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A Simplified Method of Limiting of Recent Flood Area
—An Example in the Nasuno Basin—

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Geomorphic Division of the Nasuno Basin: Several geomorphic surfaces have been recognized in the Nasuno Basin, north of Tochigi Prefecture, as shown in the previous paper[1] (Fig. 1). The higher two (Gongenyama- and Kanemaruhara-surface), covered with thick volcanic ash layer—Torinome (=Shimosueyoshi) and younger Loam—, are considered to be of late Pleistocene formation, being the oldest landscape of the basin. The Nasuno-surface, younger than the former, can be correlated physiographically as well as tephrochronologically to the Musashino-surface of southern Kantō, being covered with thin ash layer —Nasu (=Musashino) and younger Loam—underlain by Nasu fan gravels. Any of the surfaces occupying the northern rim of the basin (Momura-, Yugū-, Anazawa-, Takabayashi-, Orido- and Yokobayashi-surface) is younger than the above three, partly covered with thin tephra—Fujinita (=Tachikawa) Loam—[2].

Recent Flood on the Nasuno-surface: Northern fan-shaped surfaces bounding the mountain front such as Yugū- and Anazawa-surface have steeper slope gradients than that of the Nasuno-surface, descending successively to imperceptible mergence with the latter, and small alluvial fans or flood outwashes debouch from two intrenched streams, the river Sabi and the river Kuma, south-eastward toward the center of the basin. These streams rise from northern adjacent mountains, flood at the center of the basin and then cut again the southern margin of the Nasuno-surface. The writer and others have observed characteristic profiles of surface geology with no volcanic ash or buried ash layer at several sites on the Nasuno-surface[3], suggesting that the Nasuno-surface might partly be superposed by recent flood deposits. But between the recent flood topography and the old Nasuno-surface is a transitional zone of a mixture of surficial materials, and no distinct division of landforms can be recognized. The main effort of study should be directed toward the micro-topographic survey in this area, with the view of clarifying the detailed soil and landuse pattern. In this paper, the writer has presumed the area of recent flood deposits scattered around the modern stream courses, by a simplified method

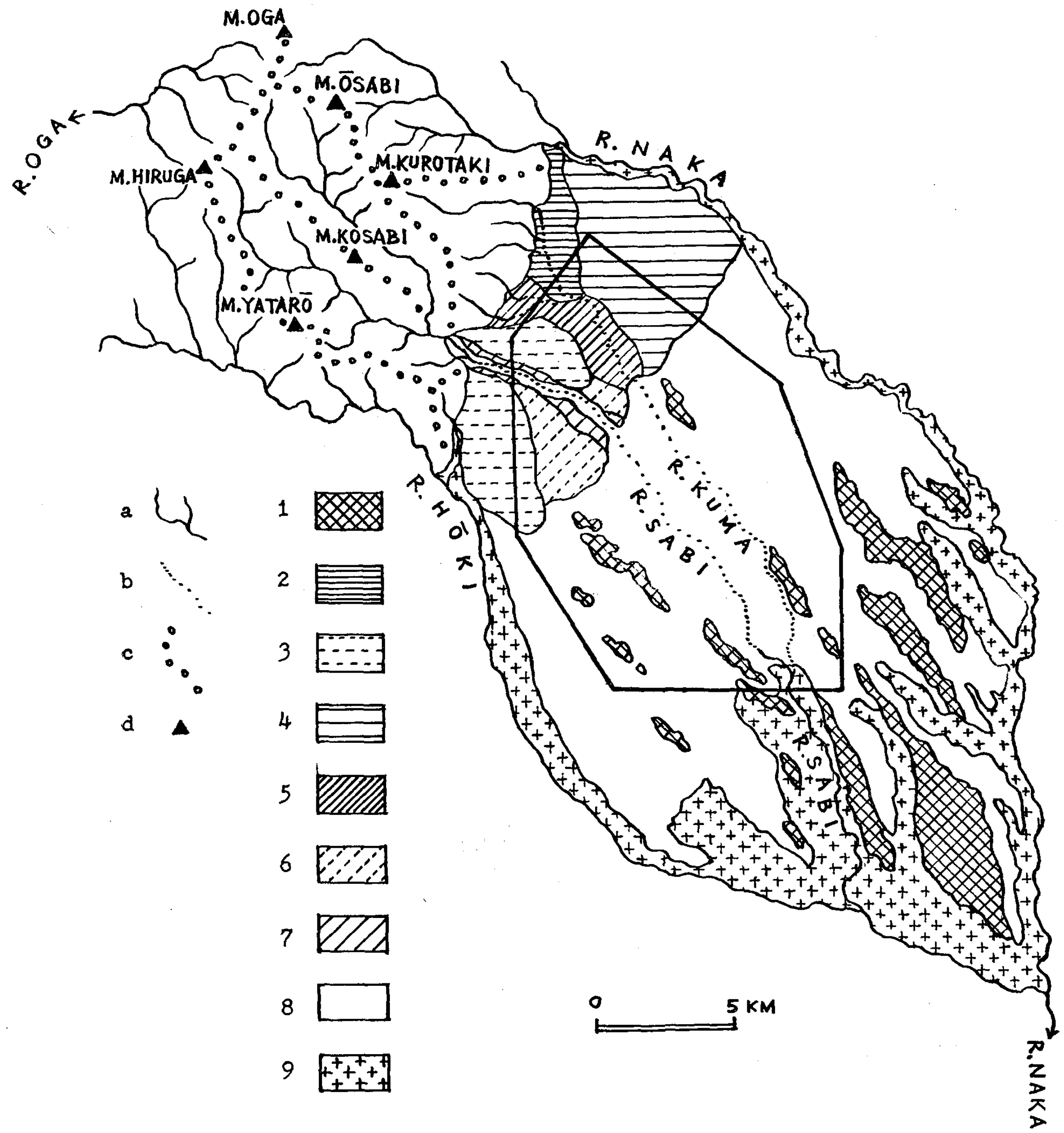

Fig. 1. Drainage Pattern and Geomorphic Surfaces of the Nasuno Basin.

a:	stream	1:	Gongenyama- and Kanemaruhara-surfaces
b:	influent stream	2:	Momura- surface
c:	divide	3:	Yugū- "
d:	peak	4:	Anazawa- "
		5:	Takabayashi- "
		6:	Orido- "
		7:	Yokobayashi- "
		8:	Nasuno- "
		9:	Chikasono- and other younger surfaces

through mechanical analysis of surface soil materials.

Geology of Adjacent Mountains: In general, the sediments of the alluvial fans or floodplains are gravels and sands originated in their source regions, influencing upon parent materials of soils developed on them. The northern adjacent mountains supplying materials to the basin consist mainly of acidic rocks such as granite, granite-porphyry and rhyolite-dacite, with exceptional addition of andesite-basalt and pyroclastic sediments. These intrusive or effusive rocks formed during late Cretaceous period or early Neogene epoch[4] (Fig. 2).

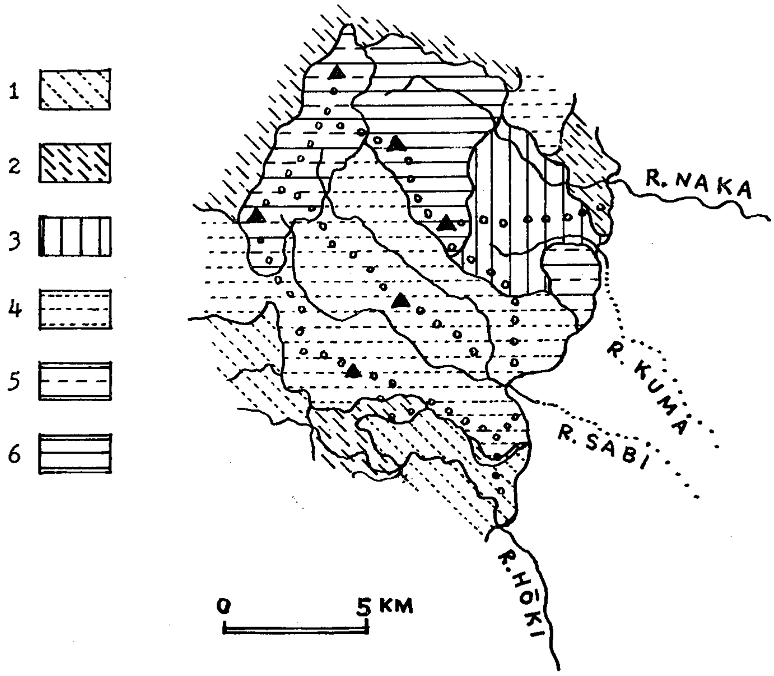

Fig. 2. Geological Map of Northern Adjacent Mountains.

1:	Sedimentary Formation	(middle Neogene)
2:	" , mostly pyroclastic	(lower Neogene)
3:	Andesite-Basalt	(early Neogene)
4:	Rhyolite-Dacite	(")
5:	Granite-Porphyry, Quartz Porphyry	(early Paleogene?)
6:	Granite	(late Cretaceous)

Samples Prepared: Surface soil materials were collected from the area encircled by big lines in Fig. 1, when reconnaissance surveys on micro-topography were practised. Sample sites were about 100 in number, distributed mainly along several passes in the perpendicular direction to the stream course, as shown in Fig. 3. All samples were initially air dried and handcrushed to pass a 2 mm sieve. Clay fractions were seperated from them by treatment with hydrogen peroxide, addition of 5% oxalic acid and shaking for an hour, followed by sedimentation of over 0.05 mm particles by ASK method of mechanical analysis, and then screened to pass a 0.2 mm sieve. The coarse sand thus prepared can be grouped into 3 types by the feature of particles and mineralogical difference through stereo microscope, as follows.

Type 1: Most particles of this type are mixed subangular sands of light color, having rather rounded edges and faces, and quite resemble to fan gravel in appearence. They seem to be derived from

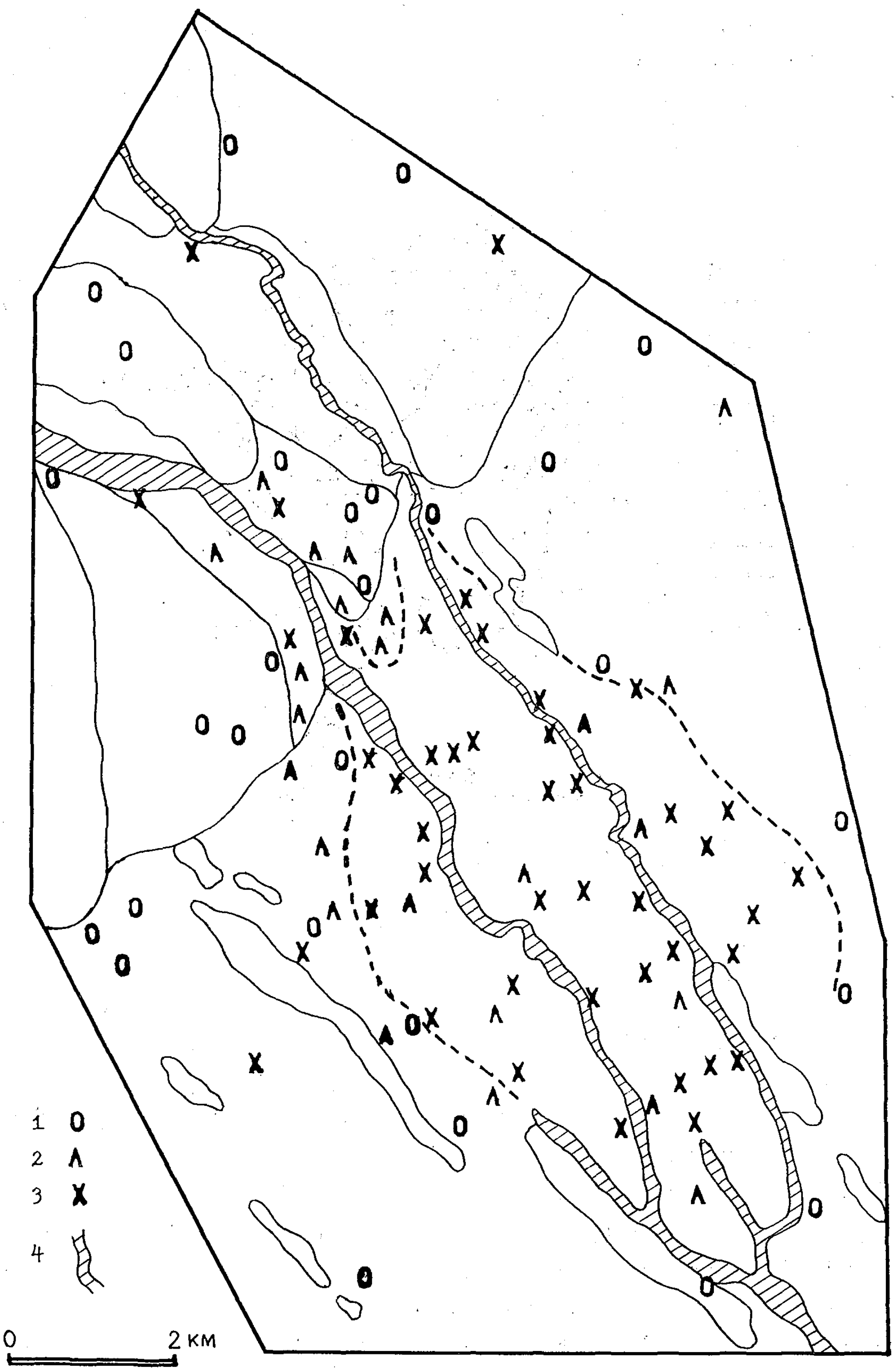

Fig. 3. Sample sites and the Area of Recent Flood Depocites Presumed in the Center of the Nasuno Basin.
1: Type 1
2: „ 2
3: „ 3
4: Modern Stream Beds

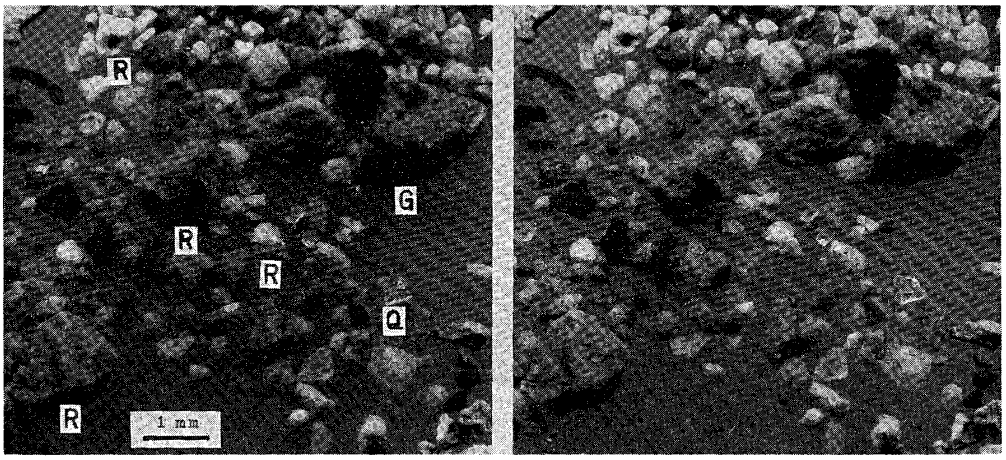

Plate 1. Stereograph of Coarse Sands—Type 1—

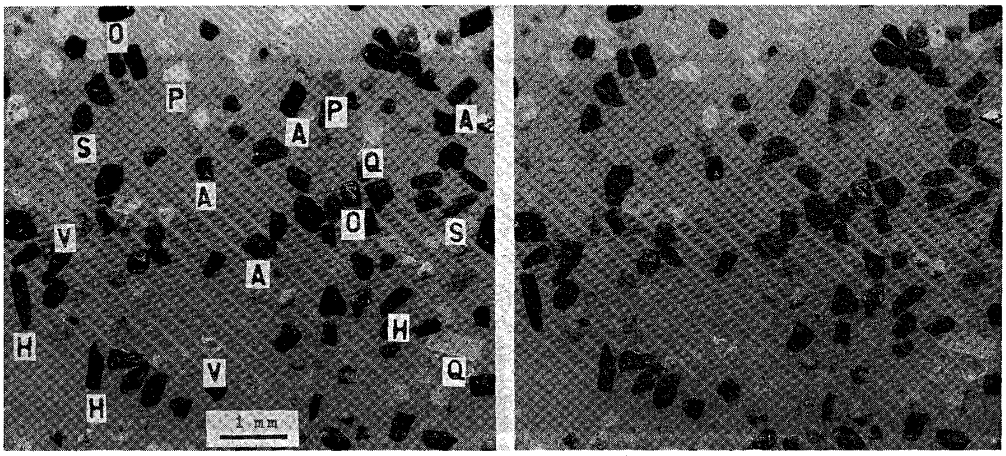

Plate 2. Stereograph of Coarse Sands—Type 3—

R : Fragment of rhyolitic rocks
G : „ of granitic rocks
A : Pyroxene
H : Hornblende
O : Olivine
P : Plagioclase
Q : Quartz
V : Volcanic glass
S : Scoria

unweathered rhyolitic or granitic rock fragments which constitute recent flood deposits (Plate 1).

Type 2: Mixed type of 1 and 3.

Type 3: Most particles consist of weathered rock fragments with much seperated mineral fractions and volcanic glass, finer than those of type 1 on the average. The mineral fractions can easily be distinguished, the main components of which are pyroxenes, hornblendes, olivines, plagioclases and quartz. Among them, pyroxenes predominate, followed by hornblendes. Such a particular composition of mineral components intimates that the source material of this type is derived from the upper volcanic ash of northern Kantō[5] (Plate 2).

Conclusion: The features of these three types were so strictly different from each other that all samples could easily be discriminated and classified under stereo microscope of 8–20 magnifications. Symbols of each type were plotted on the corresponding sample sites in Fig. 3; dotted lines drawn among the symbols of type 1 and type 2 or 3 encircle the presumed area of recent flood deposits superposed on the Nasuno-surface. Soils belong to type 1 distribute in a group by both sides of the modern stream beds with some exceptions, those belong to type 3, on the contrary, far away from the rivers or on old surfaces.

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2) Kantō Loam Survey Stuff (1965): Kantō Loam—its Origin and Nature—(in Japanese), 169–174.

3) I. Matsui, S. Asami and N. Sagehashi (1962): Geography of the Geomorphologic Surface in the Nasu-Fan Region, Tochigi Prefecture—Surface Geology as an Element Constituting Geomorphologic Region. Nat. Sci. Rep. Ochanomizu Univ., Vol. 13, No. 2, 129–134.
ibid. (2), appendix map I.

4) 1:75,000 Geological Map, "Shiobara" (1940).
1:500,000 Geological Map, "Niigata" (1967).

5) ibid. (2), 216–217.