

The First Asia Parks Congress, Nov. 2013, Sendai, Japan

Working Group 1

13 November, 2013

Change of Japanese land and construction of coastal forests

OHTA Takehiko

Professor of Emeritus at the University of Tokyo

“Fujisan”, a world's cultural heritage



Mihonomatsubara, in Shizuoka Pref.

The Great East Japan Earthquake

2011.3.11

Sendai
Airport

写真提供：毎日新聞社 名取市仙台空港東側北釜地区

The Large tsunami entirely destroyed houses and coastal forests.



Everything is disappeared ...



Natori City in Miyagi Prefecture

The Japanese learnt that

“damages from natural disasters could be decreased, however not prevented entirely”.

We are placed to shift our idea of

“disaster prevention”

to



“weakening disaster”

The types of damage

Broken stems



Push over



Uproot and wash away



Coastal forests' contributions to mitigate the tsunami disaster

- reducing tsunami power
- slowing the speed to arrive on land
- capturing driftage

Weakening tsunami energy



Capturing driftage

 Ships etc.

Google



Capturing driftage



Aomori Prefecture

Hachinohe City

History of coastal forest in Japan



Nijino-Matsubara, Karatsu City in Saga Pref.

Coastal forests prevent damages from salt breeze and sand shifts.

Coastal forests in Japan are almost designated as **protection forests**:

- for wind break
- for fog prevention
- for tide water prevention
- for shifting sand control

Most of them are artificial forests and were planted mainly to prevent damages from sand shifts after the 17th century.

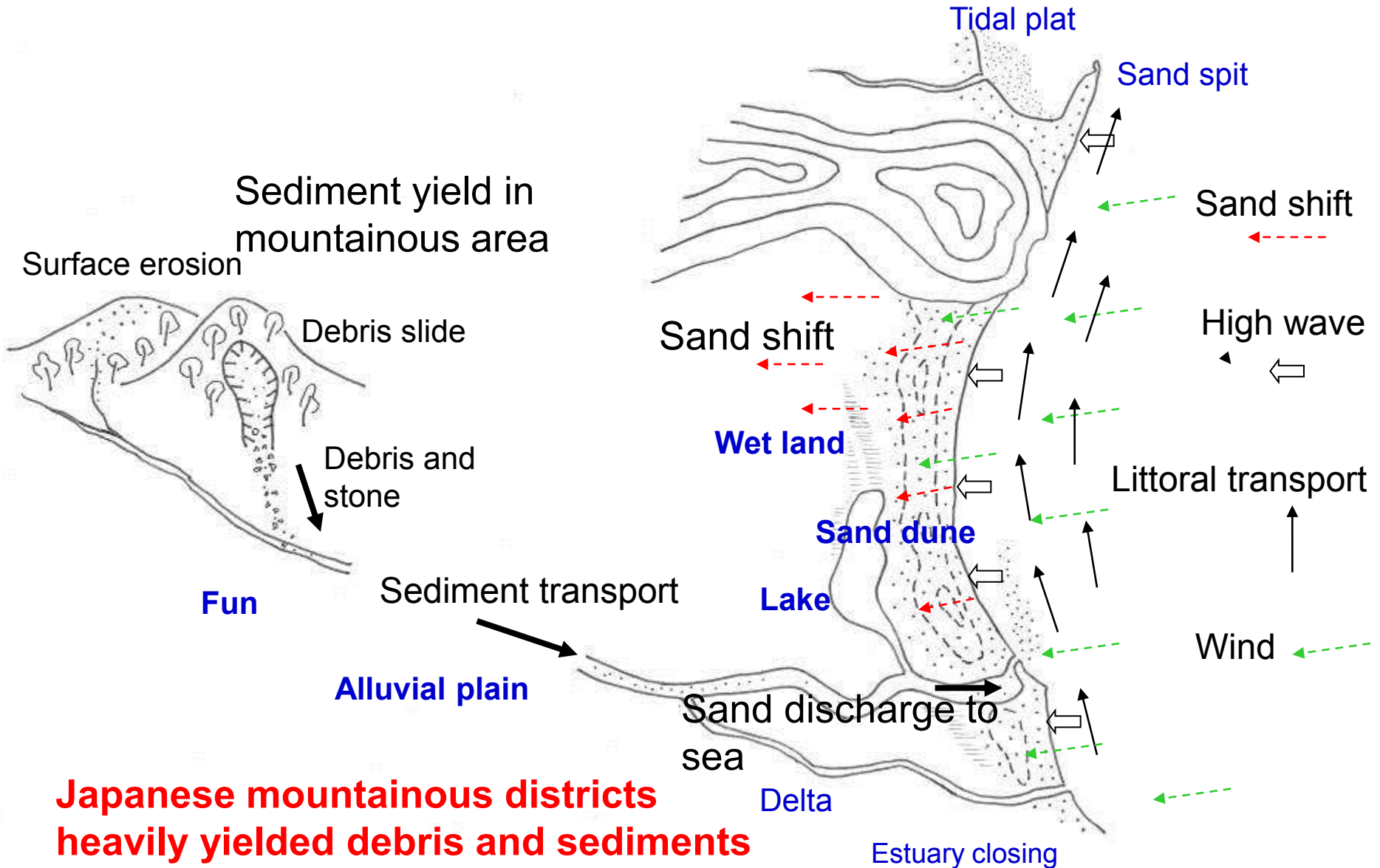
However, nowadays in Japan there are not many damages caused by sand shifts, and **why is that?**

Sand shifting disasters

Yamagata Prefecture 1933

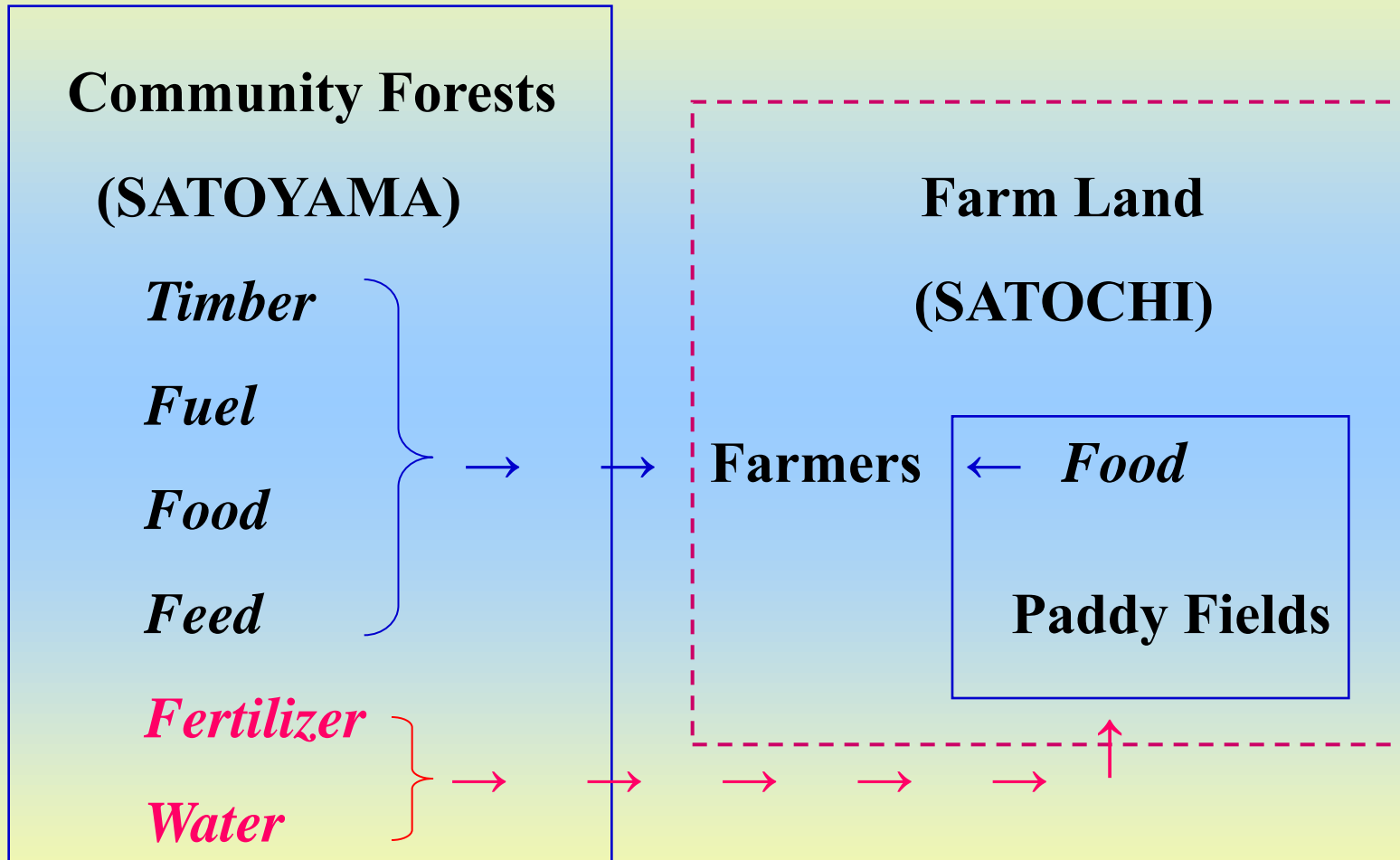


Formations of sand coast and sand dune



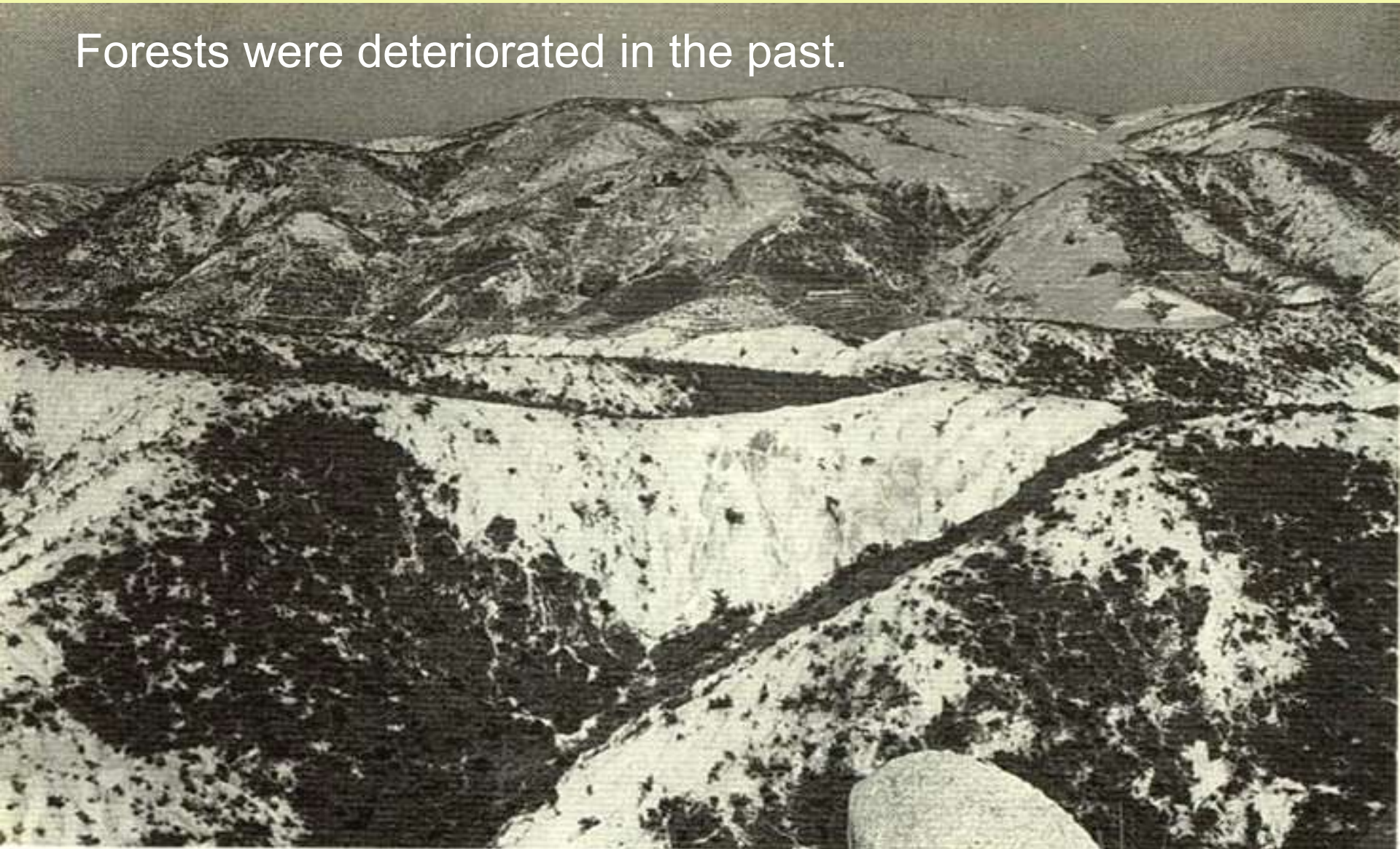
Japanese mountainous districts heavily yielded debris and sediments in the 17th to 19th century.

Forest and Agriculture



A history of Japanese forests

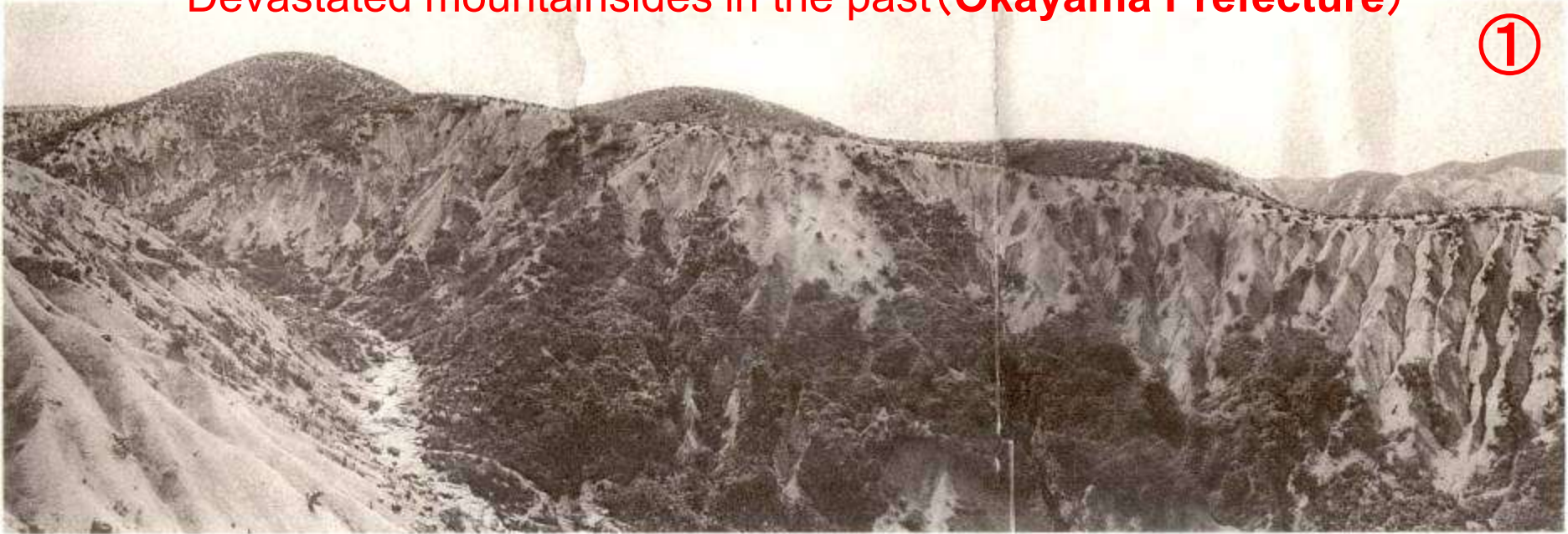
Forests were deteriorated in the past.



Okayama Prefecture

玉野市
Devastated mountainsides in the past (Okayama Prefecture)

①



Many of the forests were deteriorated, though not totally destroyed (Okayama Prefecture).

県北部

②

英田郡 東粟倉村



水源地は皆伐されて無立地化

勝田郡 広戸村 (現勝北町)



那岐・滝山連峰の山腹もチシマザサ密生で無立木。水源かん機能も低下していた。

勝田郡 梶並村 (現勝田町)



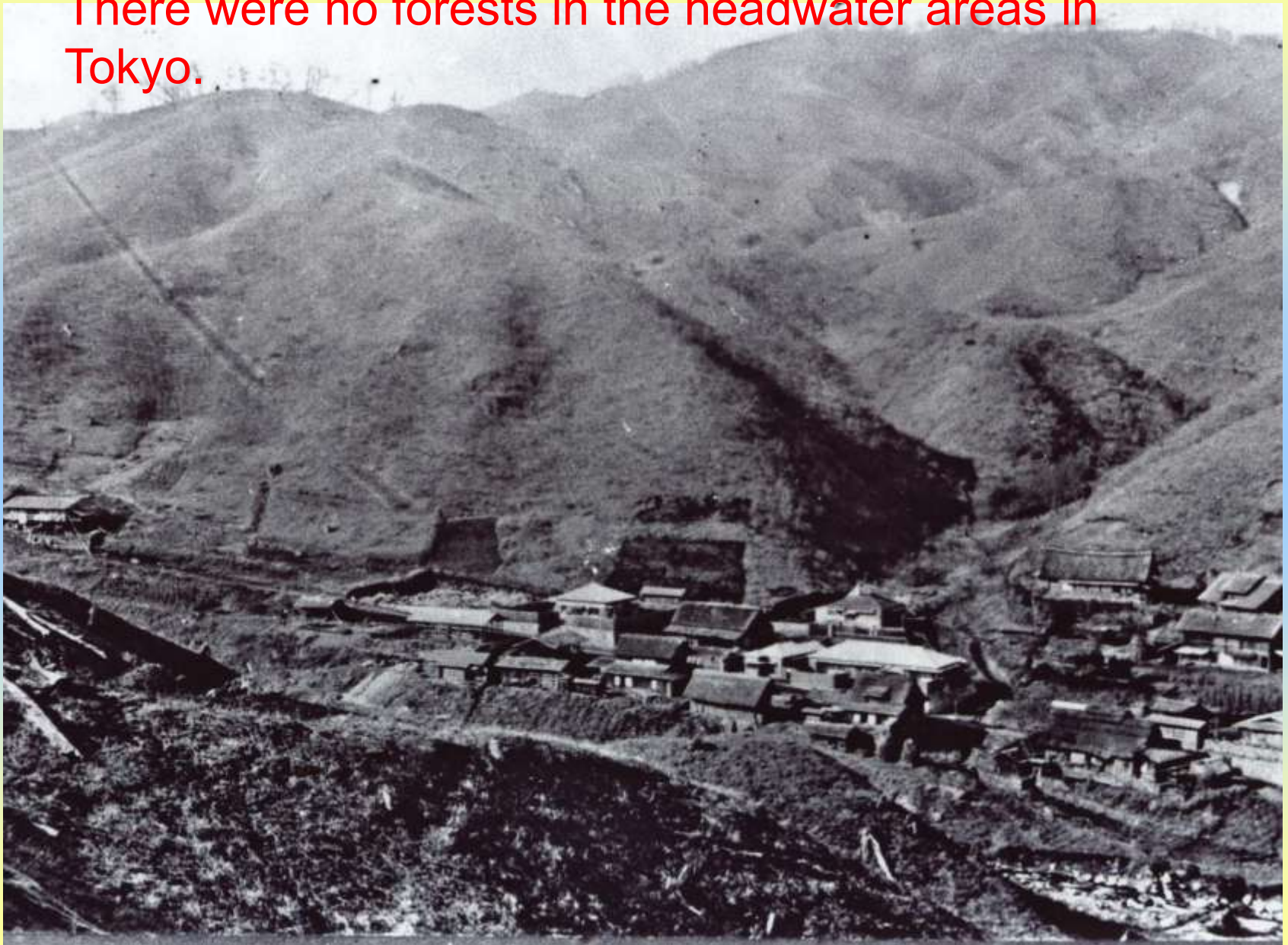
無立木地に台風襲来。大小の崩壊地が多数発生。多量の土砂を流出した。

英田郡 福本村 (現英田町)



中流部水源地域の山林も皆伐地多く、山稜部から荒廃移行しつつある。

Community forests were deteriorated in the past.
There were no forests in the headwater areas in
Tokyo.



赤磐郡 周匝村 (現吉井町)

Riverbeds were filled with sand
(Okayama Prefecture).



吉井川本流中流部の土砂堆積状況 (支流吉野川との合流部下流)

There are no rivers in Japan at present that are filled with sand as they used to be in the past.

No dense forests are found in Hiroshige's UKIYOE's.





Only pine trees can be seen in mountain sides.

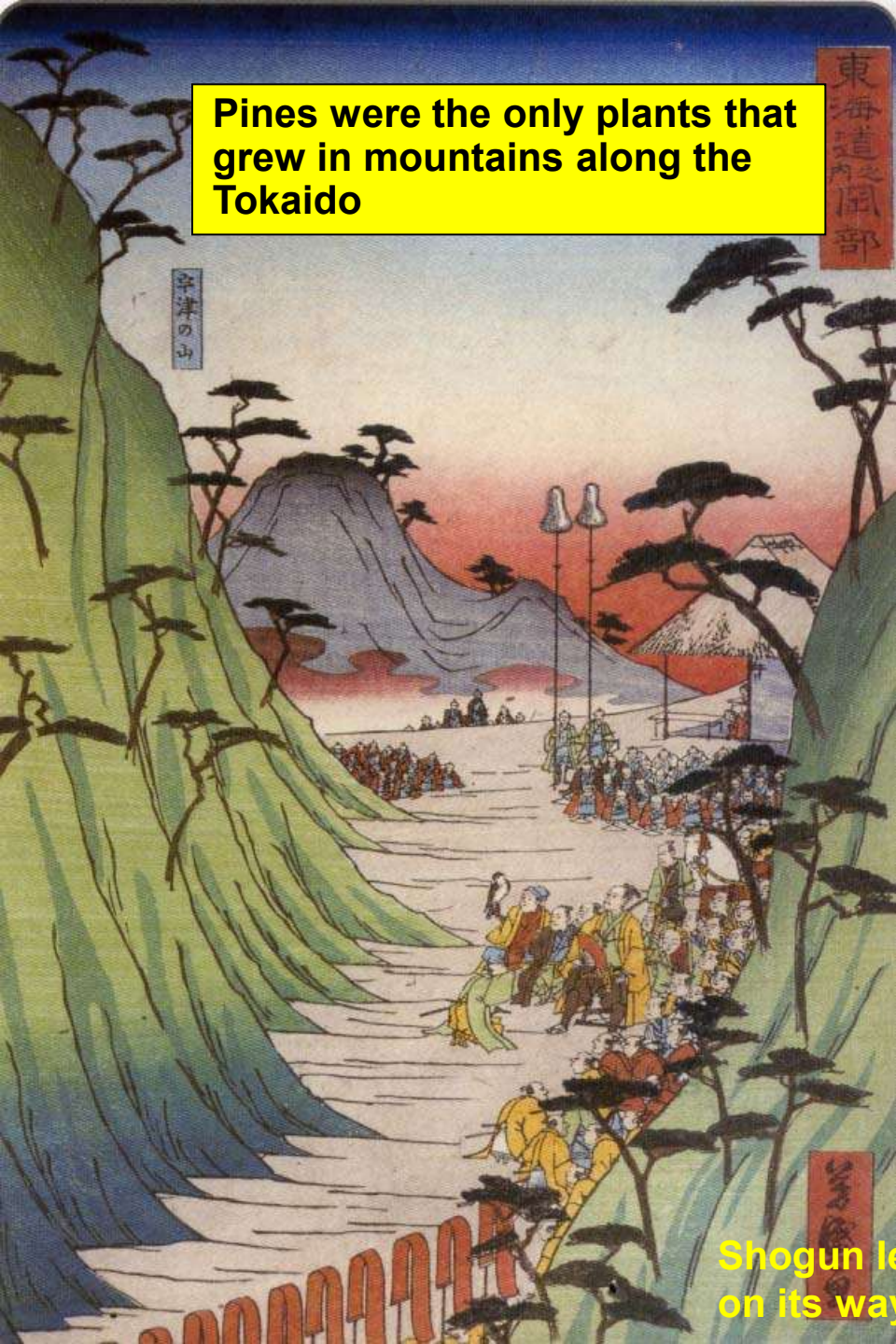
東海道
五拾三
次之内

龜山



横重車

Pines were the only plants that grew in mountains along the Tokaido



Shogun Iemochi's procession on its way to Kyoto



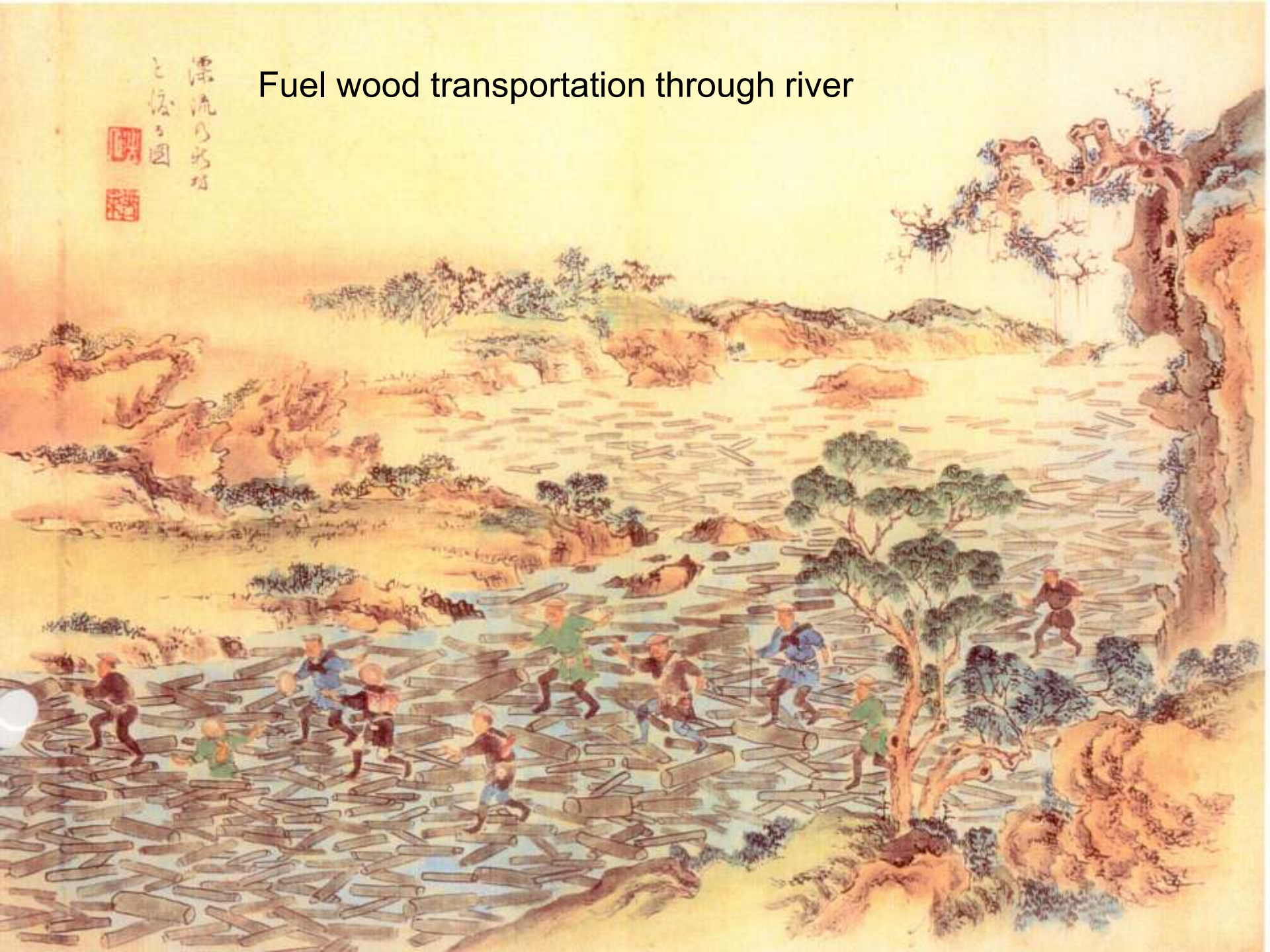
Landscape around the Anmon Waterfalls (Anmon Sansuikan) by Hirata Rosen

砂子灘村 巖梅之園
安曇山麓の巖梅之園
又山麓にありては
こゝにありては
こゝにありては



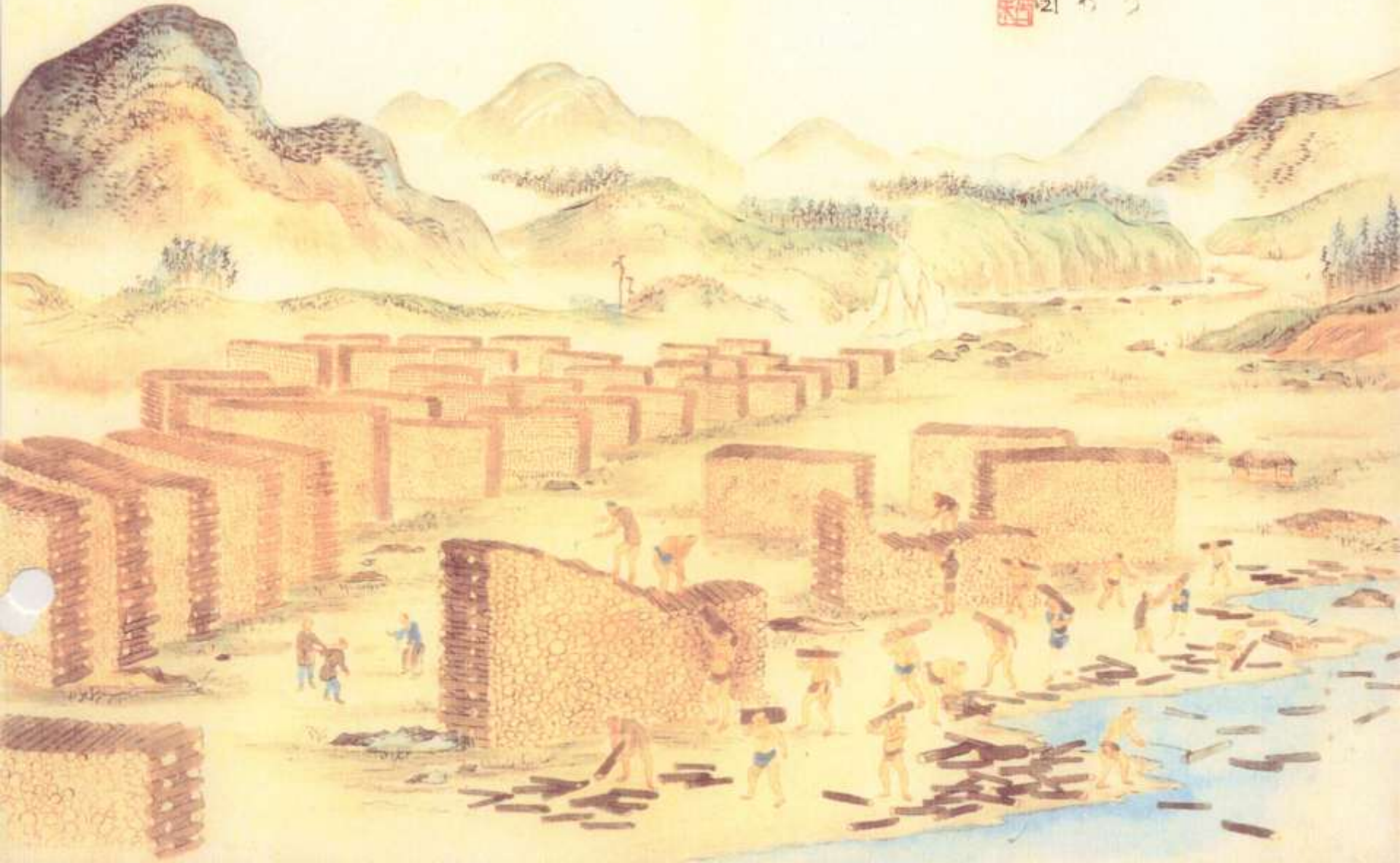
Neither were there any healthy community forests in mountains spreading beyond the Shirakami Highlands.

Fuel wood transportation through river



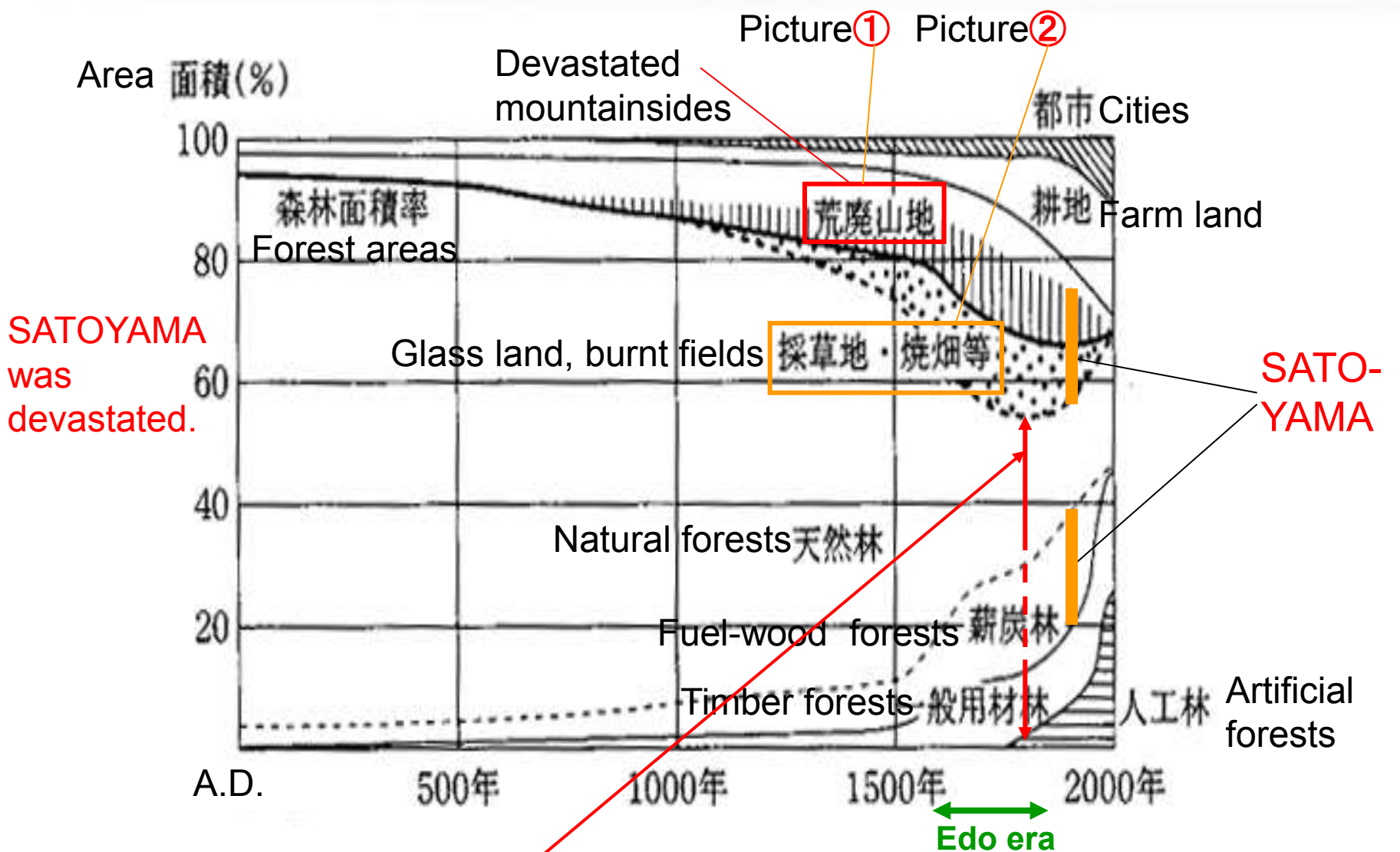
Fuel woods

鬼河遠
新野
村
二
月
二
日



History of Japanese Forests (1)

- The deterioration of community forests (*SATOYAMA*) in Japan started with the rise of cities in the ancient period.
- The population increase from the Warring States period to the Edo period accelerated forest deterioration across the country.
- Devastation in *SATOYAMA* area was particularly serious during the Edo period; promotion of afforestation for flood control by Confucian scholars.



SATOYAMA was devastated.

Good forests occupied less than half of land for more than 300 years.

Compiled based on Yorimitsu (1984)

History of forest exploitation and other forms of land use in Japan

This is SATO-YAMA.

近世の文化年間（1804—18）における稲作水田と接する里山の植生。立木地はごくわずかでほとんど草山である（大蔵永常『農具便利論 下』〔日本農業全書15『除蝗録全 後編・農具便利論上中下』農山漁村文化協会〕より）

④



Devastated area was SATOYAMA area.

This situation was continuing until 1950's.

Scars of debris slides by heavy rain after the Great Kanto Earthquake of 1923

焼山

山

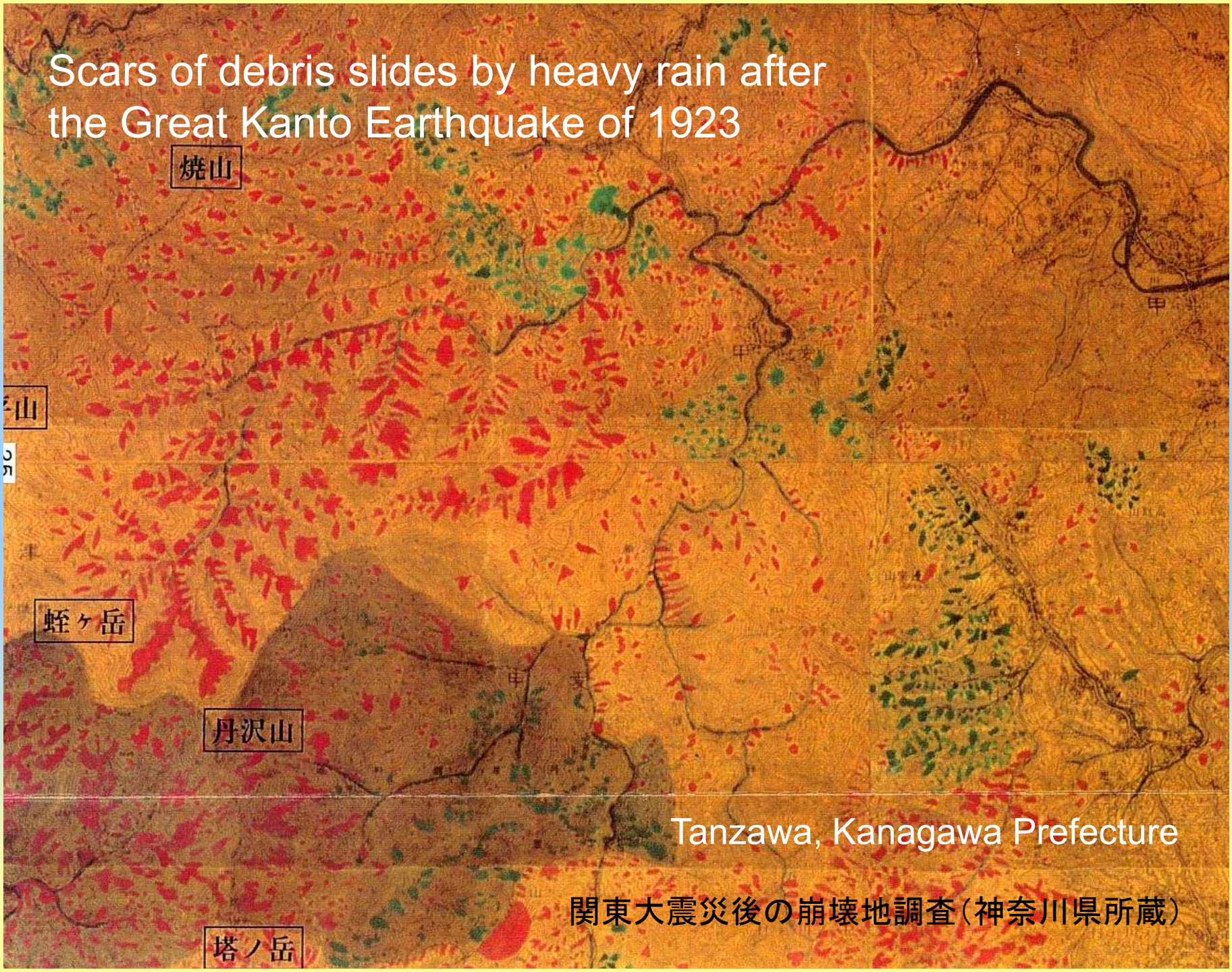
蛭ヶ岳

丹沢山

塔ノ岳

Tanzawa, Kanagawa Prefecture

関東大震災後の崩壊地調査(神奈川県所蔵)



National land conservation works and forest recovery

Land conservation projects in Edo-era

- River improvement
- Torrent works
- Hillside works
- Check dam works
- Wall works
- Prohibiting to harvest forest products such as wood and tree roots
- Recommending people to plant trees
- Rudimentary protection forest system

(continue)

- Constructing coastal disaster-prevention forests
(planting black pine trees)

For coastal lands, people planted trees to construct coastal forests which aimed to prevent damages from sand shifts.

And the only canopy tree, which was able to grow on sand dunes of coast land was

the **black pine.**

Grown up coastal black pine forests are used as

SATOYAMA.

Forest deterioration in Japan reached at its peak in Meiji-era.

Land use in Japan circa 1900



Farm land 16.75%

Forest 65.48%

Urban·Road·Railway 4.13%

Others 13.64%
(Rough land 10.68%, Gravel 0.56%)

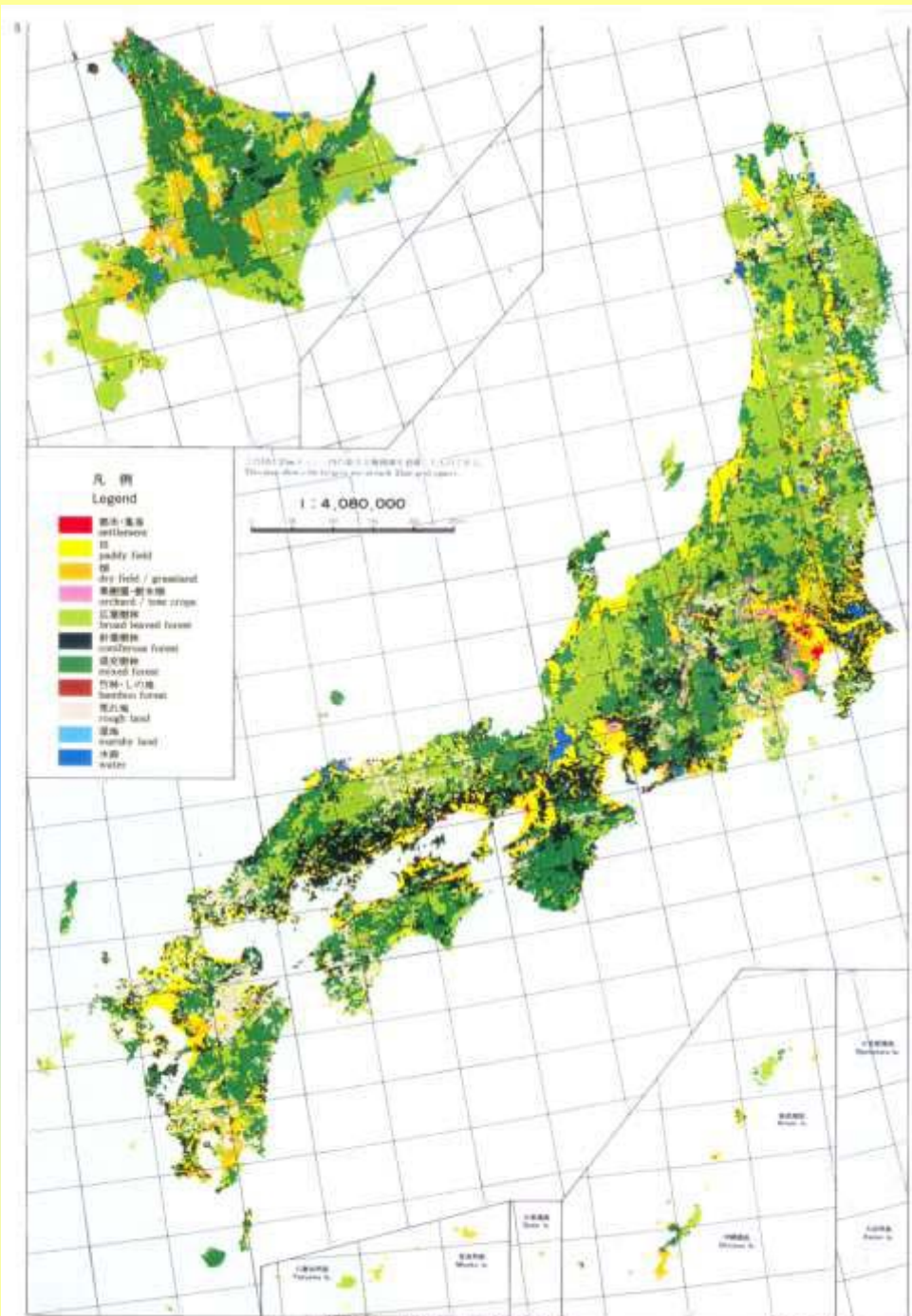


図 1-3-1 明治大正期の国土利用
Fig. 1-3-1 Land Use in Japan circa 1900

作製：水島山 幸夫
Produced by Y. Himiyama

In the middle of Meiji-era, the Meiji government enacted :

the Forest Law 1897

the River Law 1896

the Sabo Law 1897



The Forest Law (1897)

- Protection forest system
- Forest conservation project (1911~)

The Protection Forest System in Japan

Type of Protection Forest

Headwater conservation	Soil run-off prevention	
Landslide prevention	Shifting sand control	Wind breaks
Flood damage prevention	Tidal wave and salty wind prevention	
Drought prevention	Snow drift prevention	Fog prevention
Snow avalanche prevention	Rock fall prevention	
Fire protection	Fish breeding	Navigation landmark
Public health	Scenic site conservation	

Framework of Protection Forest System:

Designation : Specific forests, expected to maintain and improve public benefit functions, are designated by the Minister of MAFF or the local prefectural governor.

Incentives : Various incentives are prepared depending on degrees of restrictions.

Restrictions: Certain activities are restricted to maintain the public benefit function of the forests.

Improvement of functions: Implementation of Forest Conservation Project etc.

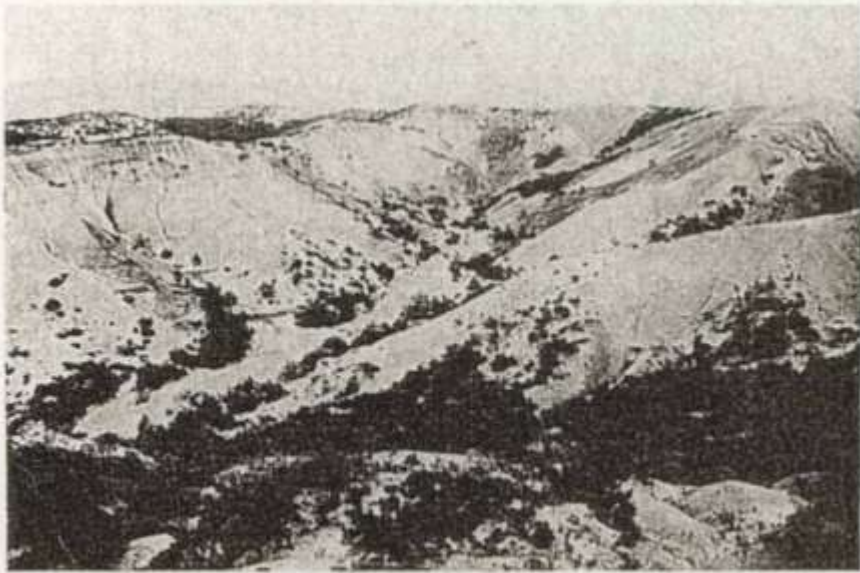


写真 2 2 - 1 瀬
明治 40 年(1907)

Modern Hillside Works in Aichi Prefecture



写真 2 3 - 1 旭村今、宇裏山
明治 40 年(1907)、施行前

写真 2 3 - 2 左に同じ (愛知県、2000)
明治 41 年(1908)、施行後 1 年



写真20-1 坂下野田開 定直志
明治39年(1906)



写真20-2 左に同じ
の状況

Modern Hillside Works in Aichi Prefecture



写真21-1 幡山村菱野、三軒家
明治40年(1907)、施行前



写真21-2 左に同じ
明治41年(1908)、施行後1年

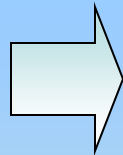
Forest Conservation Project

Forest Conservation Project

- Rehabilitation and conservation of devastated forest and torrent
- Establishment of disaster prevention forest
- Protection forest improvement work
- Land slides prevention work



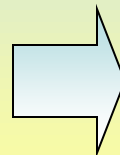
Before construction



Immediately after construction

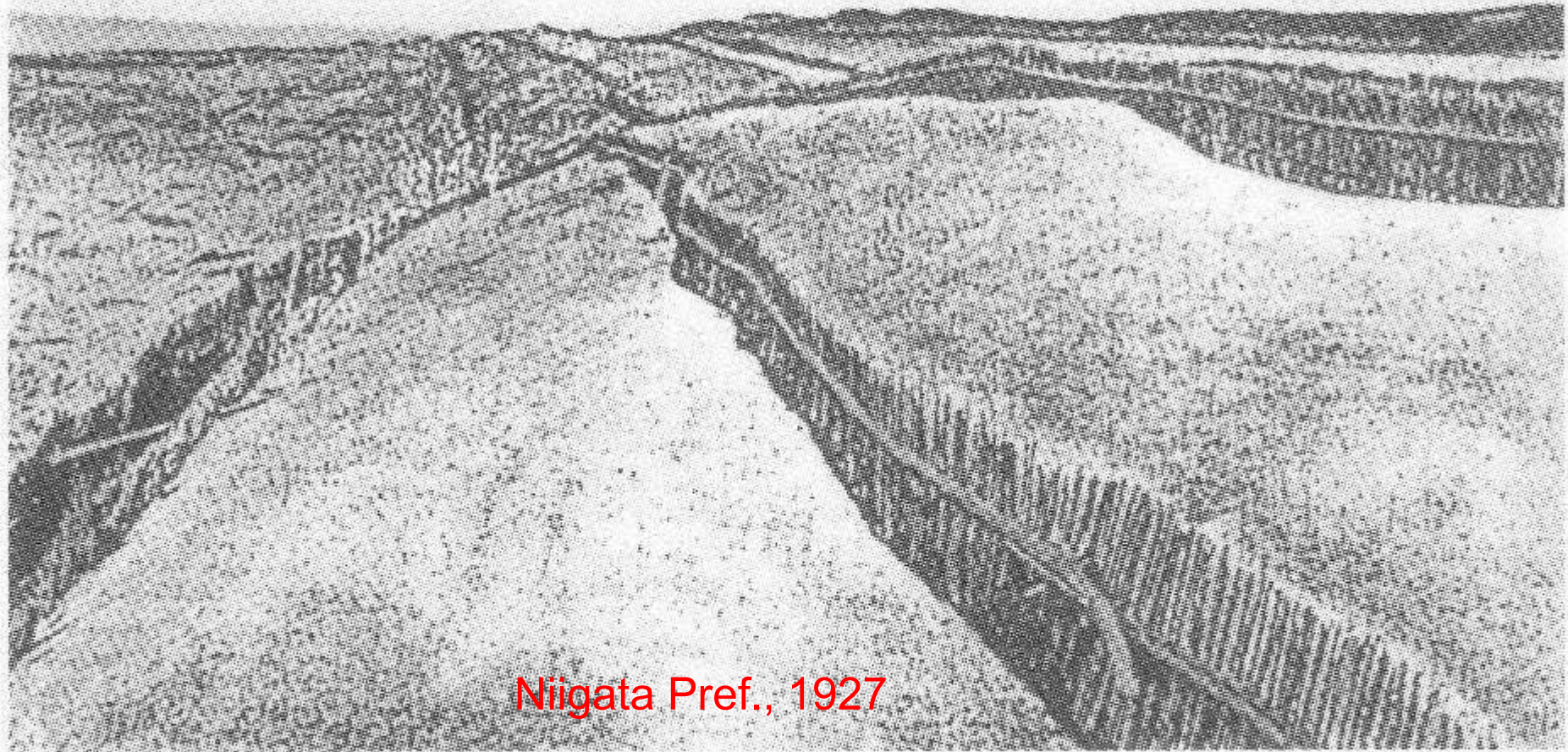


3 years after construction
before construction



12 years after construction
before construction

Bush hedge for formation of artificial sand dune



Niigata Pref., 1927

新潟市学校町濱における簀立工（昭和2年）

Bush hedge for taking care of young plants



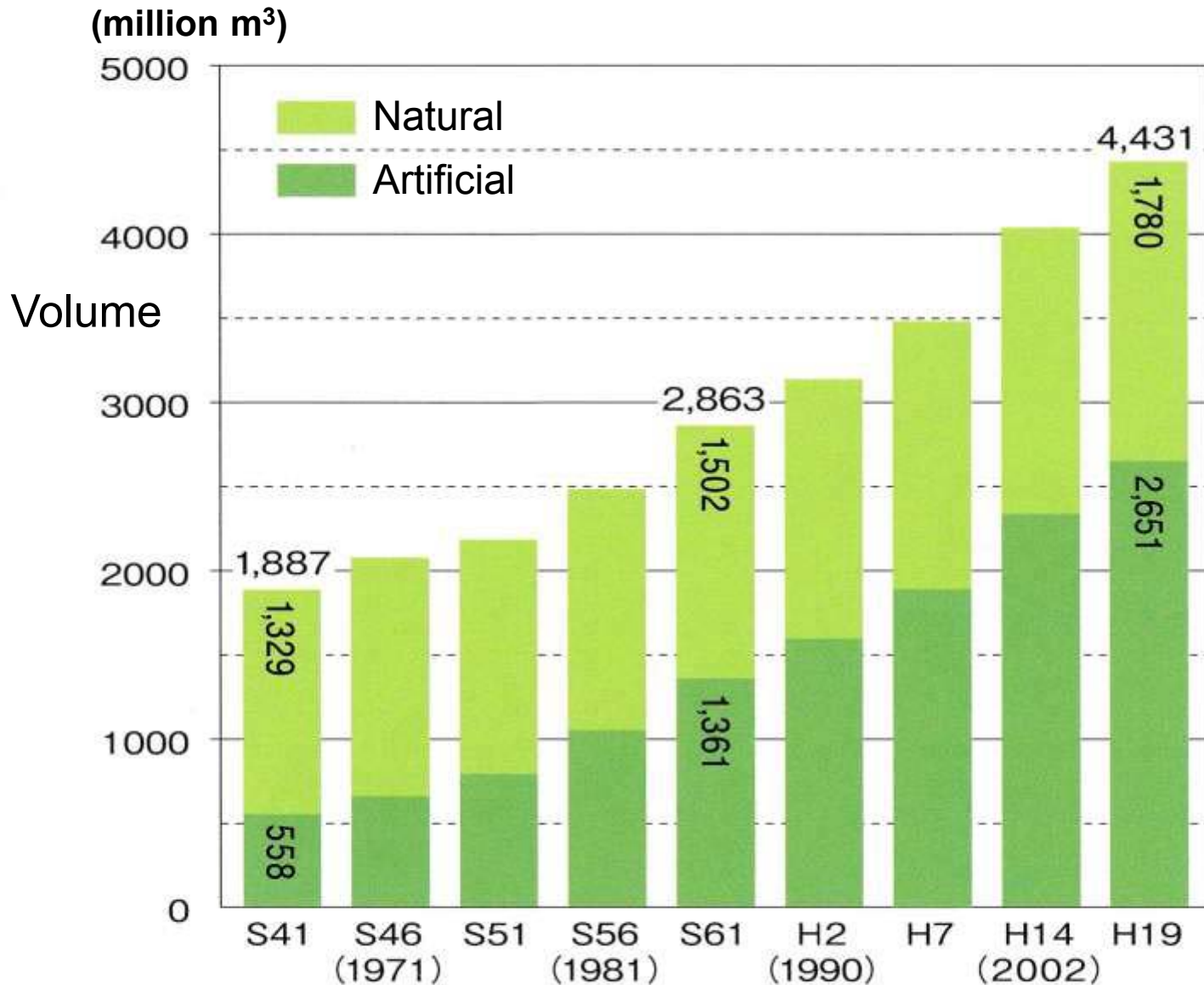
Akita City, 1932

Niigata Pref., 1958



静砂垣・北蒲原郡紫雲寺町大字藤塚浜地内（昭和33年）
（『海岸砂地造林事業の実績とその経過』）

Japanese Forest – Change of Stock –



● Since the past half century, the amount of forests have increased double.

Change in erosion and sediment transport:

- +Surface erosion disappears

- +Debris slides decrease

- +Sediment yield decreases

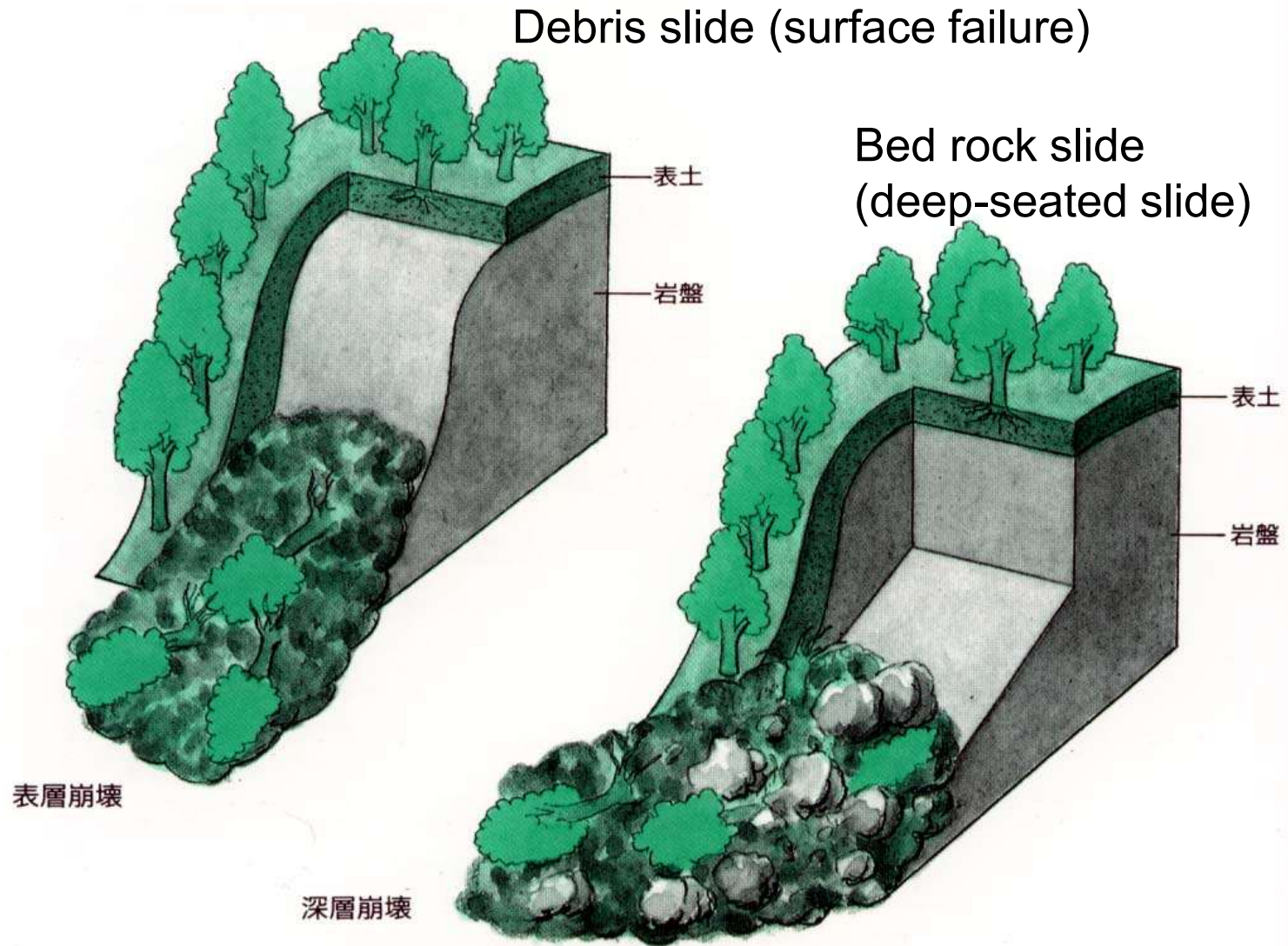
 - Measures to prevent bedrock slides

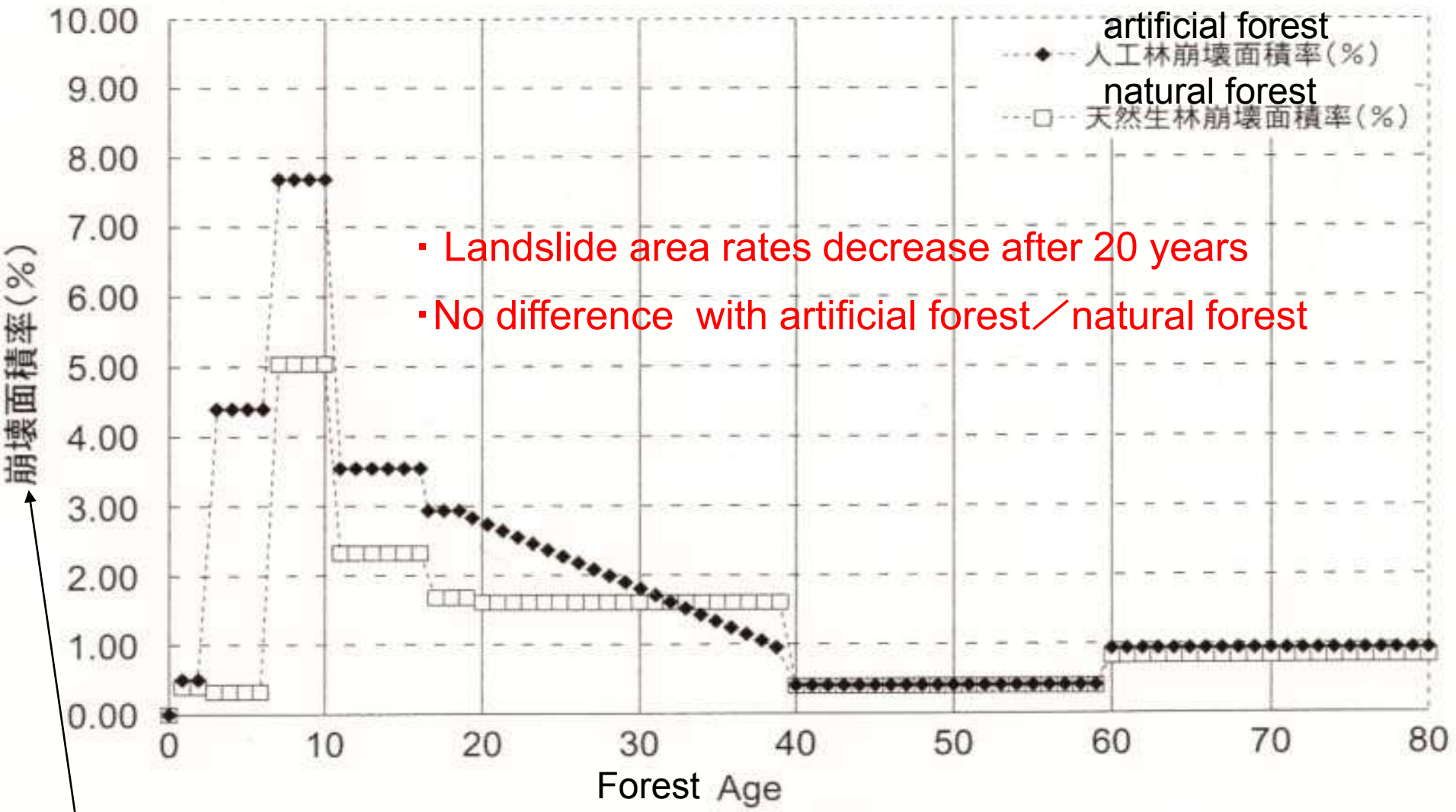
 - Measures to prevent river-bed erosion and coastal erosion

 - Comprehensive sediment control for sediment drainage systems

 - (drainage basin to address sediment)

Two Types of Landslide





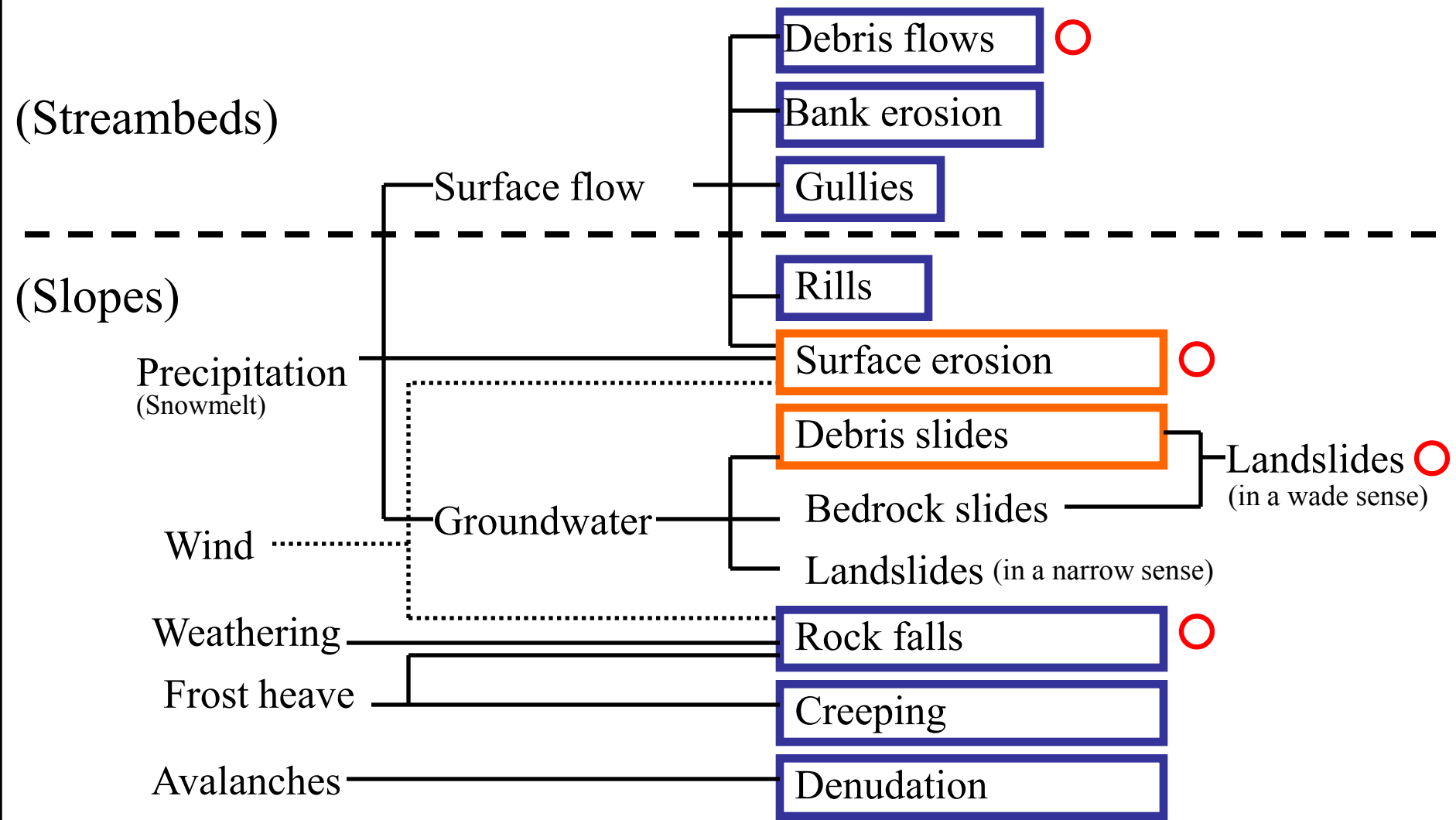
- Landslide area rates decrease after 20 years
- No difference with artificial forest / natural forest

Landslide area rate

Landslide area rate with forest age

Types of sediment related disasters in mountain regions and how forests can prevent them

<Primary cause > <Type of sediment disasters damage>



- Forests are highly effective in preventing sediment movement
- Forests may be effective in preventing sediment movement under certain conditions
- Forests may be effective in helping stop sediment movement under certain conditions



Nijino-Matsubara, Karatsu City in Saga Pref.

Japanese people considered the coastal forests as disaster-prevention forest and community forest, and have been managing and conserving them.

Nowadays, coastal forests are not only for preventing disasters but they also have many kinds of functions. **Multi-functions**

They are now enjoyed for its beautiful land landscape and recreational use.

And they also help to sustain the coastal ecological system.

Former Takata-Mastubara, Rikuzentakata in Iwate Prefecture (in winter)

• • • a famous scenic spot



Multi-functions of coastal forests

- Prevention of natural disaster
- Beautiful landscape
- Conservation of Biodiversity
- Relaxation
- Recreation
- Forest products

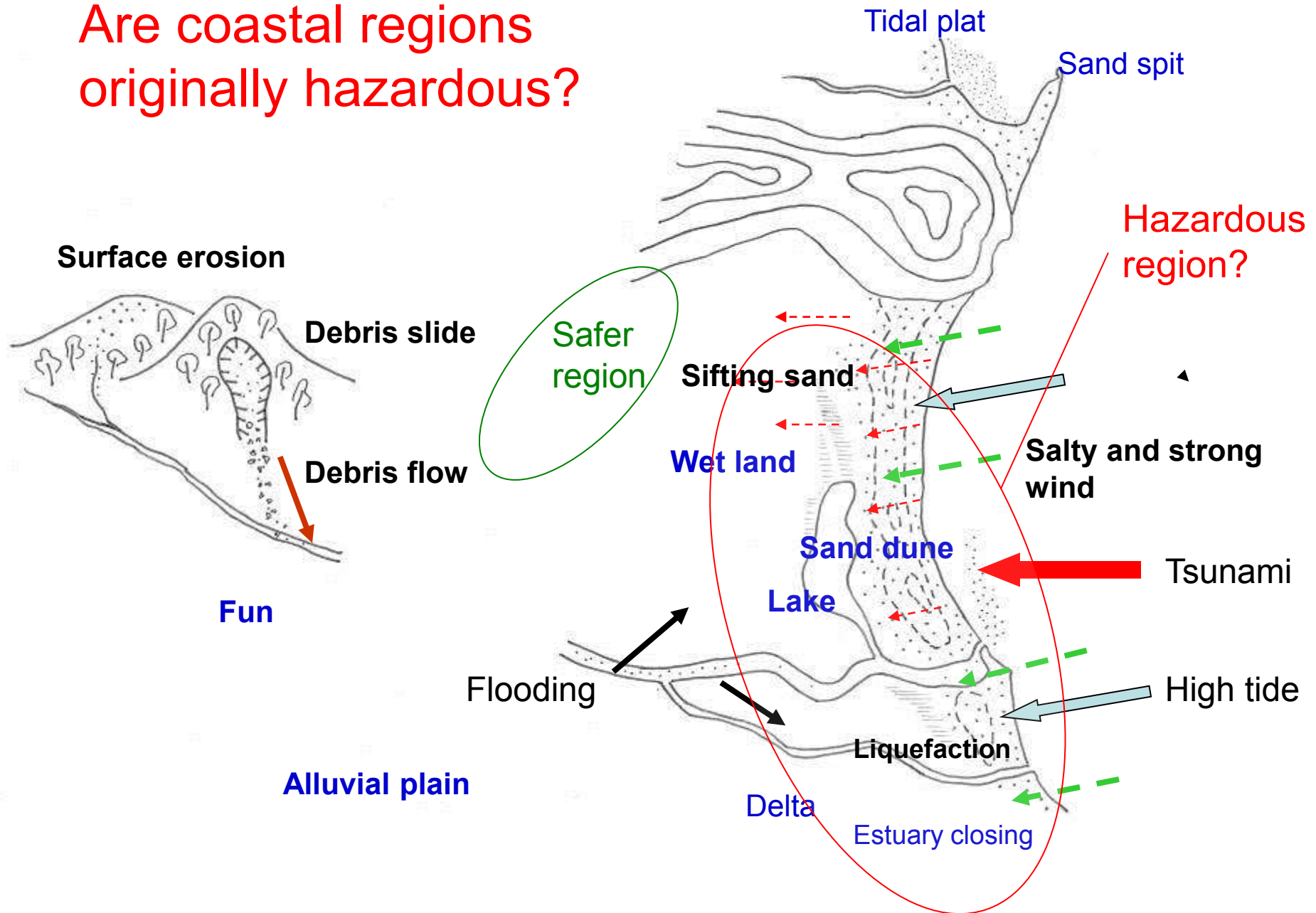
Base of life

Former Takata-Mastubara, Rikuzentakata in Iwate Prefecture (in summer)



••• recreational use

Are coastal regions originally hazardous?



Entering into the 21st century, the forests of Japan have recovered remarkably.

Therefore, people of today seem to have forgotten **the important roles of coastal forest.**

and this needs to be revised again.

Thank you !