

Actual condition and problem of visitor use in Jozankei National Forest, Japan

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Abstract: Jozankei National Forest, a part of the Shikotsu Toya National Park, is located in a mountainous area about 30 km south of central Sapporo. The forest is managed by selective cutting based on high-density forest road network. Because of the roads, visitor access is easier than it is in other surrounding forests. From spring to autumn in 2003, visitor flows were monitored at two entrances of the forest road network using Trail Traffic Counter. There was a remarkable visitor concentration in spring and the behaviour of visitor varied at each season. It was considered that the reason for the difference could be the different purposes of visits to the park as well as the characteristics of the forests visited.

Introduction

The 28 parks of National parks of Japan cover about 2.06 million ha, which is about 5.4 percent of the total land area of Japan. According to National Parks statistics, there were 934.7million visitors to the parks in 2001 (Ministry of the Environment 2002). The statistics were based on the report of municipal governments. Aoki and Hosono (1991) conducted a questionnaire survey to the municipal governments to determine the data source of the statistics. In most cases, the data was based on the number of guests at hotels and hot springs. The information concerning day trips was not used. Furthermore, it seems that some explanation should be provided for the fact that some of the information is unreliable. It appears that the statistics regarding visitors to the national parks may not be accurate, which determines the need to monitor the visitor flow at national parks.

Visitor flow was monitored at the Oze National Park and at the Shirakami World Heritage area. Because of the limits of power supply and accuracy of the sensor, only the limited area was monitored (Hirata 1999). A standalone automatic system for counting climbers was developed and the number of climbers in the Yakushima national park was monitored by the system. Total number of climbers was estimated about 45,000 in year 2000 (Hirata 2001).

There have been several studies focusing on the visitor flow in the forest parks. Yamaki and Tsuchiya (1993) conducted a study using automatic counters to determine the number of visitors to two forest parks in Hokkaido. It was observed that both of the forest parks had unique seasonal and daily pattern of visitor flow. Takahashi et al. (1994) studied the use of a forest road in the Chiba university forest of the University of Tokyo. The results show that the forest road was used

as a fast road to Famous Temple near by the University forest. A questionnaire and visitor counts have been used to monitor the visitor flow to the University forest in Ashu of Kyoto University since the 1990s. As a result, the number of visitors was estimated to be at least 15,000 people per year (Hirata et al. 1992, Hirata et al. 1993, Hirata et al. 1994).

Most of the studies targeted climbers and hikers and there are few studies dealing with vehicular access focused on the use of forest roads. Limited study related to car access was done especially the usage of forest roads.

Thus, objective of this study was to know how forest roads in National Parks are used by continuously monitoring them with automatic counters and to discuss the conflict between visitor use and forest management.

Study Area and Method

The Shikotsu Toya National Park has 99,302 ha, including Lakes Shikotsu and Toya, Mt. Yotei, Mt. Usu, and Mt. New Showa. More than 90% of the area is a part of the national forest of the Ministry of Agriculture, Forestry, and Fisheries.

The study area, Okujozankei National Forest, which has about 11,000ha, is located in the southern end of Sapporo City at an elevation in the range of 500 to 1,300m. Selective cutting has been used to manage the forest since 1969, and a dense network of roads has been established (Figure 1). The density of forest roads is 46.7 m per ha. Yamaki (1997) clarified the characteristics of recreational access in the Shikotsu Toya National Park. He mentioned the potential of forest roads for recreational access. Okujozankei national forest has one of highest potential area for recreational use because of the dens forest road net-

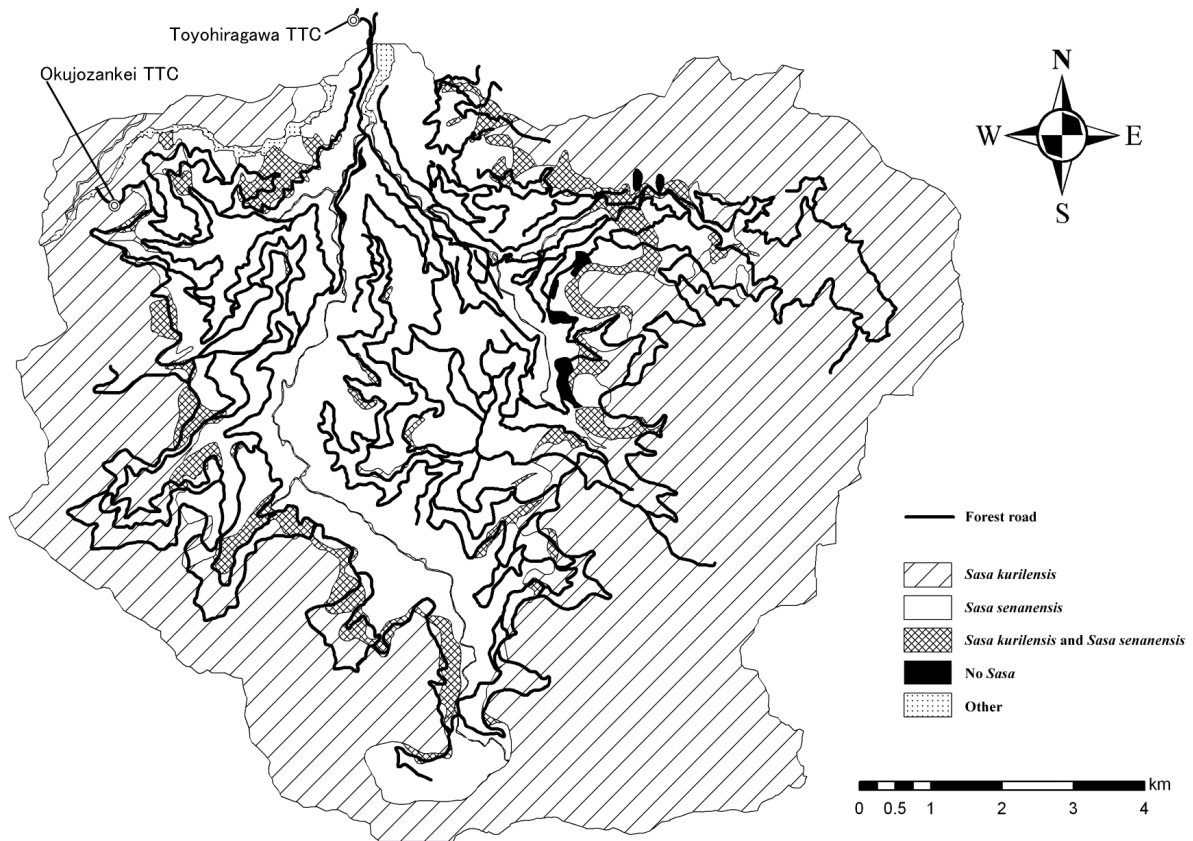


Figure 1. Study area and type of *Sasa* vegetation.

work. Therefore, Okujozankei national forest is characterized as an easy access area (Yamaki 1997).

The Forest roads connect with public roads in three places. One of them is strictly controlled by the Jozankei Dam management office. The other two, Okujozankei forest road (Okujozankei) and Toyohiragawa forest road (Toyohiragawa), connect with National Road No. 230 (Figure 1). In addition, the forest road network does not connect with the adjoining forest road network; visitors must use these two entrances. Consequently, the flow of visitors using these entrances could be monitored with the use of a trail traffic counter (Ivan technologies inc. TTC). A TTC is an active infrared counter comprising an emitter and detector. If the infrared signal is interrupted, the time is recorded. Both the emitter and detector are comparatively small, and long-life batteries are built in. The accuracy of the TTC was checked and confirmed in outdoor experiments (Gasvoda 1999, Takahashi et al. 2003).

TCC devices were installed at the entrances to the forest roads. The flow of visitors using the two forest roads was monitored for 170 days, from 28 May to 13 November 2003. The visitors were assumed to arrive at the entrance by car or on foot. Therefore, emitters and detectors are set up 3 to 10 m apart from the edge of the forest road using wooden pile and plate and detection area was set about 60 to 80 cm above ground. The distances between the emitter and

detector were about 14 meters at Okujozankei and about 24 meters at Toyohiragawa. The logged data were corrected once every one to three weeks. At that time, to avoid miscounting, the vegetation around the equipment was trimmed, and the detector and emitter were inspected.

The Hokkaido Regional Development Bureau of the Hokkaido Development Agency monitored the weather at the Nakayama Pass at the Nakayama weather station, which is located about 1 km south from the entrance to the Okujozankei Forest. Weather, temperature, and wind speed were corrected at noon to detect errors in counting and analyze the fluctuation of the visitor flow. In addition, foresters at the Ishikari Forestry Office completed a questionnaire as a part of the study.

Results and Discussion

Detection and correction of errors in counting

A total of 15,786 were counted at Okujozankei and 6,697 at Toyohiragawa. The counts were exceptionally high when the wind speed was high and when snow was falling, which was apparently due to a malfunction of the TTC device. The dubious counts were attributed to bad weather.

Therefore, the following counts should be considered erroneous observations and thus deleted from the data for analysis:

- Data obtained when the wind speed was over 8 meters in Okujozankei
- Data obtained when snow fell in Toyohiragawa.

There is a technical possibility to obtain the counts at less than five second intervals. However, high frequency counts with short intervals should be considered to be erroneous observations. Hence, it is eliminated from the analysis that the day, which more than 30 % of whole day counts were, observed less than 5-second intervals

After exclusion, counts in Okujozankei were 7,149 and 6,152 in Toyohiragawa.

Trends observed in the visitor flow

The monthly ratio of the counts at Okujozankei and Toyohira are shown in Figure 2. At Okujozankei, the counts in June reached 63.3% of the total counts. Interviews with foresters indicated that the main purpose of the visits in June was collecting edible wild vegetables, in particular, shoot of *Sasa kurilensis*. Okujozankei could provide an easy access to *Sasa kurilensis* covered area.

On the other hand, in Toyohiragawa, about 30% of all counts were noted in July. June, August, and October shared around 14–20% of the total counts. Interviews indicated that visitors' activities included picking wild edible vegetables and mushrooms as well as fishing. However, Toyohiragawa was partially unavailable to visitors in June because of a landslide the previous winter. Therefore, it might be possible that most visitors would concentrate in Okujozankei in June.

Average counts by weather condition showed that weather condition affected significantly in Okujozankei, but insignificantly in Toyohiragawa (Figure 3). Elevation of Okujozankei was relatively high to Toyohira. Additionally, Toyohira went through the bottom of the valley. Visitor could use Toyohira in all winds and weathers.

In forest parks in Hokkaido, more than half of visitors visited on Sunday (Yamaki & Tsuchiya 1994). The daily counts in Figure 4 shows that the average counts on weekends were larger than that on weekdays. Compare to the result of the Forest Parks, there are not concentrated on Sunday significantly. It is considered that Okujozankei national forest mainly manages for forest management and facility for visitors did not built.

According to the interview of the foresters, it was estimated that 50 counts were generated by forest management work, 62 by forest research work and 156 by permitted events. In addition, several construction and maintenance work were in progress in the forest in 2003. It was estimated that 836 counts were generated by road maintenance and 1,238 by several construction works. Therefore, 2,342 counts were generated by forest management related work and permitted use. It means more than 10,900 counts were generated by visitors in 2003 (Figure 5), which indicates that counts by visitors was four times or more than forest management related counts.

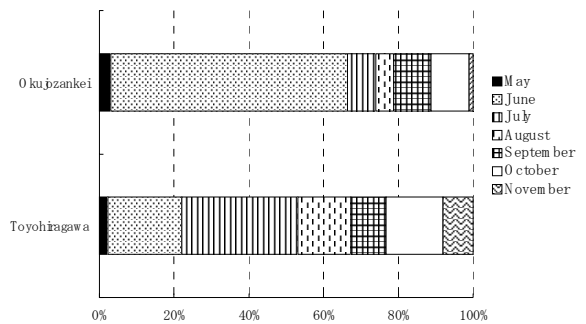


Figure 2. The monthly ratio of the counts.

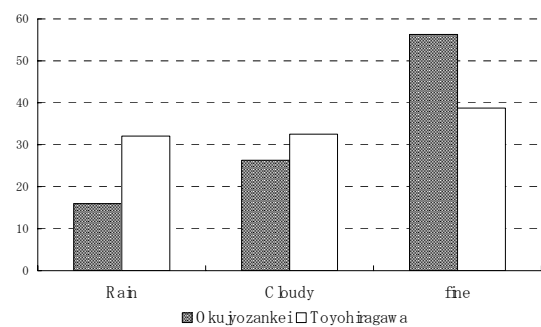


Figure 3. Average counts by weather condition.

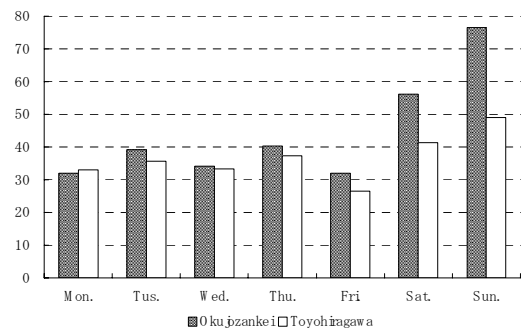


Figure 4. Average counts by the day of the week.

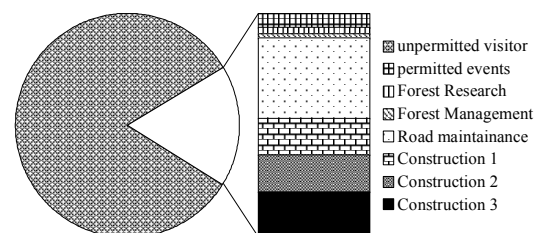


Figure 5. Count Ratio by type of visitors.

Conflict between forest management and visitor use

As a result of questionnaire survey, more than 80% of foresters in Ishikari forestry office were recognized that so many visitors were used their managed forests (Figure 6). Half of them recognized that visitor use made problem for their management activities (Figure 7). Examples of the problems were damage for forest roads, illegal dumping, and rescue work for casualty.

Almost all forest in Okujozankei national forest has *Sasa kurilensis*, one of typical edible wild vegetable, as major forest floor vegetation. Additionally, *Sasa kurilensis* grow very fast and has rhizomes. Therefore, there is no damage of *Sasa kurilensis* vegetation by picking bamboo shoot.

On the other hand, other edible wild vegetables do not have rhizome. Some of them are picked not only leaf or bud but also rootstock. Thus, it is a high possibility to incur resource depletion of wild edible vegetables.

Ando et al. (2002) reported that recreational fishing strongly affected fresh water fish in Hokkaido. Same situation might be concerned in Okujozankei national forest.

The forestry agency determined that visitors could access the national forests on foot but not by automobiles. Thus, most of the forest roads have a gate to control the traffic. However, at least in Hokkaido, people can buy keys at household goods stores in the city to unlock the gate. Most counts at both Okujozankei and Toyohiragawa were the result of automobiles crossing the gate illegally. This indicates

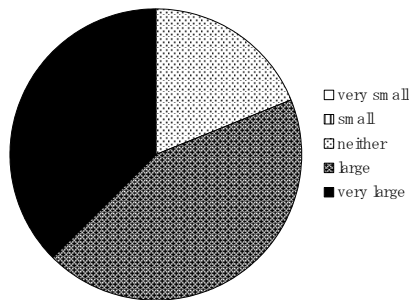


Figure 6. The Amount of visitors in forests of Ishikari forestry office.

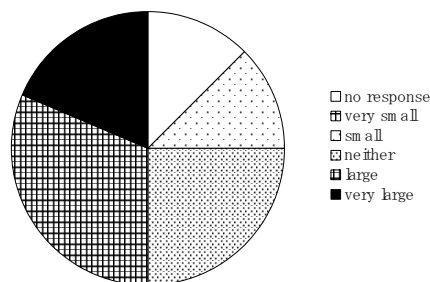


Figure 7. The amount of the effects for forest management caused by visitor use.

that the gate system is not adequate and has a bad effect on forest management.

Conclusions

Automatic infrared counters were used to monitor the flow of visitors who used two forest roads at Okujozankei national forest in Shikotsu Toya National Park. Above 13,000 counts were noted, and the ratio of visitor use to forest management activities was 4 to 1.

Ineffective control of the gate of forest roads affects not only forest management but also depletion of wild edible vegetables and fish resources.

Improvement of visitor flow control is strongly needed in national parks and national forests.

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