparation?*” 18 students answered that they were aware of it. Five  
256 students said that their family members or acquaintances were (or had been) hunting. We  
257 received comments, such as:

- 258 • *“I know someone who is a hunter. I want to try hunting after graduation. I actually*  
259 *want to use my license.”* (a man in his teens)
- 260 • *“I want to get a gun license as well in the future. I want to learn from a hunter I*  
261 *know and stay overnight to hunt with him.”* (a man in his teens)
- 262 • *“My grandfather had a hunting license. I went to patrol traps with him.”* (a man  
263 in his 20s)

264 In addition, there was a comment:

- 265 • *“I got my hunting license (traps) when I was a senior in high school. I couldn’t*  
266 *do it well even after 4 months, but I could do it soon after an experienced*  
267 *instructor taught me in the school.”* (a man in his teens)

268 *Necessity of hunting or hunting licenses in forestry*

269 Regarding the question, *“Do you think hunting or hunting licenses are necessary to*  
270 *prevent damage by birds and animals in forestry?”* 17, 2, and 1 students answered  
271 *“necessary,” “not always necessary,”* and *“do not know,”* respectively.

272 The reasons for *“necessary”* included:

- 273 • *“Deer get caught in protective nets.”* (a woman in her 30s)
- 274 • *“The protective nets deteriorate. Other measures are necessary.”* (a man in his  
275 30s)
- 276 • *“If the population is large, we need to reduce it.”* (a man in his 20s)
- 277 • *“It is not enough to just protect from them. If we do not catch them, they will not*  
278 *decrease.”* (a man in his 40s)
- 279 • *“With protective nets, we can only drive them back. Hunting is necessary to*  
280 *reduce their numbers.”* (a man in his teens)

281 Some pointed out the limitations of individual responses as follows:

282 • *“There are not enough hunters, so we need to increase the number of hunters first.”*

283 (a man in his 30s)

284 • *“I think it is necessary, but I do not have the time. Hunting can become a hobby,  
285 but hunting with a purpose is difficult.”* (a woman in her 20s)

286 • *“It is not enough to hunt individually, but the forestry cooperative as a whole must  
287 do it to catch up with the increase in deer.”* (a man in his teens)

288 Moreover, several comments expressed frustration after catching the deer, such  
289 as:

290 • *“I cannot even kill a deer. I do not want to kill them.”* (a man in his teens)

291 • *“It is important that we know the whole process until we eat the deer at the end. I  
292 worry about whether I can carry it through.”* (a man in his 30s)

293 • *“It is essential to reduce the psychological burden. Being a responsible hunter is  
294 important until the end.”* (a man in his 20s)

295 • *“I am worried about my skills to kill a deer safely following the correct steps.”* (a  
296 man in his 40s)

297 *Willingness to renew hunting license*

298 To the question *“Do you intend to renew your hunting license after graduation?”* 14, 4,  
299 and 2 students answered *“Yes,” “No,”* and *“don’t know yet,”* respectively.

300 The reasons of the students who answered *“Yes”* included *“since I obtained a  
301 hunting license in the class”* and *“I think I will need it.”* Another opinion is that:

302       • *“If I have a license, it is easier to hunt because I can hunt and disassemble the*  
303           *prey by myself. If I can hunt, I don’t have to buy meat, and I get paid for it. It is*  
304           *good for me and for the mountains.”* (a man in his teens)

305       We also received an opinion that:

306       • *“I feel that the cost is a little expensive.”* (a man in his teens)

307       In contrast, the major reason of the students who answered “No” was *“I don’t*  
308       *think I will use the license often.”*

309       Another reason included:

310       • *“I have no plans at the moment, but I will consider renewing it depending on the*  
311           *company I join.”* (a man in his teens)

### 312    ***Survey on the number of people obtaining hunting licenses***

313    Table 2 represents the number of people who passed the hunting license examination in  
314    2021 in eight prefectures (Gifu, Hyogo, Nara, Tottori, Shimane, Tokushima, Kumamoto,  
315    and Miyazaki) by age group. In total, 2,122 people passed the exam in 2021. Those in  
316    their 60s were the highest, accounting for approximately one-quarter of the total. In  
317    contrast, at forestry schools, of the 110 students who passed the exam, teenagers were the  
318    highest (47, approximately 40%), and those in their 60s were the lowest. Of the 112  
319    teenagers who passed the exam, approximately 40% were students from forestry schools.

### 320    **Discussion**

321    The percentage of forestry school students among the total number of people who  
322    successfully obtained hunting licenses was low in the eight prefectures. In contrast, the  
323    forestry schools had the highest number of teenagers who passed the exam, accounting

324 for approximately 40% of all teenagers who passed the exam. Therefore, forestry schools  
325 could contribute to the recruitment of young hunters, especially teenagers.

326 The forestry schools, however, are not specialized schools that foster new hunters.  
327 Their primary purpose is to train frontline personnel responsible for wood production and  
328 forest maintenance. Some forestry schools mentioned the limited study period as a reason  
329 for not including classes on the hunting license system in their curriculum. However,  
330 several forestry schools had hunting-related extracurricular activities in a club-like  
331 manner. Mitani and Kumazawa (2018) indicated that the higher proportion of older  
332 people among hunters might have reduced the opportunities for hunters to interact  
333 naturally with younger generations under 40 at work, at their leisure time, or in their daily  
334 lives. Ryan and Shaw (2011) highlighted the limitations of recruiting and maintaining  
335 traditional hunters at home. Therefore, inheriting hunting skills from the previous  
336 generation is a main concern. Although a few systems related to matching new license  
337 holders with veteran hunters exist (Makino and Hattori 2018), forestry schools could  
338 become an alternative place and may help strengthen the recruitment and retention of new  
339 hunters.

340 This study identified challenges in the recruitment and retention of hunters in  
341 forestry schools. The first challenge is a gap between hunting license acquisitions and  
342 actual behaviors. Hansson-Forman et al. (2020) indicated that taking a test does not  
343 guarantee actual participation in hunting. After obtaining a license, various barriers must  
344 be overcome before people can register as hunters and participate in hunting. One such  
345 example is post-capture handling. The practical test for hunting license (trap)  
346 examinations only has an indoor trap setting. Therefore, few opportunities are available  
347 to learn about post-capture game handling. In fact, our interviews with students at

348 Kumamoto Forestry College indicated that many of them were worried about post-  
349 capture handling.

350         The second challenge is the promotion of game meat utilization. Koga (2021)  
351 suggested that establishing new small-scale privately owned meat processing facilities in  
352 rural villages can reduce the burden on hunters by taking over game-handling and  
353 processing, and hunters can focus on capturing game animals to increase income. Several  
354 forestry schools included game meat utilization methods in their curriculum. Further, a  
355 school specializing in *gibier* processing training, which offers courses on all aspects of  
356 catching, processing, and marketing game meat, was established in Oita Prefecture in  
357 2023 (NCF 2023). Hence, enhancing the curriculum of forestry schools to incorporate  
358 training in game meat utilization, possibly through collaborations with specialized  
359 institutions, may increase student enrollment in forestry schools and recruitment of both  
360 forestry workers and hunters.

361         In recent years, clearcutting of Japanese cedar (*Cryptomeria japonica*) and  
362 Japanese cypress (*Chamaecyparis obtusa*) plantations and subsequent reforestation have  
363 increased (FAMAFF 2023b). Clearcutting increases the number of forage plants, such as  
364 forbs, shade-intolerant grasses, and shrubs, offering an attractive ideal ecological  
365 environment for sika deer (Takatsuki 2009; Reimoser and Gossow 1996). Therefore,  
366 alleviation of deer browsing pressure is a critical factor for successful forest regeneration  
367 (Kuiters et al. 1996; Kuiters and Slim 2002; Tsujino and Matsui 2022). Silvicultural  
368 techniques also strongly influence browsing and bark stripping (Reimoser and Gossow  
369 1996). Accordingly, game management and silvicultural measures must be implemented  
370 conscientiously and with specificity to enhance positive impacts and mitigate negative  
371 impacts of game ungulates on forest structure (Reimoser F and Reimoser S 1997).  
372 However, forest and game management practices have diversified in Japan. Hunting



373 continues to complement core forestry education in many forestry schools. The main  
374 workplaces for forestry school graduates are forestry cooperatives and enterprises. With  
375 the need for the integration of forestry and game management initiatives, forestry schools  
376 could play a pivotal role in training frontline forest personnel skilled in both forestry and  
377 hunting.

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### 385 **Institutional Review Board Statement**

386 The Ethics Committee of the Faculty of Agriculture, Kyushu University obligates all  
387 faculty members and graduate students to take the designated course on research ethics.  
388 All authors have completed the obligatory course on responsible conduct of research from  
389 the Association for Promotion of Research Integrity.

### 390 **Informed Consent Statement**

391 Informed consent was obtained from all participants involved in the study.

### 392 **Disclosure statement**

393 The authors declare no conflicts of interest.

394 **Note**

395 <sup>1</sup> The Prefectural Governor has the authority to prescribe a Category 2 Specified Wildlife  
396 Protection Plan under the Wildlife Protection, Control, and Hunting Management Act. This plan  
397 is implemented when wildlife populations experience rapid growth or expansion of their habitats  
398 within the prefectural area, excluding rare species. Such a prescription occurs when wildlife  
399 control becomes necessary due to population dynamics or habitat expansion.

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555



556 **Table 1.** Financial support for the hunting license examination. Note: (A) schools pay the  
 557 full cost (including medical certificates), (B) schools pay the full cost (excluding medical  
 558 certificates), (C) the individual taking the test pays the full cost, (D) unknown as the  
 559 questionnaire was not collected.

No.	Prefectures	School	Type of financial support
1	Hokkaido	Hokkaido College of Northern Forestry	(C)
7	Gunma	Gunma Prefectural Institute of Agriculture and Forestry	(D)
9	Yamanashi	Yamanashi Prefectural College of Agriculture and Forestry	(C)
11	Gifu	Gifu Academy of Forest Science and Culture	(C)
12	Shizuoka	Shizuoka Professional University Junior College of Agriculture	(C)
13	Kyoto	Kyoto Prefectural College of Forestry	(C)
14	Hyogo	Hyogo Prefectural College of Forest Management	(C)
15	Nara	Nara Forester Academy	(B)
17	Tottori	Nichinan Chugoku-sanchi Forestry Academy	(A)
18	Shimane	Shimane Prefectural College for Agriculture and Forestry	(C)
19	Tokushima	Tokushima Forestry Academy	(A)
21	Kochi	Kochi Prefectural Forestry College	(B)
22	Kumamoto	Kumamoto forestry college	(B)
23	Oita	Oita Forestry Academy	(D)
24	Miyazaki	Miyazaki Forestry College ( <i>Miyazaki Ringyo Daigakou</i> )	(B)

560

561

562 **Table 2.** Number of people who passed the hunting license examination in 2021 in the  
563 eight prefectures.

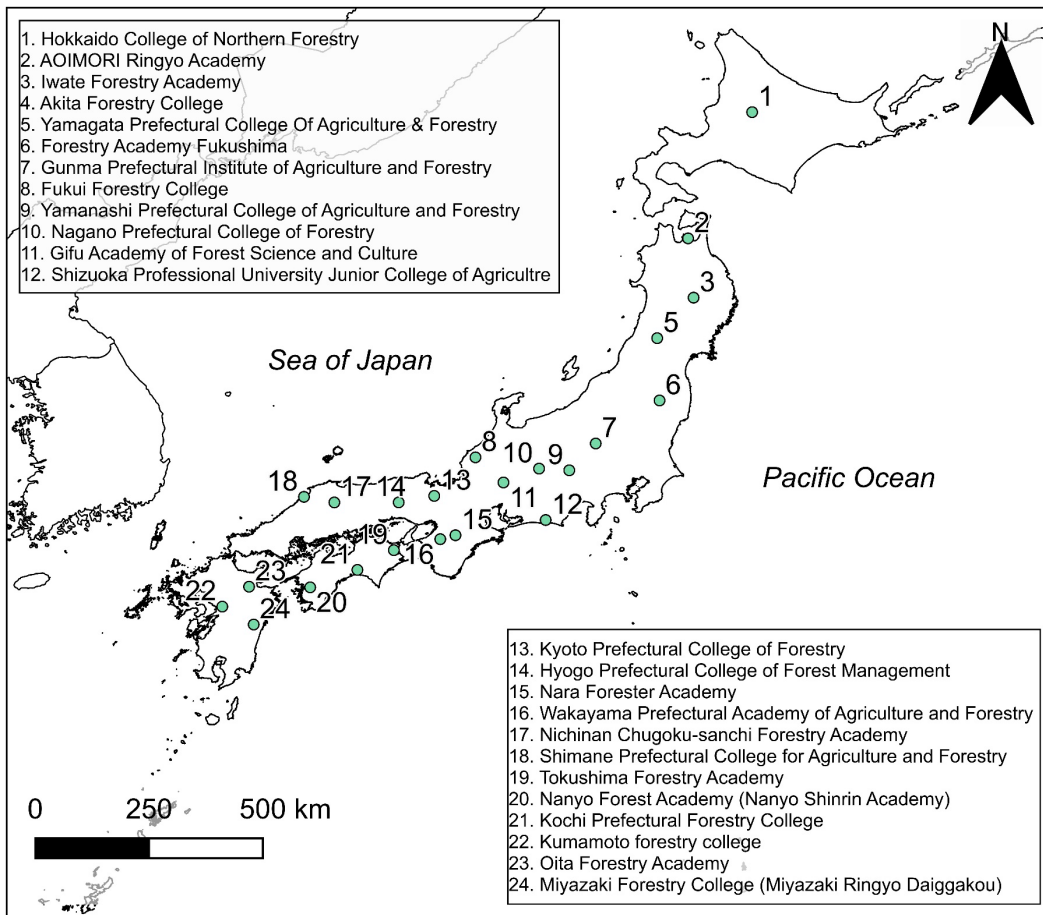
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Age (years)	Number of overall successful people	Number of students of the forestry schools (percentage of forestry school students)
18–19	112	47 (42.0)
20–29	273	23 (8.4)
30–39	412	23 (5.6)
40–49	488	9 (1.8)
50–59	305	5 (1.6)
>60	532	3 (0.6)
Total	2122	110 (5.18)

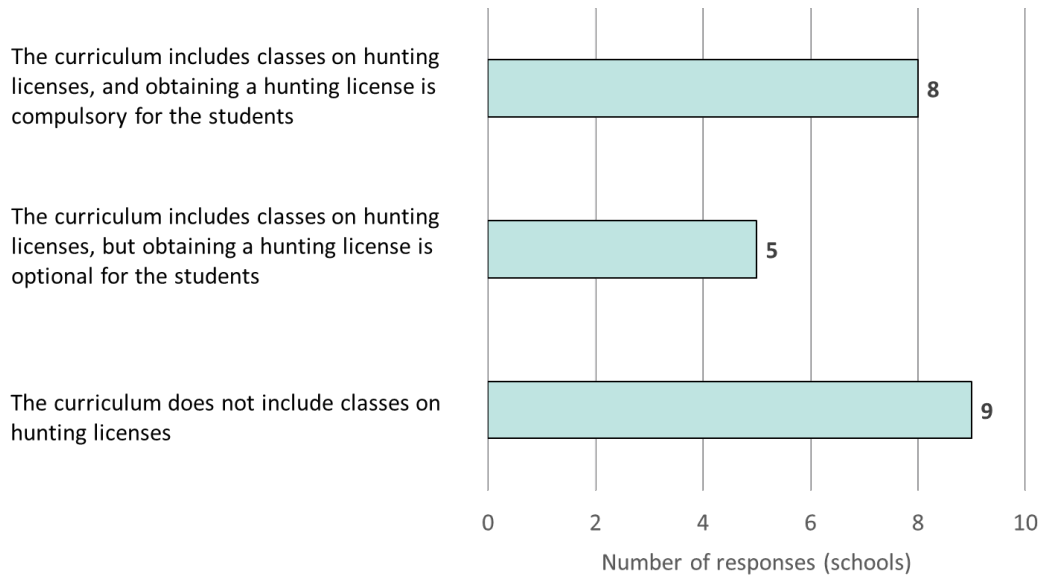
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565



568 **Figure 2.**



569

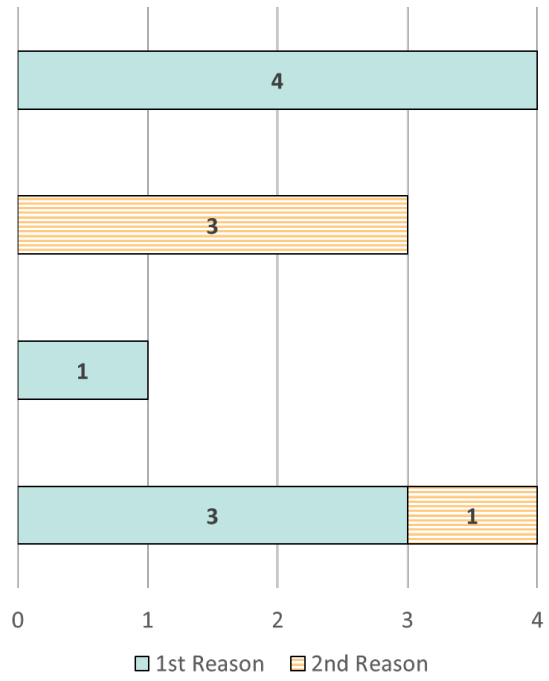
570 **Figure 3.**

Because we think hunting licenses are less important licenses for training forestry workers.

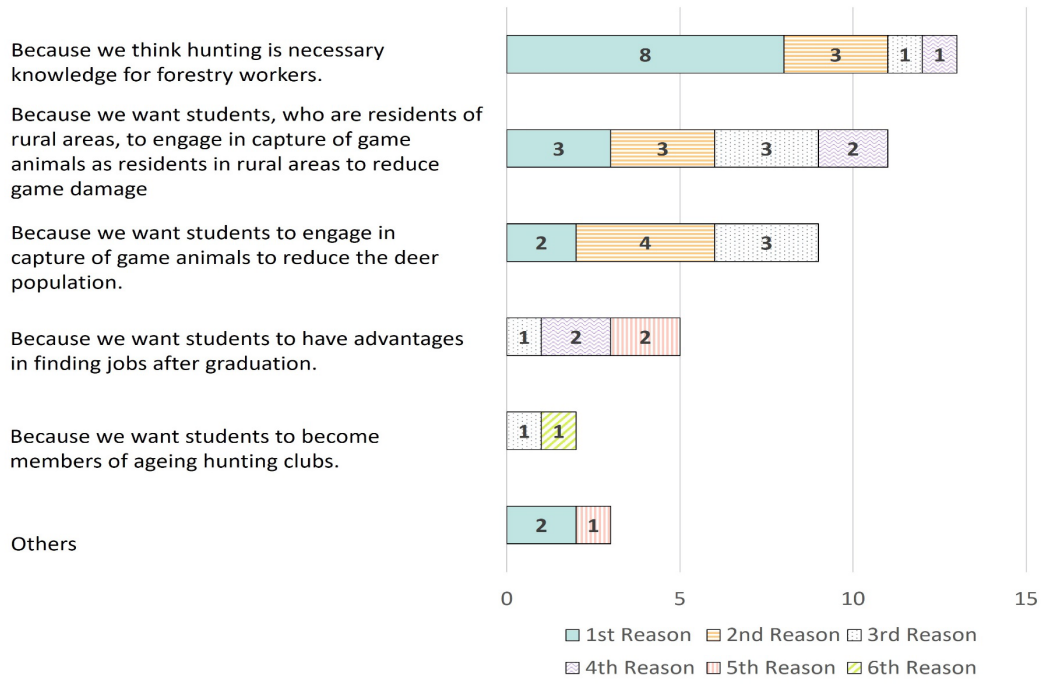
Because we have time constraints and it make difficult to include hunting license classes in our curriculum.

Because we have not observed significant game damage in our prefecture.

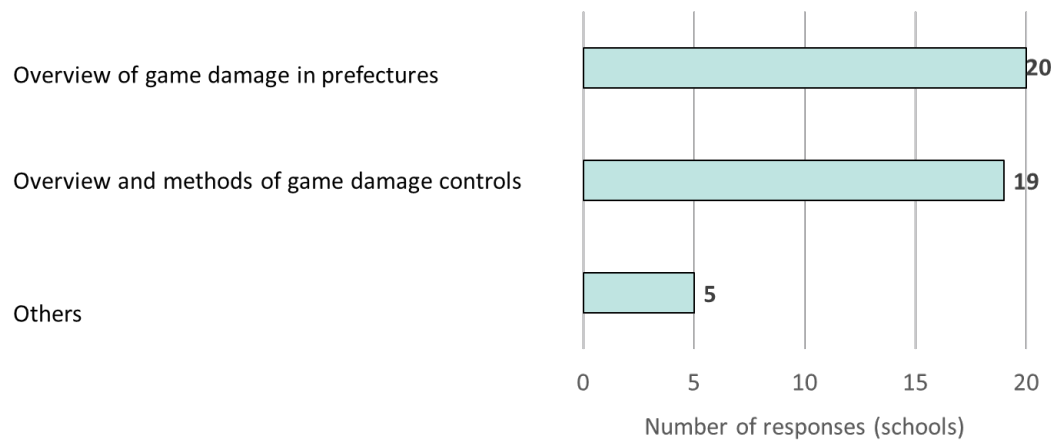
Others



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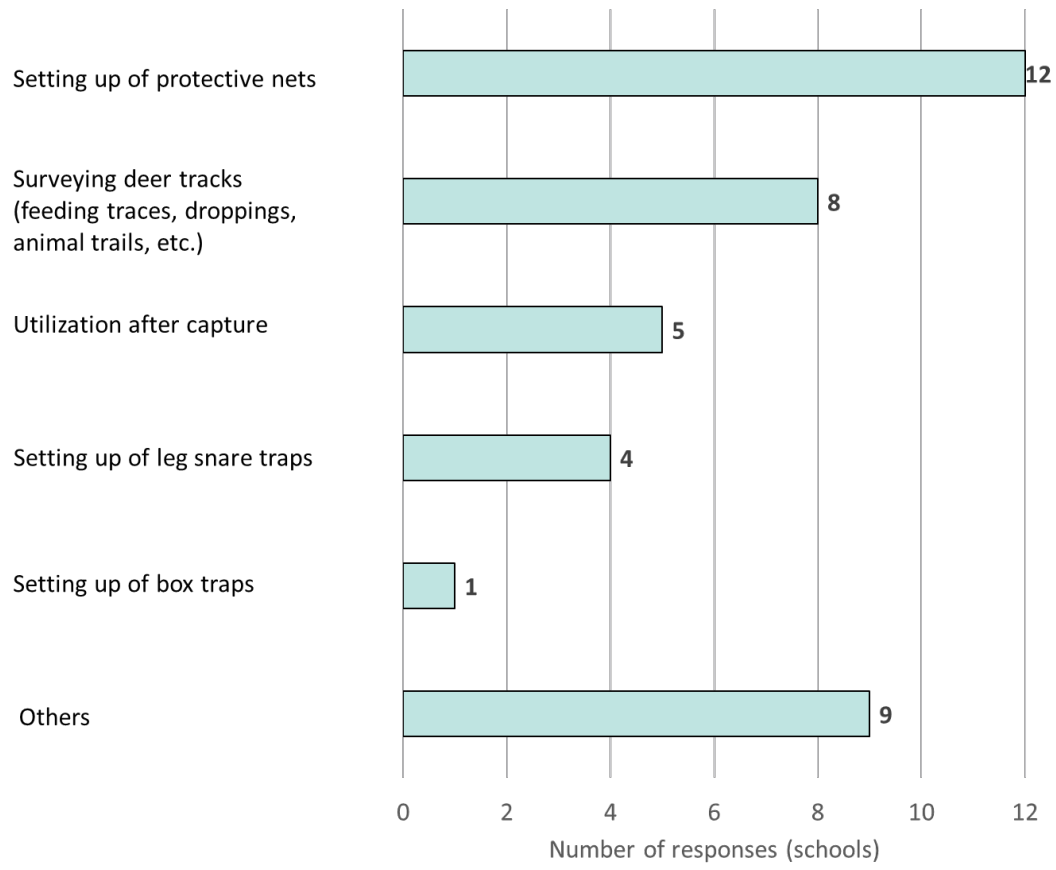
574 **Figure 5.**



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576

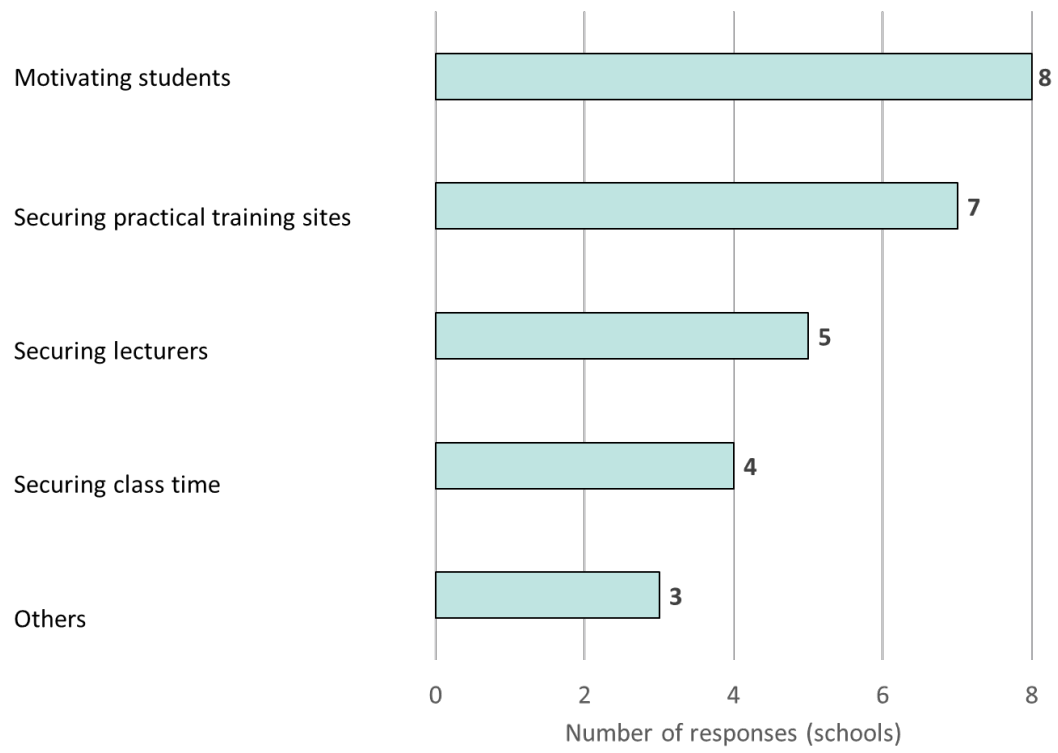
577 **Figure 6.**



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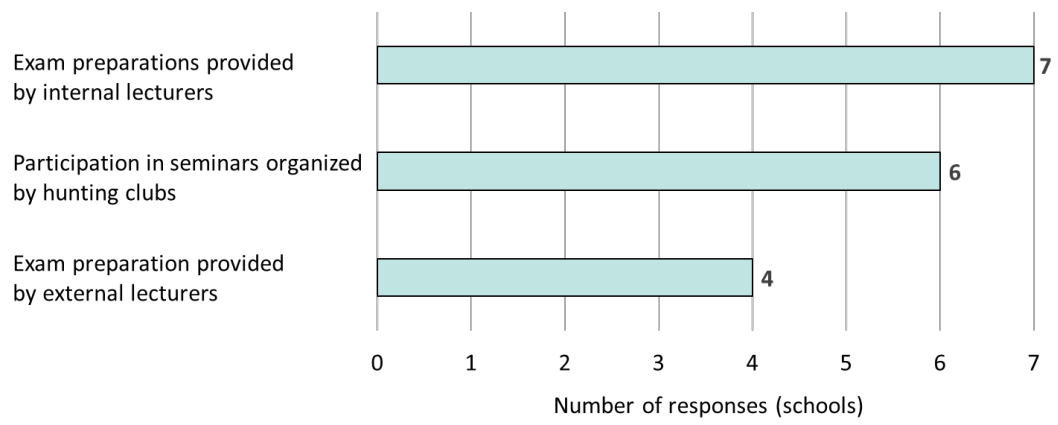
579 **Figure 7.**



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581

582 **Figure 8.**



583

584 **Figure captions**

585

586 **Figure 1.** Locations of the forestry schools.

587

588 **Figure 2.** Position of hunting subjects in the curriculum (n = 22).

589

590 **Figure 3.** Reasons for not including classes on hunting licenses in the curriculum (n = 9)  
591 (multiple answers).

592

593 **Figure 4.** Reasons for including classes on hunting licenses in the curriculum (n = 13)  
594 (multiple answers).

595

596 **Figure 5.** Breakdown of classroom lectures (n = 22) (multiple answers). Source: Prepared  
597 by authors based on the questionnaire survey.

598

599 **Figure 6.** Breakdown of classroom lectures (n = 22) (multiple answers). Source: Prepared  
600 by authors based on the questionnaire survey.

601

602 **Figure 7.** Breakdown of classroom lectures (n = 22) (multiple answers). Source: Prepared  
603 by authors based on the questionnaire survey.

604

605 **Figure 8.** Preparation for the hunting license examination in forestry schools (n = 13)  
606 (multiple answers). Source: Prepared by authors based on the questionnaire survey.