Mapping a Mountain: Mt. Fuji Land Cover Transitions Over the 20th Century

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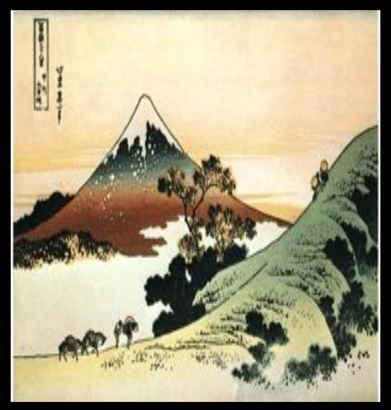
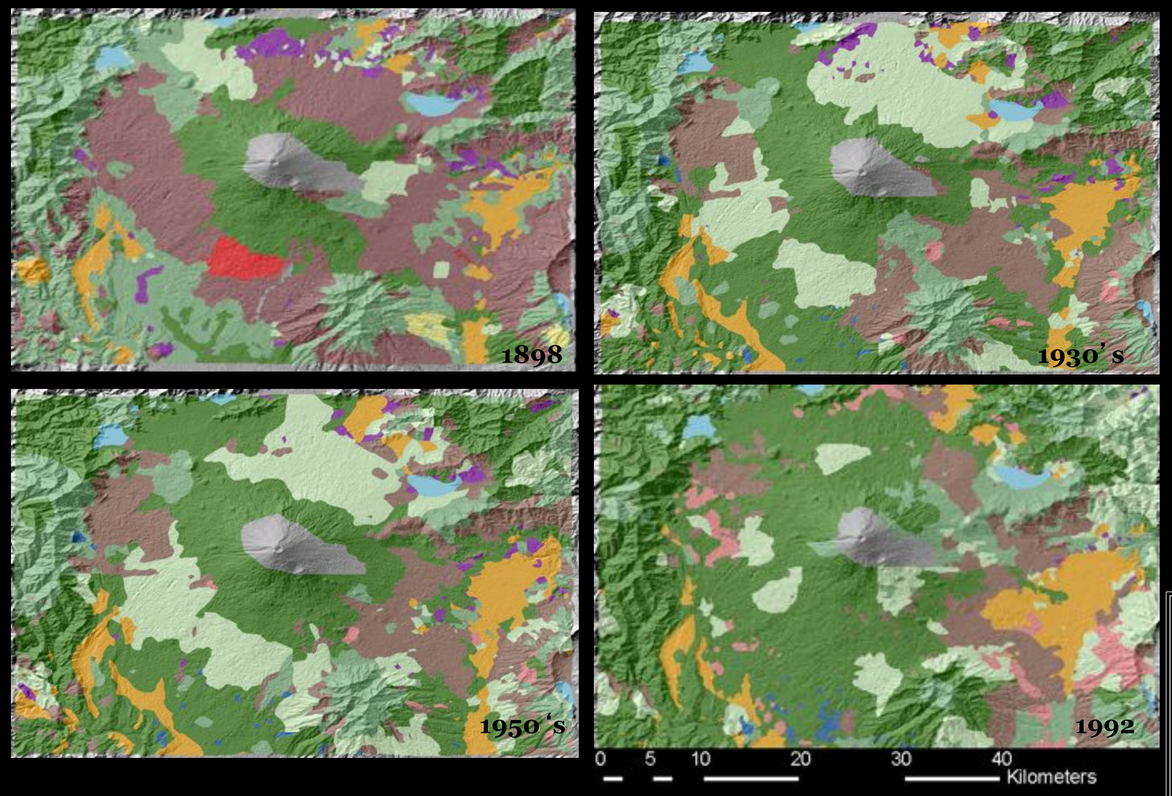
Geologic constraints limit flexibility of land use transitions in the face of shifting patterns of resource demand.



Why Fuji?

- The primary focus of this thesis is to analyze land cover change and geologic constraints of an iconic landscape: Mt. Fuji.
- Japan has been able to control land tenure structures, subsidies, and resource security strategies.
- As a microcosm of Japan, Mt. Fuji land cover change reflects patterns of modernization, globalization, and commerce as well as national controls such as subsidies and land tenure patterns.
- Fuji is composed of porous volcanic lava. The skirts and lower lying areas of the volcano are habitable but geologic constraints underlie land use opportunities.
- Fuji was officially registered as UNESCO World Heritage site in 2013 and attracts roughly 300,000 climbers a year.



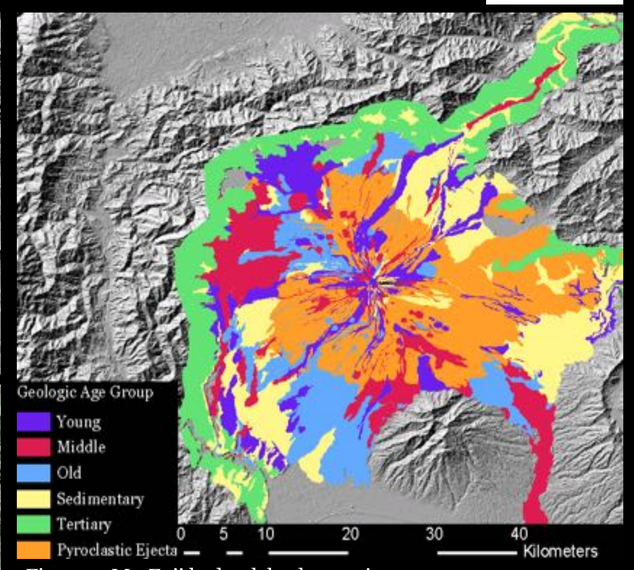


Figure 3. Mt. Fuji bedrock broken up into age groups.

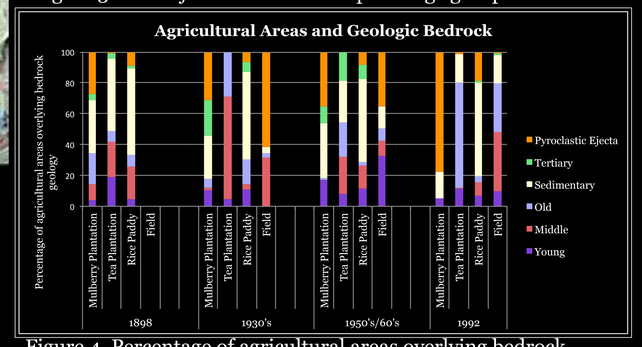


Figure 4. Percentage of agricultural areas overlying bedrock geology. Notably, rice paddy areas are predominately located on sedimentary layers.

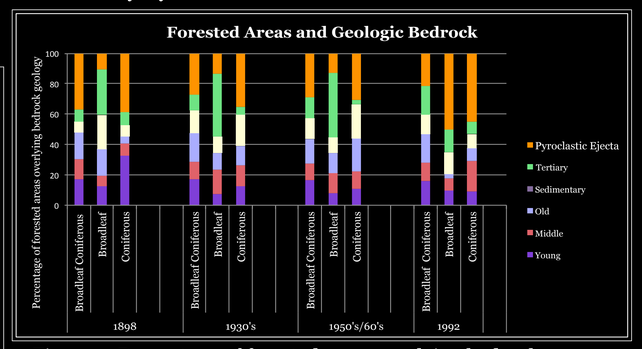


Figure 5. Percentage of forested areas overlying bedrock geology. Forested areas had very little change in substrate type,

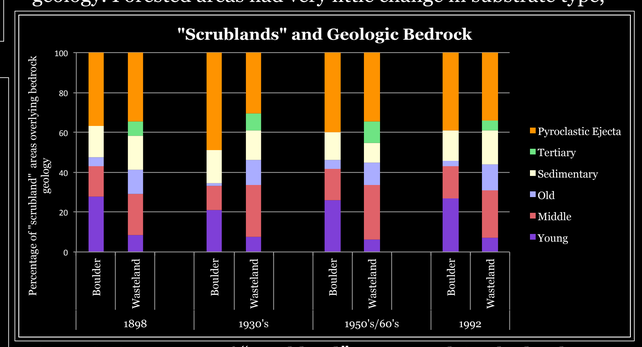


Figure 6. Percentage of "scrubland" areas overlying bedrock geology.

Methodology

Land cover was analyzed for four decades, 1898, the 1930's, the 1950's and 1992.

Original land cover maps produced by the Kokudo Chiriin were traced by hand:

Created a personal data resolution of blocks of at least 3 land cover symbols (~5m2).

- Drew polygons separating differing types of land cover
- Scanned the vegetation tracings

The scanned maps were digitized using ArcMap 10 and converted into gridded data for further analysis.

Land cover maps were intersected with a geologic map of Mt. Fuji to analyze which land cover types overlay differing bed rock age groups and types.

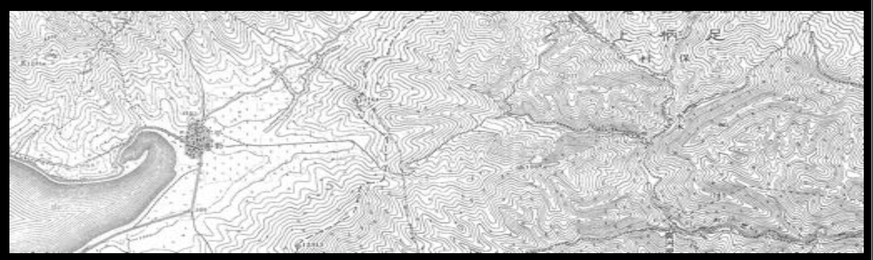


Figure 1. An example of an original land cover map produced by the Kokudo Chiriin. Different symbols represent differing land cover types.

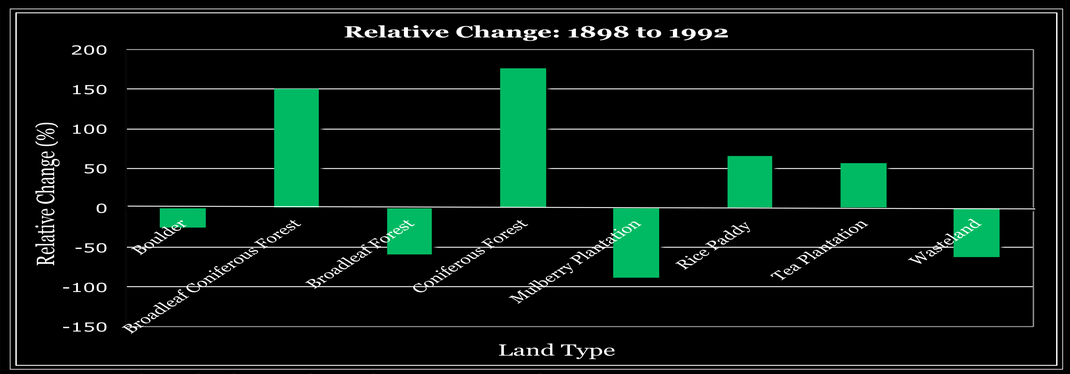


Figure 2. Relative land cover change between 1898 and 1992.

Conclusions

The dominant land cover transitions between 1898 and 1992 were from wasteland and broadleaf forests to coniferous forests and broadleaf coniferous forests, with a moderate expansion of rice paddy areas on sediments. During the mid 20th century, urban migration depopulated rural village communities which reduced the demand for common lands (wasteland) and subsistence agriculture/farming.

Through a series of afforestation practices, Japan has arguably become "stuck" and no longer manages forestry resources, lacking economic incentives to maintain over-grown forests. Geologic constraints exacerbate this problem because land management is limited to vegetation that can colonize young volcanic bedrock. Wooded vegetation is more adept to loose scorious substratum compared to plants with shallower root systems.

With overgrown plantation forestry and limited land use alternatives, a recent increase of tourism may lead to land cover transitions that are more visitor friendly, and consequently, more profitable.

References

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