The History of Sediment Disasters and Sabo Projects in the Yomase River Basin, Nagano Prefecture, Japan

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INTRODUCTION

The Yomase River is a flashy devastated river that discharges a large amount of sediment from the Shiga Highlands, a plateau formed by the activities of an ancient volcano, with a catchment area of 117 km^2 and a total length of 26 km. It joins with the Chikuma River at Yanagisawa, Nakano City, Nagano Prefecture. The Yokoyu River and Kakuma River, which both start in the Shiga Highlands at a height of about 2000 m, join each other near the Yudanaka and Shibu Spa in Yamanouchi town. A vast alluvial cone, the Yomase River Fan, stretching for 6 km and covering an area of 25 km^2, is formed in the downstream area of the Yomase River.

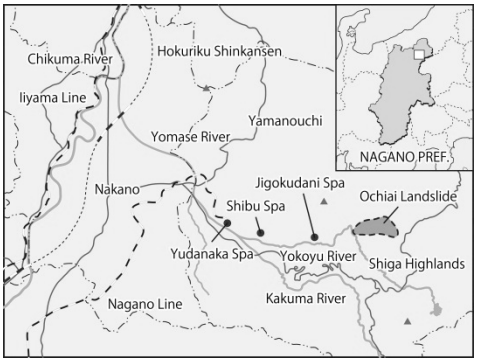

Fig. 1 Location map

The Nagano Prefectural Museum of History stores the large-scale survey maps prepared from actual measurements made from 1906 to 1911 and the documents related to the Yokoyu River sabo works (sediment control works).

In consideration of this background, we investigated the topographic and geologic conditions of the Yomase River and its history of sediment disasters and report in this paper the results of our investigation about their relationship with the sabo projects (sediment control projects).

PAST SEDIMENT DISASTERS IN THE YOMASE RIVER BASIN

The midstream area of the Yomase River, a popular spot used for hot-spring cure for many centuries, has repeatedly suffered damage by sediment disasters.

Table 1 Past sediment disasters in the Yomase River basin

No.	Year	Description
1	1406	A major flood changed the course of the Yomase River, which originally ran toward Entoku Paddy Field, to what it is today.
2	1614	Major landslides occurred in Mt. Kosha due to heavy rainfall. Two landslides ran down toward the Yomase River and crushed villages on the way. Flooding occurred in the river, and the damage to Entoku Paddy Field was particularly serious.
3	1742	An enormous flood (called Inu-no-Mansui) occurred in the Chikuma River and inundated the paddy and upland fields in the alluvial fan of the Yomase River.
4	1757	Heavy rainfall caused a flood, making the Yokoyu River overflow and washing away the Kawara-yu hot spring building. A major landslide occurred on the mountain behind Shibu Oyu hot spring.
5	1847	A major earthquake, the Zenkoji Earthquake, occurred, and there were major landslides from Mt. Iwakura, which dammed the Sai River. The vast landslide dam was breached and resulted in a big flood in Entoku Paddy Field.
6	1910	A major flood occurred in the Yomase River basin, washing away the sabo facilities that had been constructed previously.
7	1950	Heavy rainfall caused a major flood in the Yomase River. The overflowing water of the Kakuma River breached the levees and almost totally destroyed Honami Hot Spring.

HISTORY OF SEDIMENT DISASTERS AND THE SABO PROJECTS

After the Sabo Act was put to effect in 1897, the Nagano prefectural government started a sabo project in the upstream area of the Yokoyu River, a right-bank tributary of the Yomase River in 1906. Fig. 2 is a sketch of sabo works locations in the Yokoyu River prepared in 1908, stored by the Nagano Prefectural Museum of History. It shows that many sabo works planned and executed near the lower part of the Ochiai Landslide near the confluence with the Ryuozawa Stream on the right-bank side of the Yokoyu River. In those days, the works were mainly dry masonry dams, drainage works, and terracing of slopes with seeding. However, a sediment disaster that occurred in August 1910 mostly destroyed the sabo facilities constructed by then, and almost none is extant today.

However, the local residents, the victims of the major flood, powerfully made a plea for resumption of the project, and the then Ministry of Interior launched a sabo project under direct management of the national government in the Yokoyu River in 1918. The resumed works were conducted by Ministry of Interior Niigata Construction Branch Office until 1933. Many of sabo works are still extant, and our field survey identified mortar masonry dams.

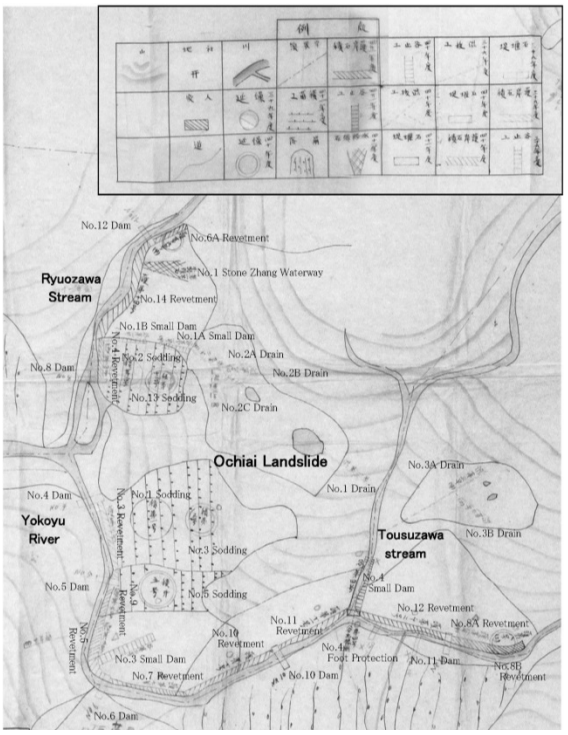

Fig. 2 A sketch of the sabo facility locations in the Yokoyu River in 1908
stored in the Nagano Prefectural Museum of History

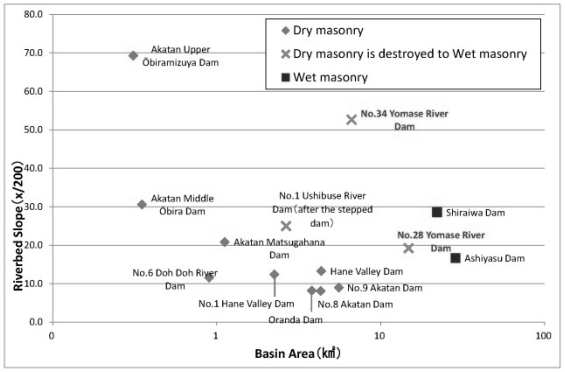

Fig. 3 The relationship among historical sabo dams, basin areas, and riverbed slopes

DISCUSSION

It is generally understood that the first application of concrete to sabo dams was construction of the Ashiyasu Sabo Dam completed in 1916. It is logically presumed that diffusion of concrete as a building material for sabo works in the Yomase River, where floods frequently washed away sabo facilities, had a major impact. The authors organized the data on the locations where well-known sabo facilities of historical value constructed along local rivers including the Yomase River were constructed using catchment area and riverbed gradient as indicators (Fig. 3).

CONCLUSIONS

Fig. 2 is very valuable since it shows the layout of sabo facilities constructed at the end of the Meiji Era (1906-1910). We obtained useful knowledge for discussion or study on, for example, how dry masonry dams were constructed in those days or on limit conditions for preservation of those historical facilities.

In future, we will consider issues such as suppressing the activities of Ochiai landslide, maintaining existing facilities and improving disaster prevention awareness.

Keywords: Historical sediment disaster, Sabo projects history, Historical sabo facilities, Dry masonry dams