


# Assessment Method of Soil Degradation by Monitoring Forest Floor Cover and its Data Analysis



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# Topic

- I. Background and feature of soil erosion survey in National Forest Inventory (NFI), Japan
- II. What does the soil erosion survey data talk about?
  - Analysis of **Floor Cover Percentage (FCP)** as a key indicator against soil erosion

# **A green country with forests – Japan**

**67% – forest coverage**

**Humid – high rainfall**

**Steep slope**

**Sub-tropical to cool temperate forests**

# Severe forest degradation led to a complete loss of soil – Ashio copper mine



松本沢

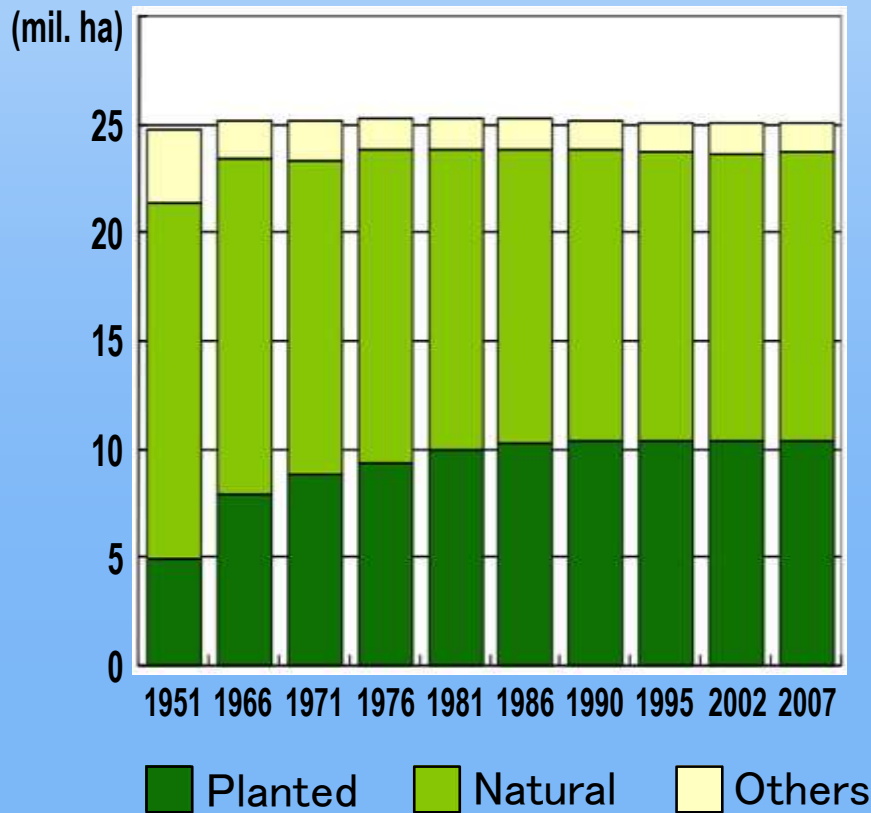
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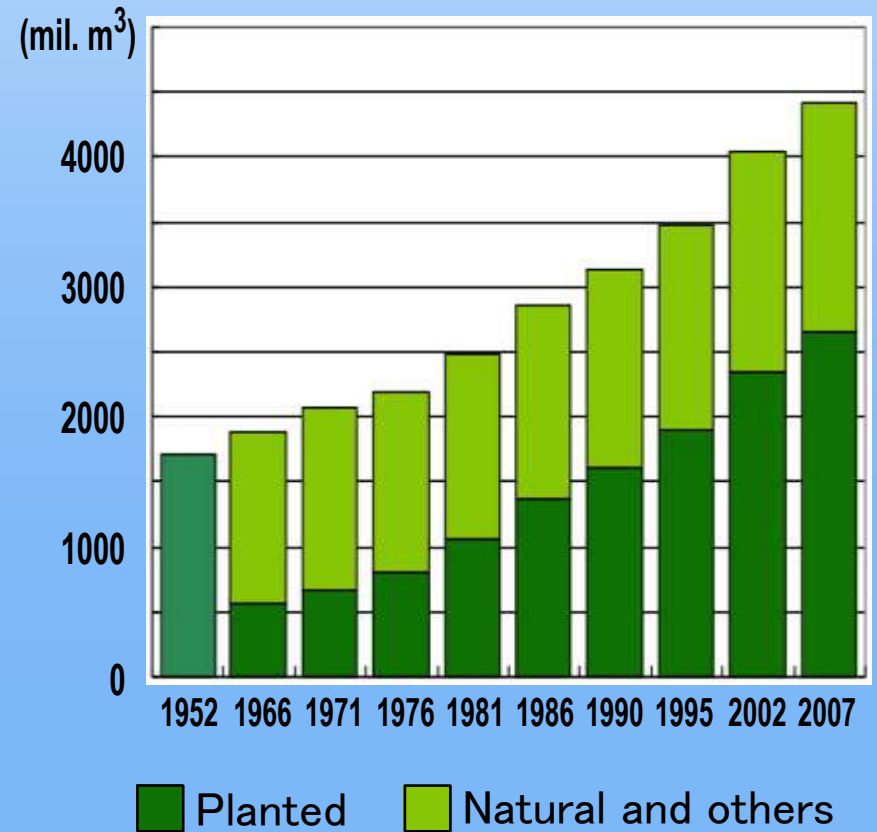
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# Recent change of forests in Japan

## Forest area



## Growing stock



Forestry Agency (2009)

# Forests of Japan in early 21th century

- Well grown forests have recovered.
  - Have soils under forests also recovered?
  - What is the level of multiple functions of forests?
  - Have we managed forests sustainably?
- >> Monitoring forests through National Forest Inventory towards sustainable forest management

# National Forest Inventory (NFI) in Japan

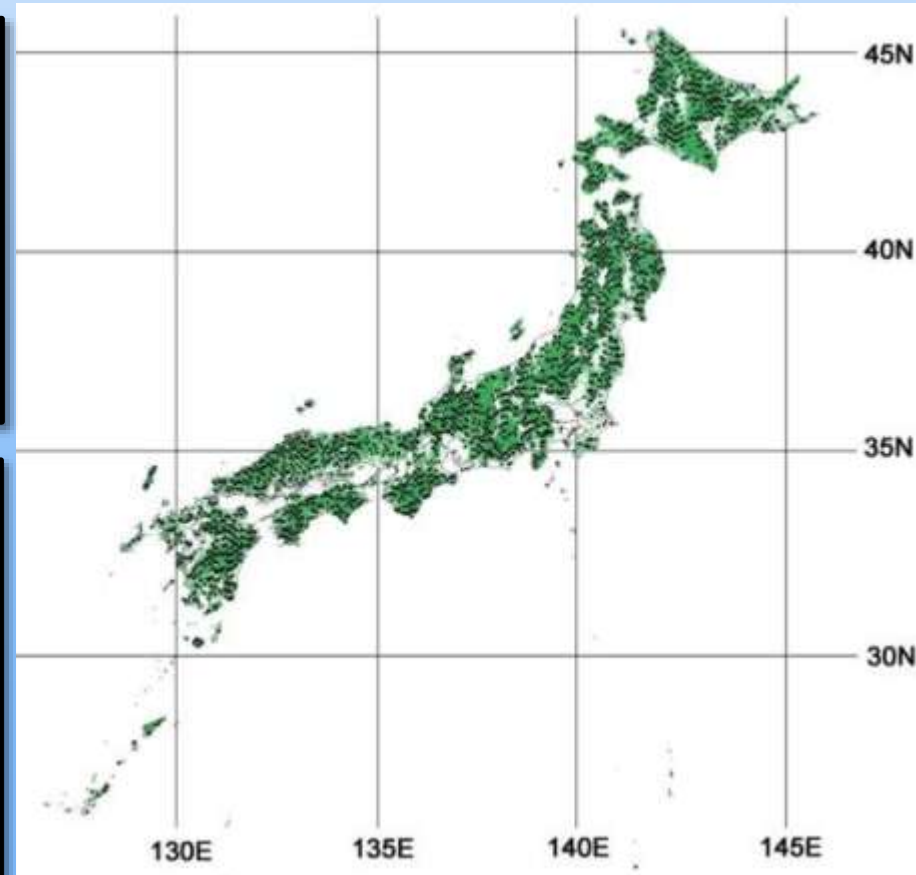
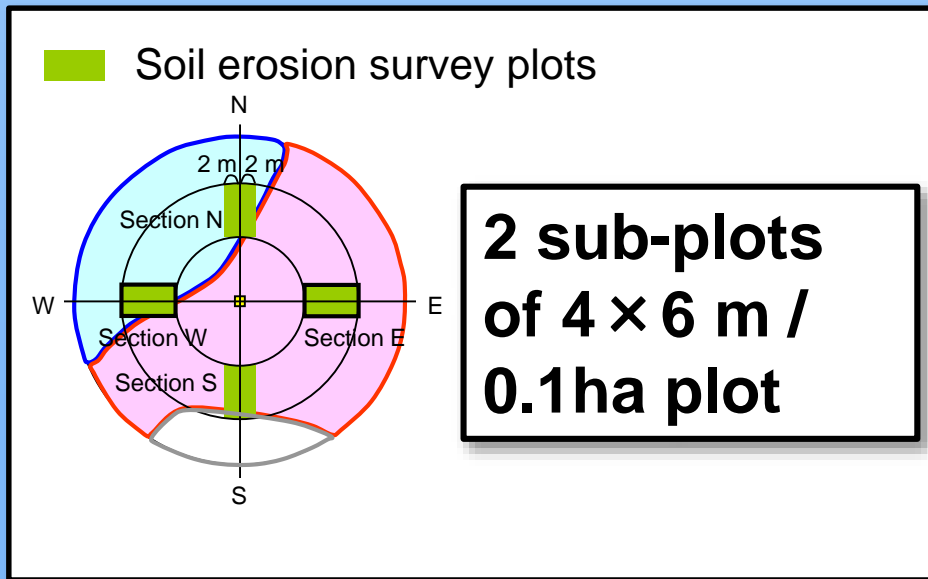
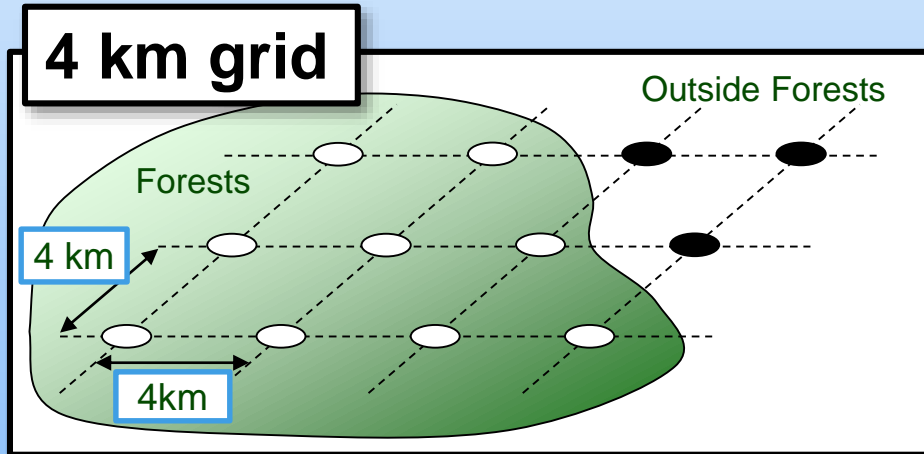
1999–2008 Forest Resource Monitoring Survey  
1<sup>st</sup> and 2<sup>nd</sup> rounds

2006–2010 Forest Soil Carbon  
Inventory, 1<sup>st</sup> round

2009–2018 3<sup>rd</sup> and 4<sup>th</sup> rounds

2011–2015 2<sup>nd</sup> round

# NFI : 15,000 points, per 5-year round



**Forest soil carbon  
inventory points (2,500)**

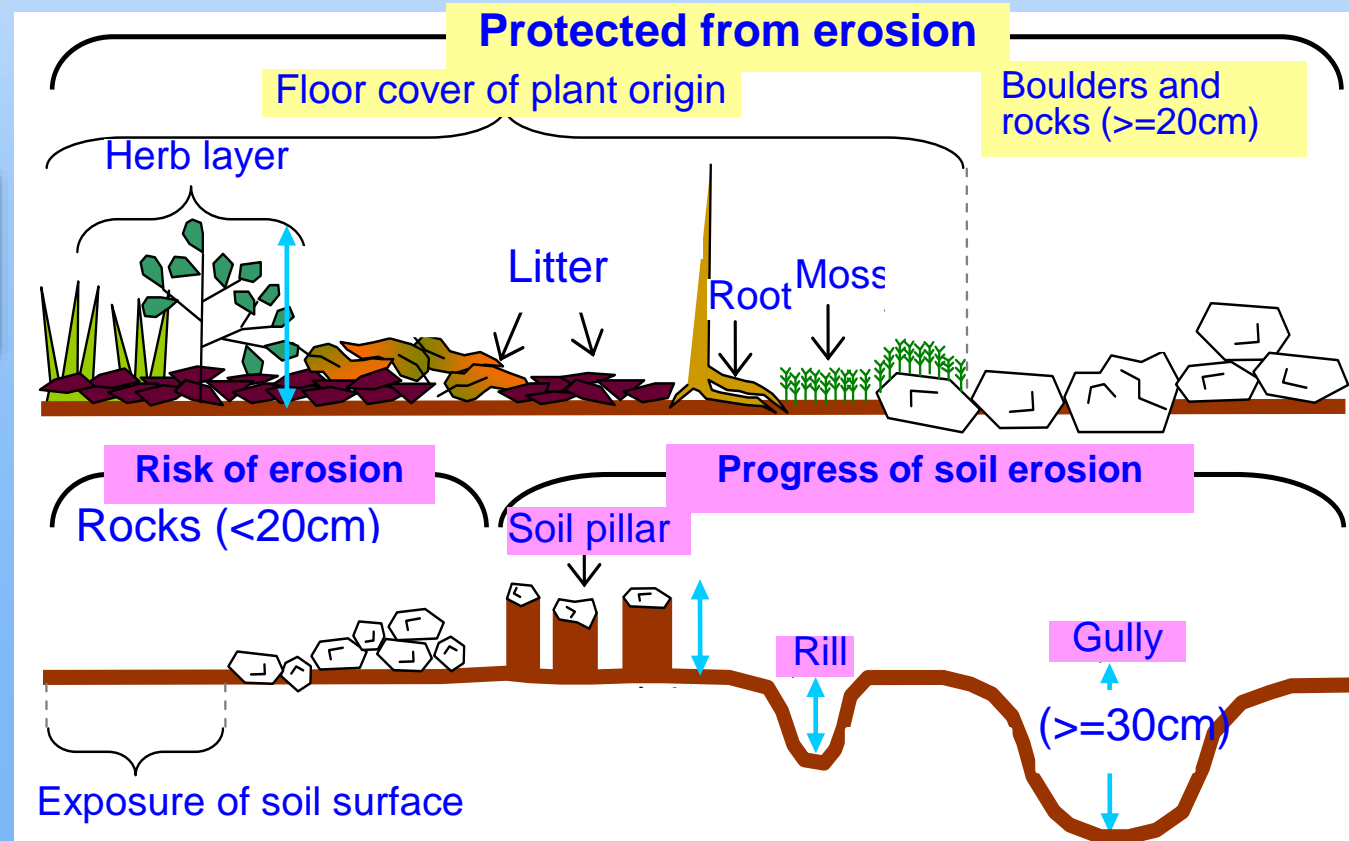


# Erosion survey: Check, floor cover and evidence of erosion

## Protection

% herb or litter cover >> FCP

## Risk and Progress



# Field survey – quick, and low cost



Judging FCP



Soil pillar

10 slight erosion

## Field note

Percentage floor cover	90	%
Percentage boulders	0	%
Evidence of erosion	Soil pillar / Rill / Gully	



Rill

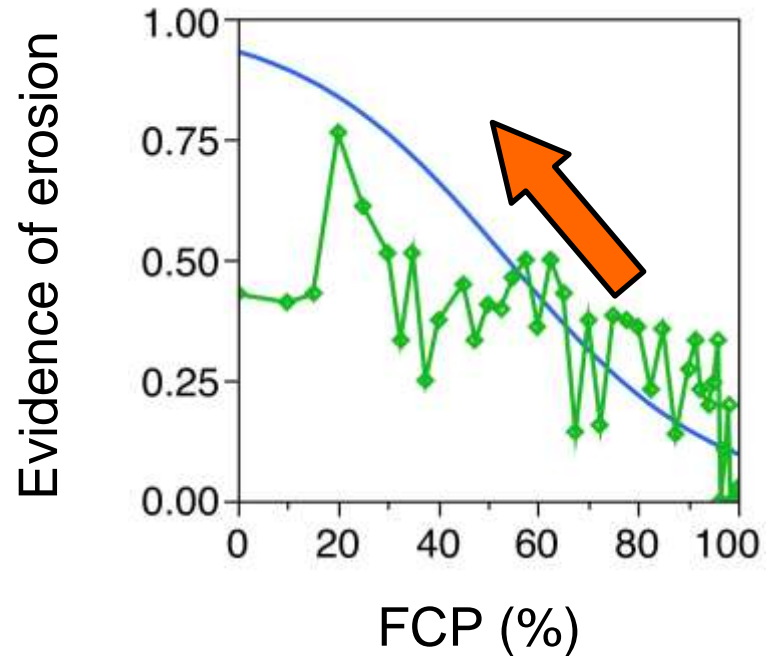
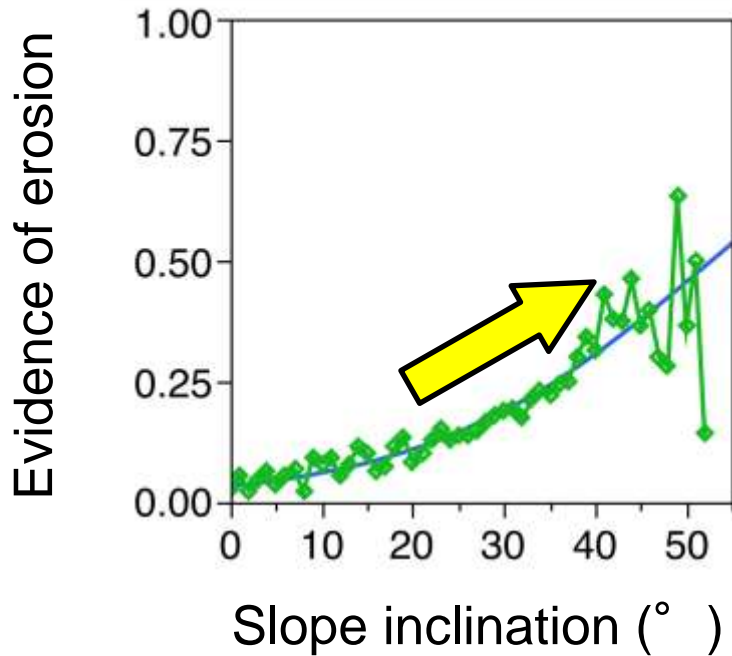
< moderate erosion



Gully

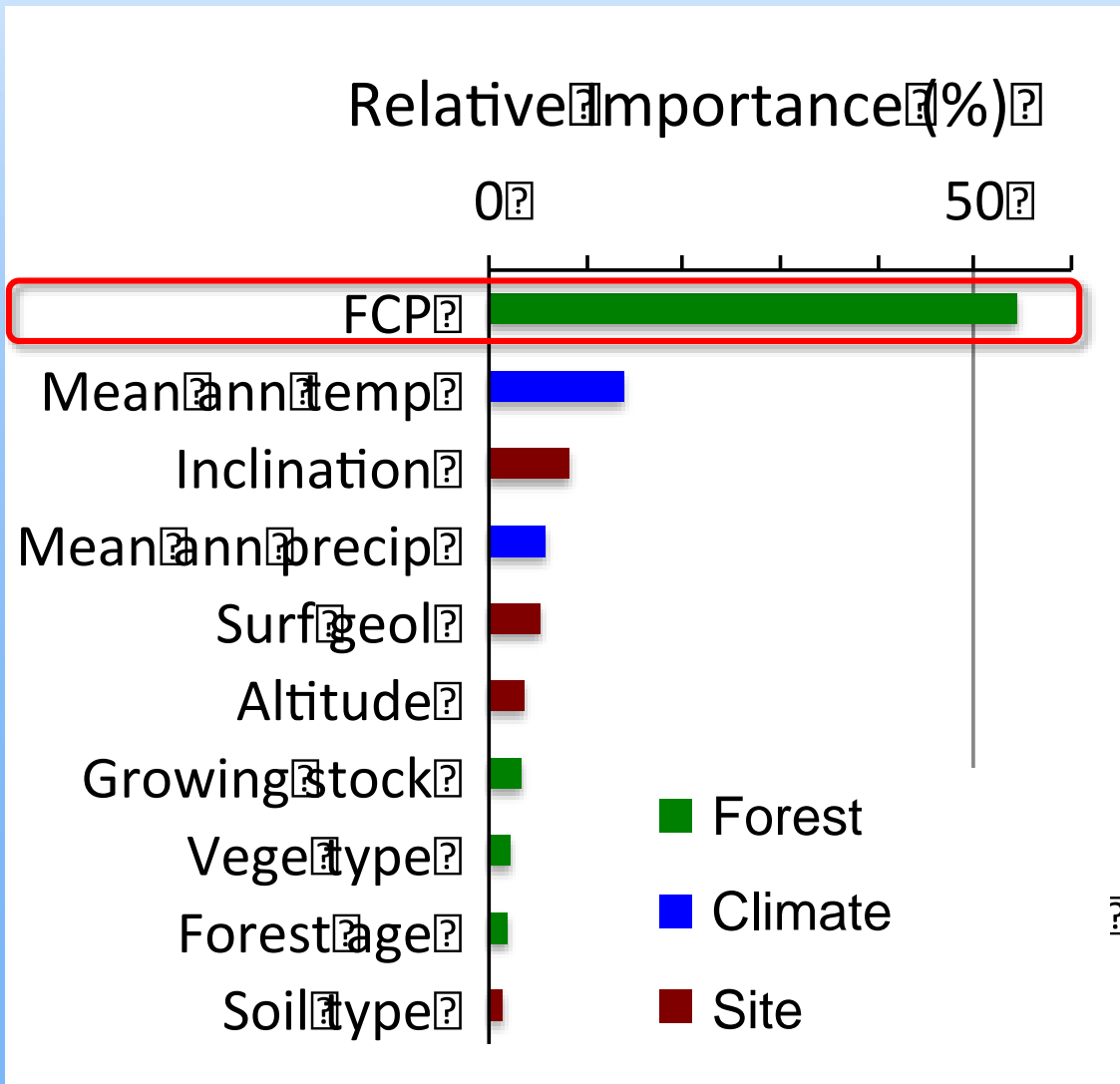
< extreme erosion

# Evidence of soil erosion depends on slope inclination and FCP



— Observed (Green)  
— Predicted (Blue)

# FCP predominantly affects erosion



## Floor cover

can be managed

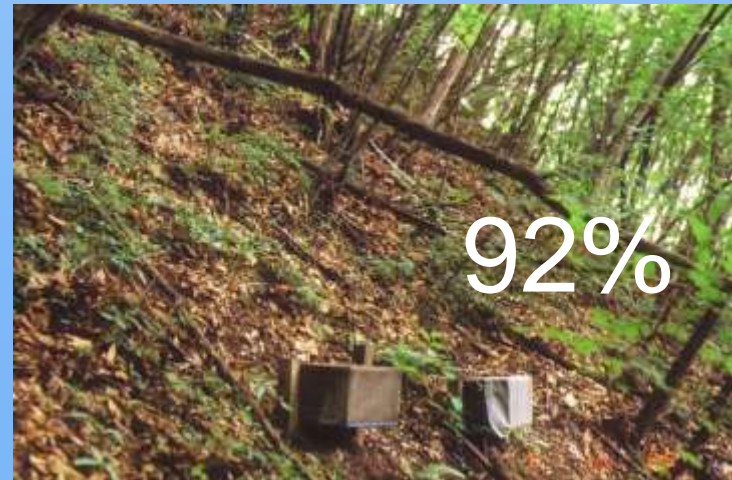
➔ Monitor **floor cover**  
and  
manage soil erosion

# Floor cover of common forests and FCP

Japanese cypress



Red pine

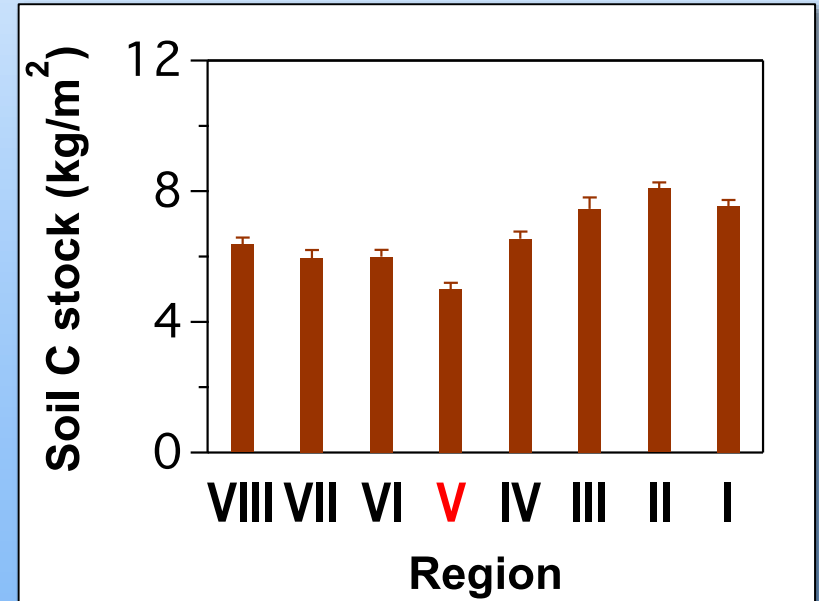
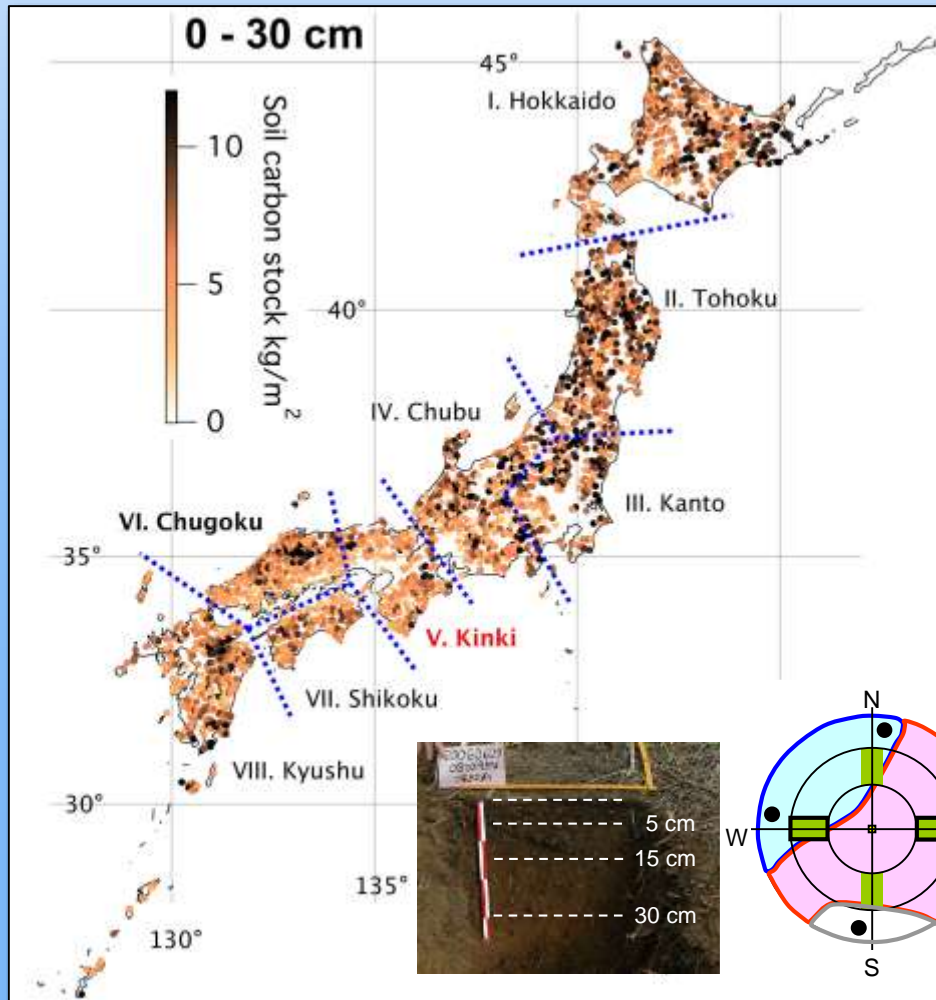


Japanese cedar

Hardwood

# Low soil carbon stock in Kinki Region

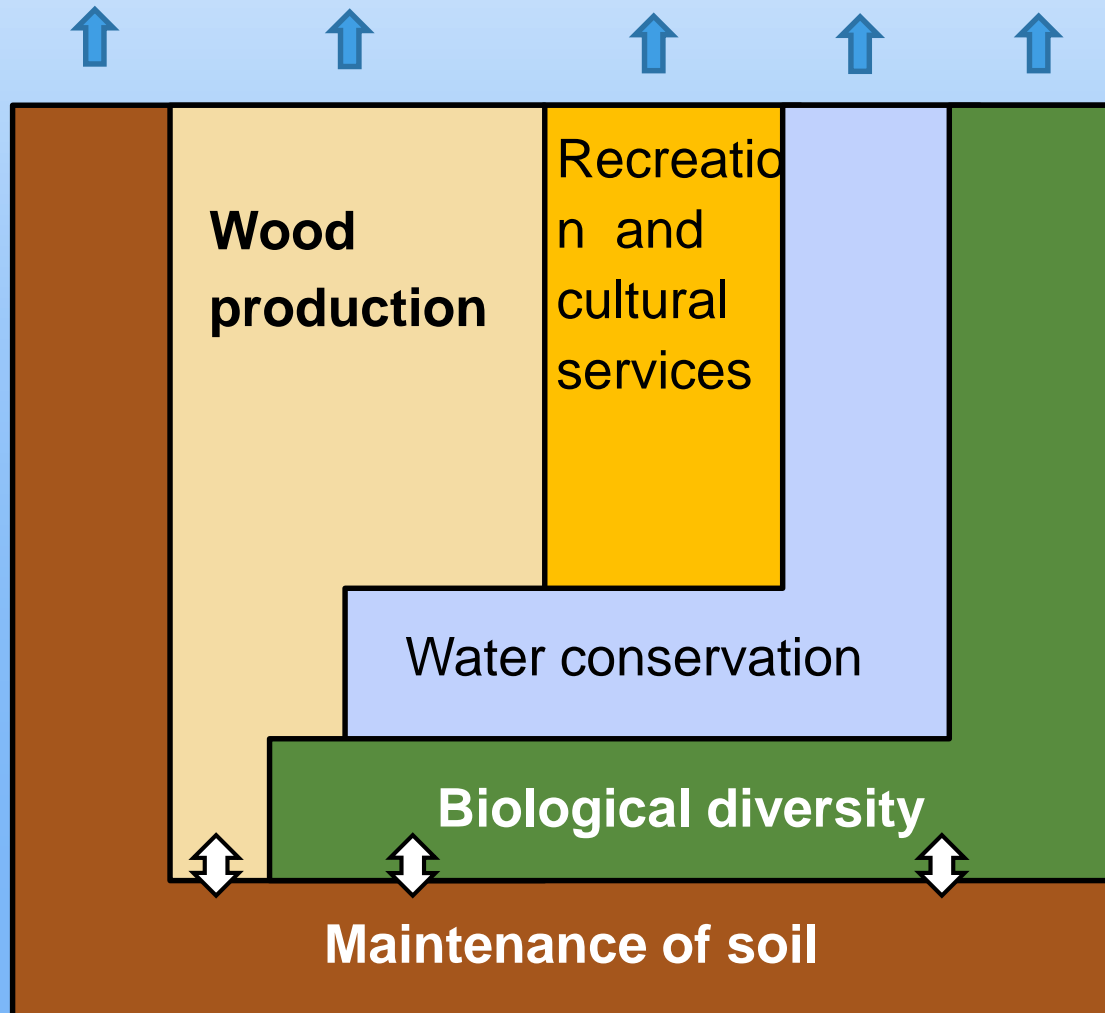
Soil C :  $6.94 \pm 3.25 \text{ kg/m}^2$



- Soil C stock varied among regions.
- Both environmental and human factors may have affected.

# Hierarchical Structure of Forest Ecosystem Services

## Fulfilling functions of multiple-services



- Hierarchic structure and
- Trade-off exists between wood production, biological diversity, and water conservation.

- **Soil supports** forest ecosystems.
- **Forest cultivates** soils.

# Take home message

- Soil erosion survey in NFI of Japan was improved and enhanced in 2009 in 3<sup>rd</sup> round survey.
- Monitoring FCP is a cost effective assessment method of soil erosion status of forest.
- **Monitor both canopy and forest floor**, which will provide useful information to combat forest degradation and to achieve sustainable forest management.

Because **soil supports** forest ecosystems and **forest cultivate** soils



An aerial photograph of a mountain valley. A river flows through the center, surrounded by dense green forest. The terrain is rugged with visible ridges and gullies.

# Thank you for your attention.

## Acknowledgment

I thank to persons concerned with planning and managing NFI of Japan (Forest Resource Monitoring Survey was renamed in Forest Ecosystem Diversity Survey), mainly staff of Forest Agency of Japan, Japan Forest Technology Association, Forestry and Forest Products Research Institute of Japan, and many field surveyors involved in this national project.