

Challenges and outcomes of integrating the Japanese vegetation and IUCN ecosystem classification systems

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Kadoya, Masato Yoshikawa, David Keith, Yayoi Takeuchi**



- Currently under review (Ecological Research)
- Available at Authorea: [10.22541/au.177269411.19684440/v1](https://doi.org/10.22541/au.177269411.19684440/v1)



Integrating the Japanese vegetation categories and the IUCN global ecosystem typology – a high-resolution, terrestrial ecosystem dataset defining *Subglobal ecosystem types* under *Ecosystem functional groups*

36: BIODIVERSITY

7: ECOSYSTEM ECOLOGY

8: VEGETATION SCIENCES

LAND-USE MAP





SETS

SPATIAL DATA

TERRESTRIAL ECOSYSTEM

VEGETATION CLASSIFICATION



Lea Végh , Jun Nishihiro, Hironori Toyama, Fumiko Ishihama , Hiroyuki Kudo, Yuki Tanno, Taku Kadoya, Masato Yoshikawa, David Keith, Yayoi Takeuchi  


What is the IUCN typology?

- Classification framework for Earth's ecosystems
- Integrates functional and compositional features
- International standard (United Nations Conventions)

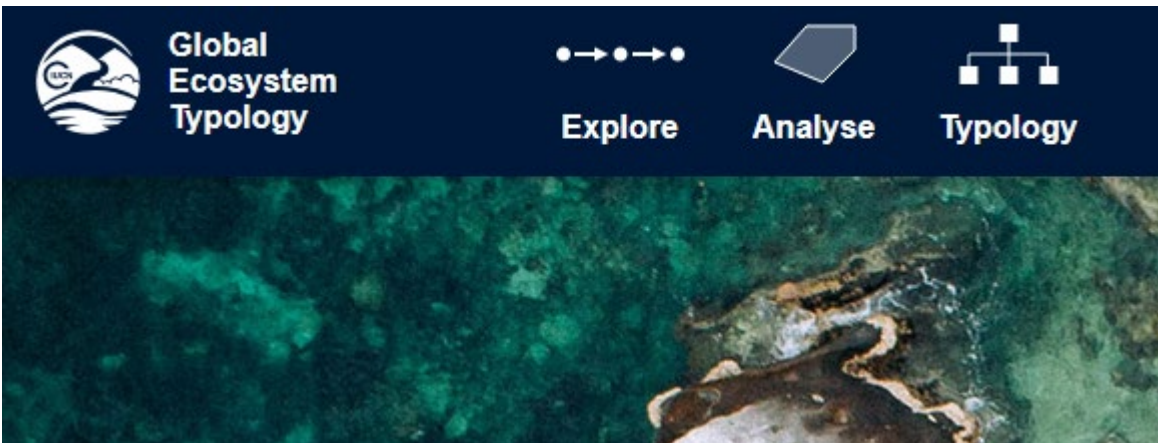
nature

Article | [Open access](#) | Published: 12 October 2022

A function-based typology for Earth's ecosystems

[David A. Keith](#) , [José R. Ferrer-Paris](#), [Emily Nicholson](#), [Melanie J. Bishop](#), [Beth A. Polidoro](#), [Eva Ramirez-Llodra](#), [Mark G. Tozer](#), [Jeanne L. Nel](#), [Ralph Mac Nally](#), [Edward J. Gregr](#), [Kate E. Watermeyer](#), [Franz Essl](#), [Don Faber-Langendoen](#), [Janet Franklin](#), [Caroline E. R. Lehmann](#), [Andrés Etter](#), [Dirk J. Roux](#), [Jonathan S. Stark](#), [Jessica A. Rowland](#), [Neil A. Brummitt](#), [Ulla C. Fernandez-Arcaya](#), [Iain M. Suthers](#), [Susan K. Wiser](#), [Ian Donohue](#), ... [Richard T. Kingsford](#) [+ Show authors](#)

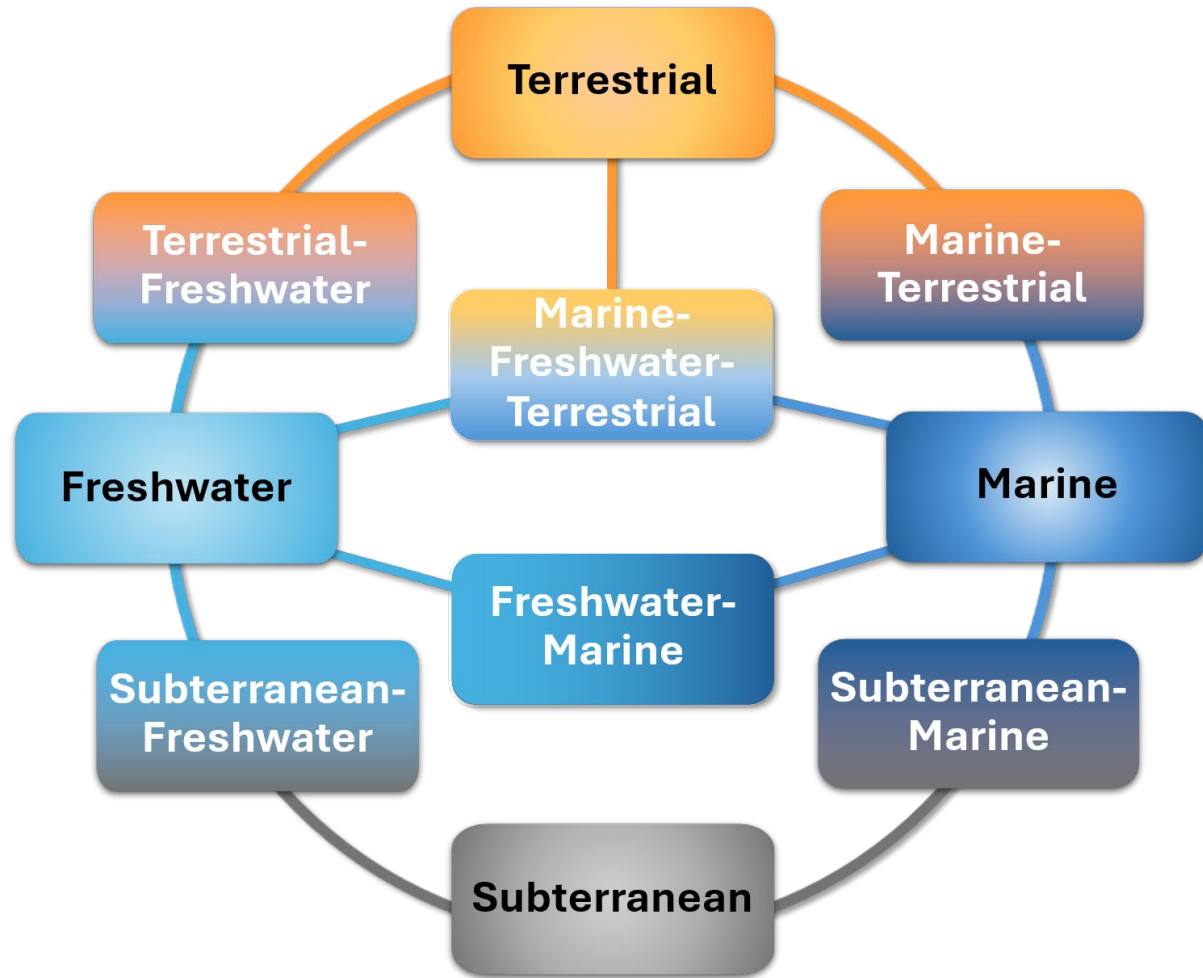
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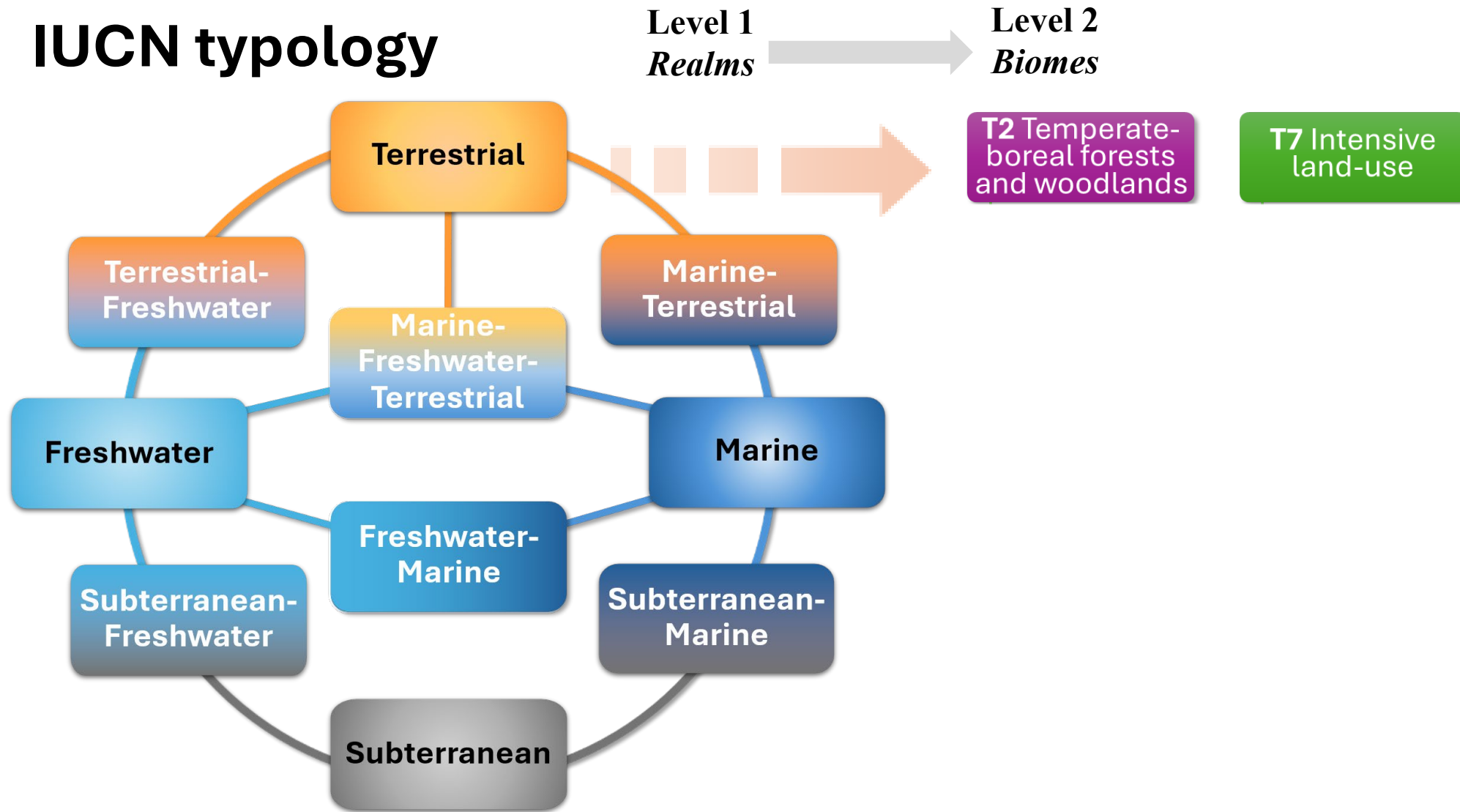
<https://global-ecosystems.org/>

Structure of the IUCN typology

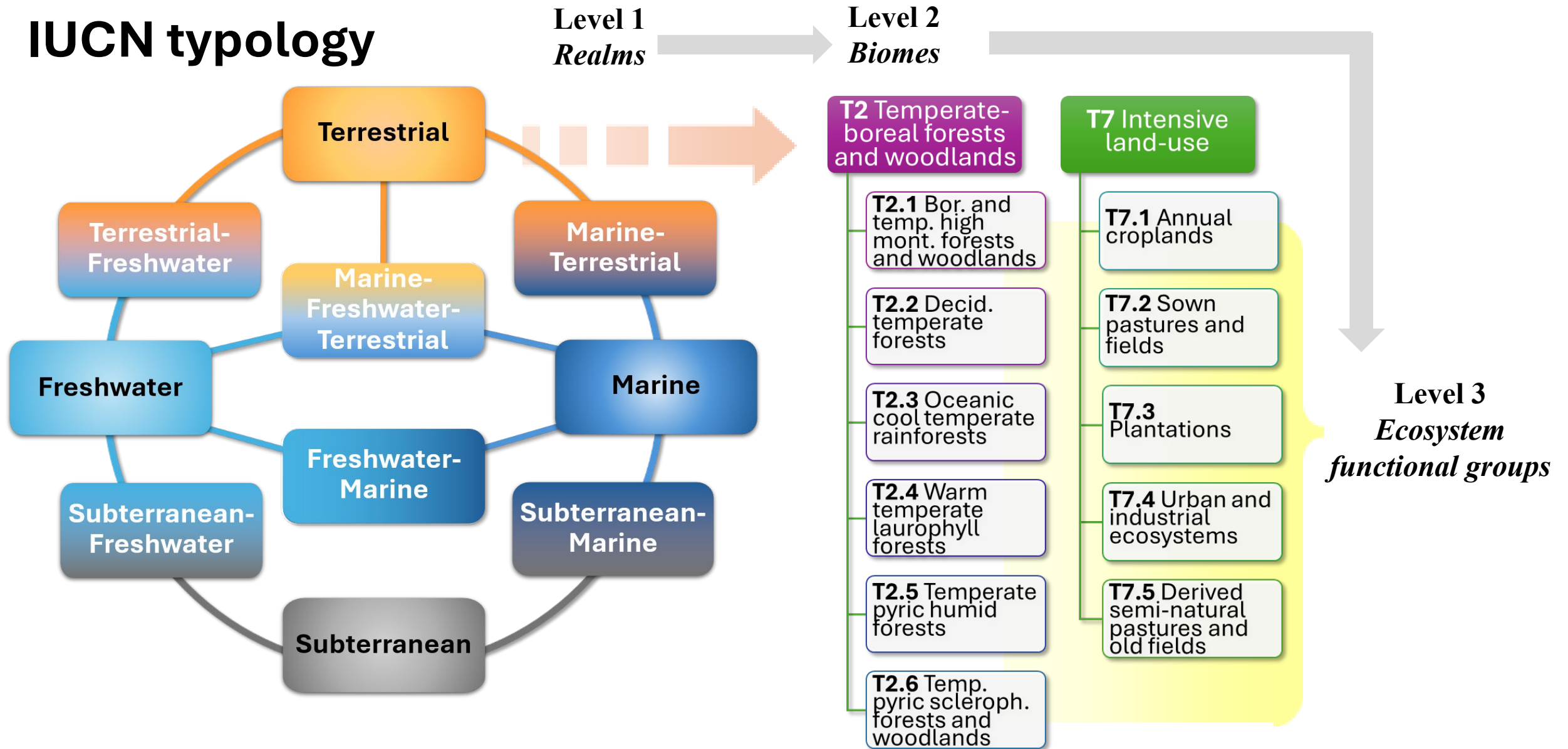
Level 1
Realms



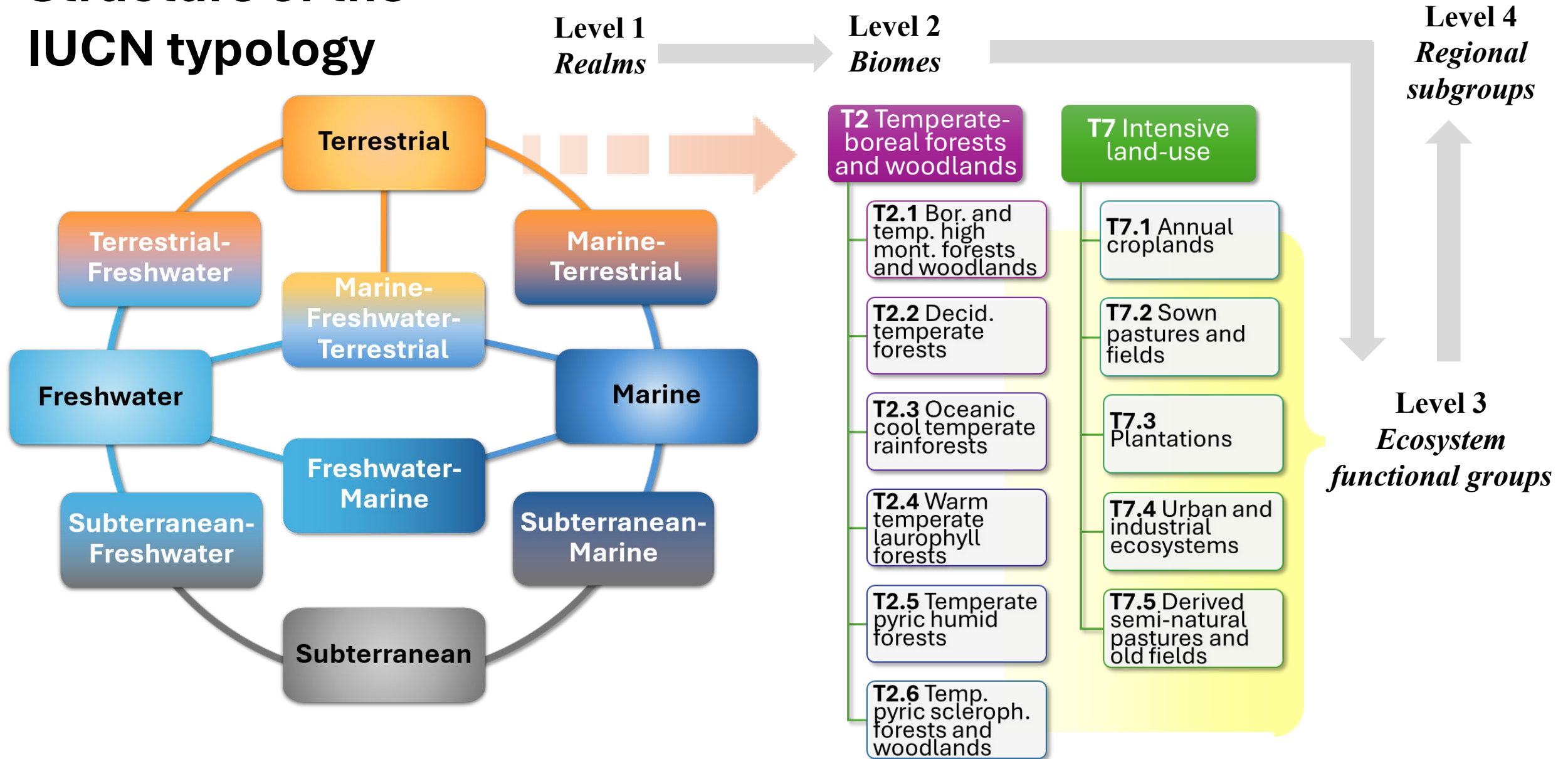
Structure of the IUCN typology



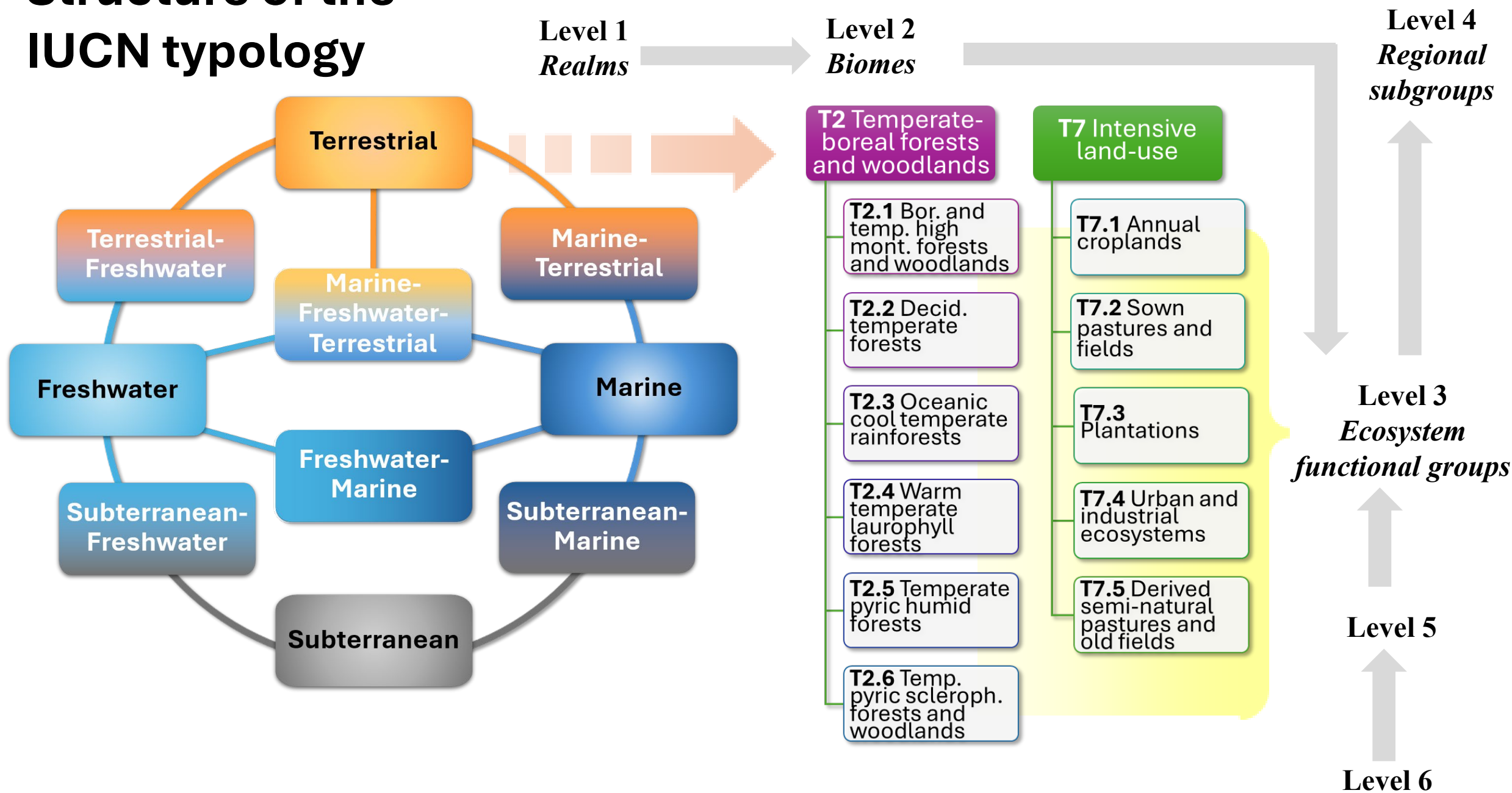
Structure of the IUCN typology



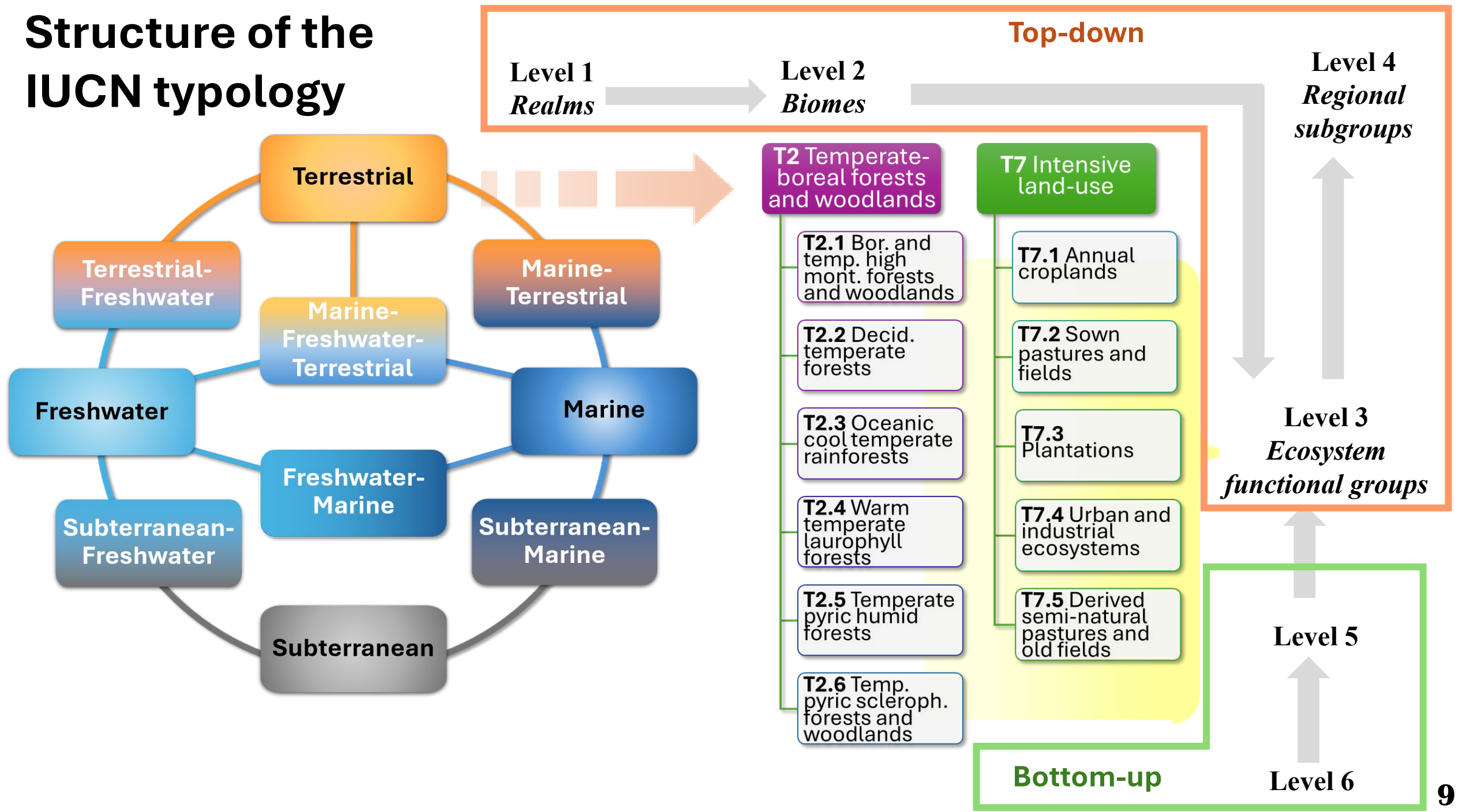
Structure of the IUCN typology



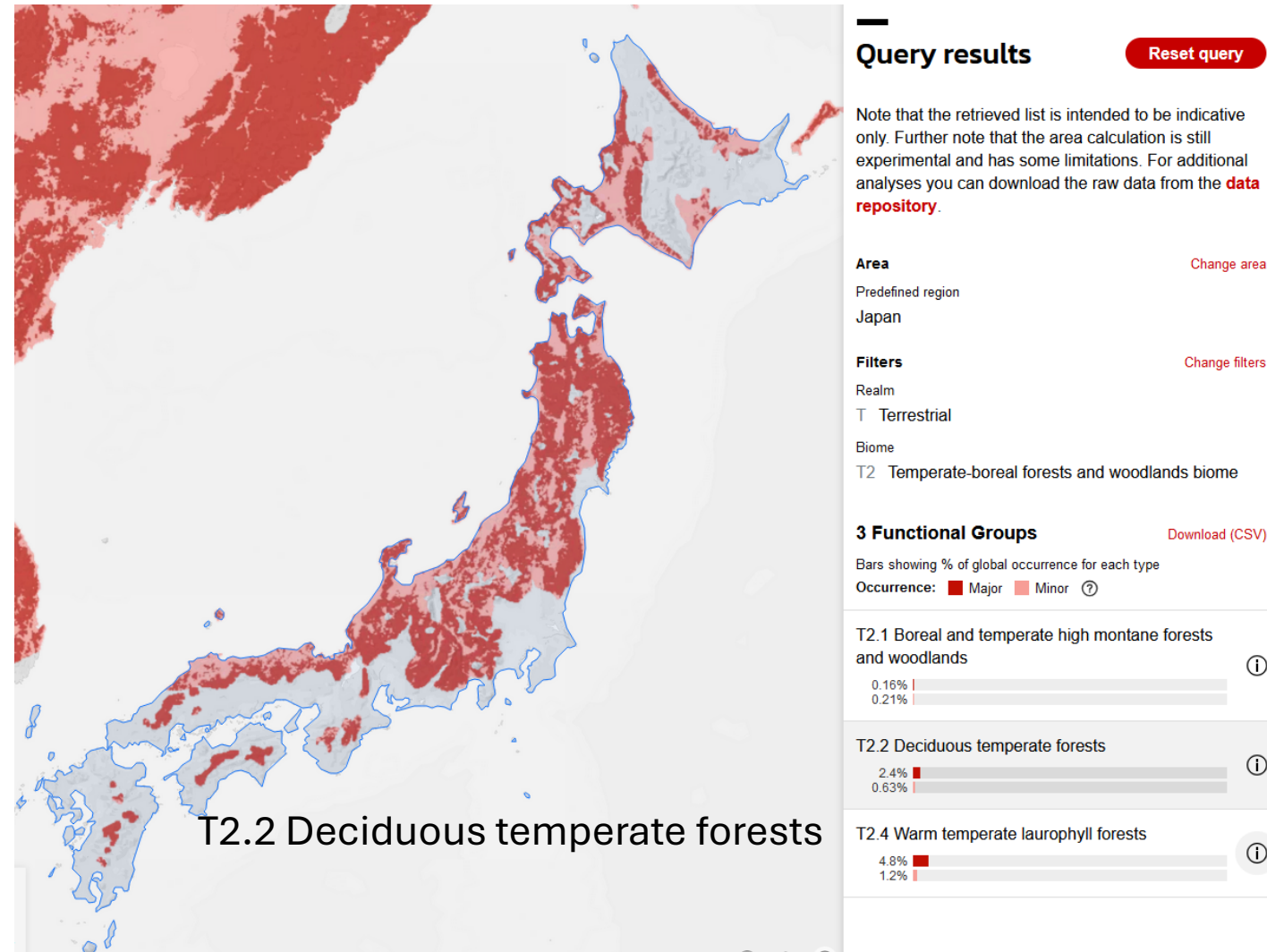
Structure of the IUCN typology



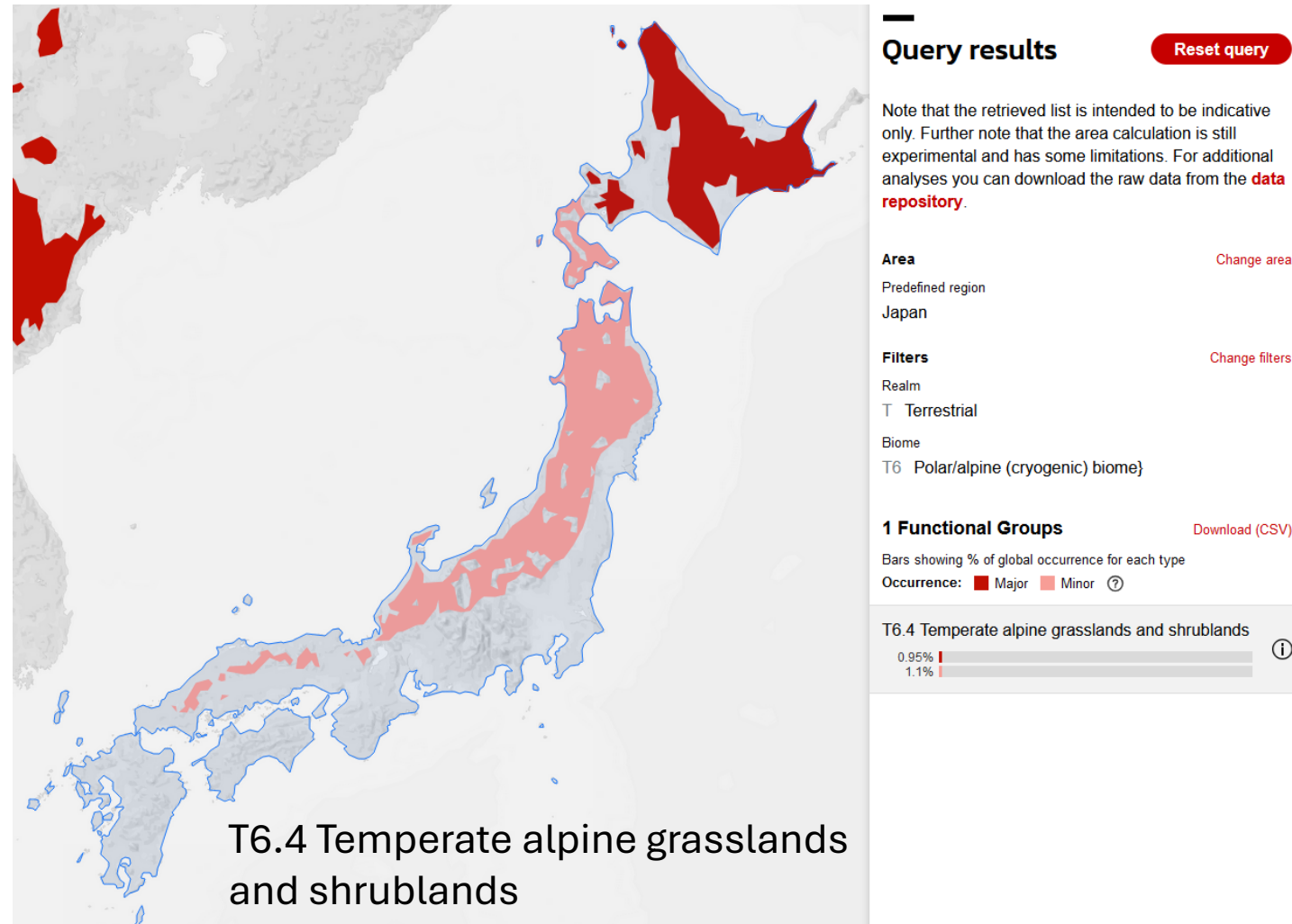
Structure of the IUCN typology



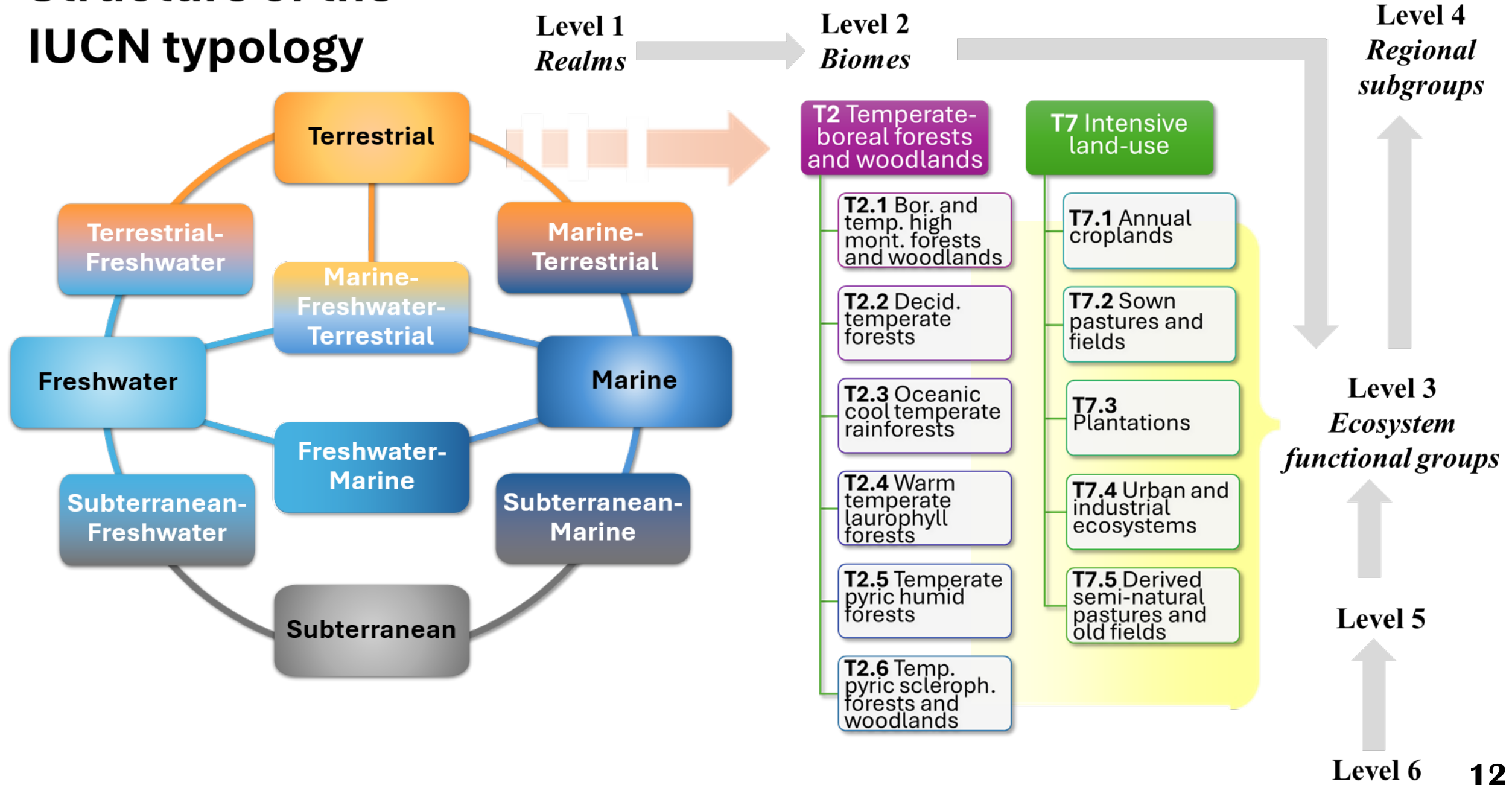
- Current visualization of Japan based on global data paper (Keith et al., 2023, *Zenodo*)
- Resolution depends on Ecosystem Functional Group (EFG)
- Some EFGs are likely under-informed



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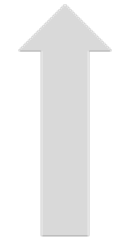
Structure of the IUCN typology



Level 3
***Ecosystem
functional groups***



Level 5 ***Global ecosystem types***



Level 6 ***Subglobal ecosystem types (SETs)***

Bottom-up

Level 3
*Ecosystem
functional groups*

Level 5

Global ecosystem types

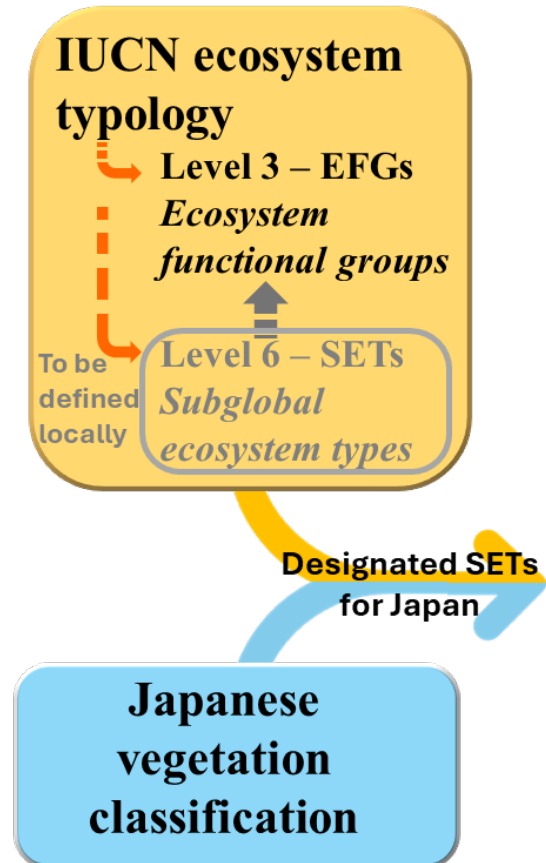
- Designed for subregional use
- Consolidating multiple national SETs

Level 6

Subglobal ecosystem types (SETs)

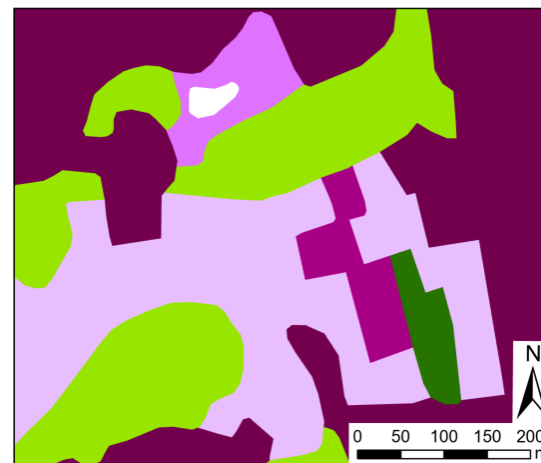
- Designed for national classification
- Further national subunits allowed

Bottom-up



Japanese vegetation surveys

- By Ministry of Environment (MOE)
- Current is 6th-7th vegetation survey:
 - 1999-2004 and 2005-2024
- Focus on terrestrial ecosystems
- Based on field and remote surveys
- Minimum mapping unit: 1 hectare
 - Scale 1: 25 000 (~ 50 m resolution)
 - Visual representation up to ~ 7 m
- Available for download, in Japanese



トップ ▶ 自然環境調査Web-GIS ▶ Shapeデータダウンロード ▶ 植生調査(1/2.5万) 都道府県別一覧

植生調査(1/2.5万) 都道府県別一覧



全県分ダウンロード

(ファイル容量 4.4GB)

ファイル容量17.1~703.6MBですのでご注意ください。
また、複数の圧縮ファイルをまとめて解凍すると、データに変化をきたす恐れがありますのでご注意ください。

都道府県別	シェイプ	都道府県別	シェイプ	都道府県別	シェイプ
北海道	ダウンロード	青森県	ダウンロード	岩手県	ダウンロード

<http://gis.biodic.go.jp/webgis/sc-025.html?kind=v67>



環境ジオポータル

ホーム データセット一覧 操作ガイド

検索 現存植生図2024

Filters

Reset

1 - 12 of 57 results

Sort by: Relevance

List

Collections

- ☒ All content (137)
- ☐ データ (117)
- ☐ ドキュメント (1)
- ☐ アプリおよびマップ (11)

Location

Dataset

[現存植生図2024 関東ブロック](#)

現存植生図2024_関東ブロックのGISデータです。

Type: Feature Service

Date updated: 2/25/2026

Tags: 環境省, 生物多様性センター, 現存植生図, 自然環境保...

Date created: 5/28/2025

<https://geoportal.env.go.jp/search?q=現存植生図2024>

Japanese vegetation categories

Vegetation zone (植生 – Shoku)

- Coded as 1, 2, 3, ... 10, 99
- Climate zones

Large (大 – Dai)

- Coded as 01, 02, 03, ... 58, 99
- Life forms, structures

Middle (中 – Chu)

- Coded as 00, 01, 02, ... 23
- Alliances

Small (細 – Sai)

- Coded as 00, 01, 02, ... 20
- Associations

Phytosociology

3 Subalpine substitutional vegetation

08 Subalpine secondary forest

01 Betula ermanii (Birch) community

02 Picea glehnii (Spruce) community

09 Secondary grassland

01 Dwarf bamboo communities

02 Calamagrostis longiseta community

03 Senecio cannabifolius community

10 Clear-cut community

00

10 Urban areas, etc.

58 Urban areas, etc.

01 Urban areas

02 Woody green areas (parks, cemeteries, etc.)

03 Industrial areas

04 Reclaimed land (terrestrial)

05 Reclaimed land (marine)

06 Open water

07 Natural barelands

08 Woody areas

09 Perennial snow patches

eg.: *Vaccinium vitis-idaea* and *Pinus pumila* association

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Identification code (凡例 – Hanrei)

- Coded as 00, 01, 02, ... 23

01 00 00 - 58 09 00, 9999 (958 unique + 9999)

Small (細 – Sai)

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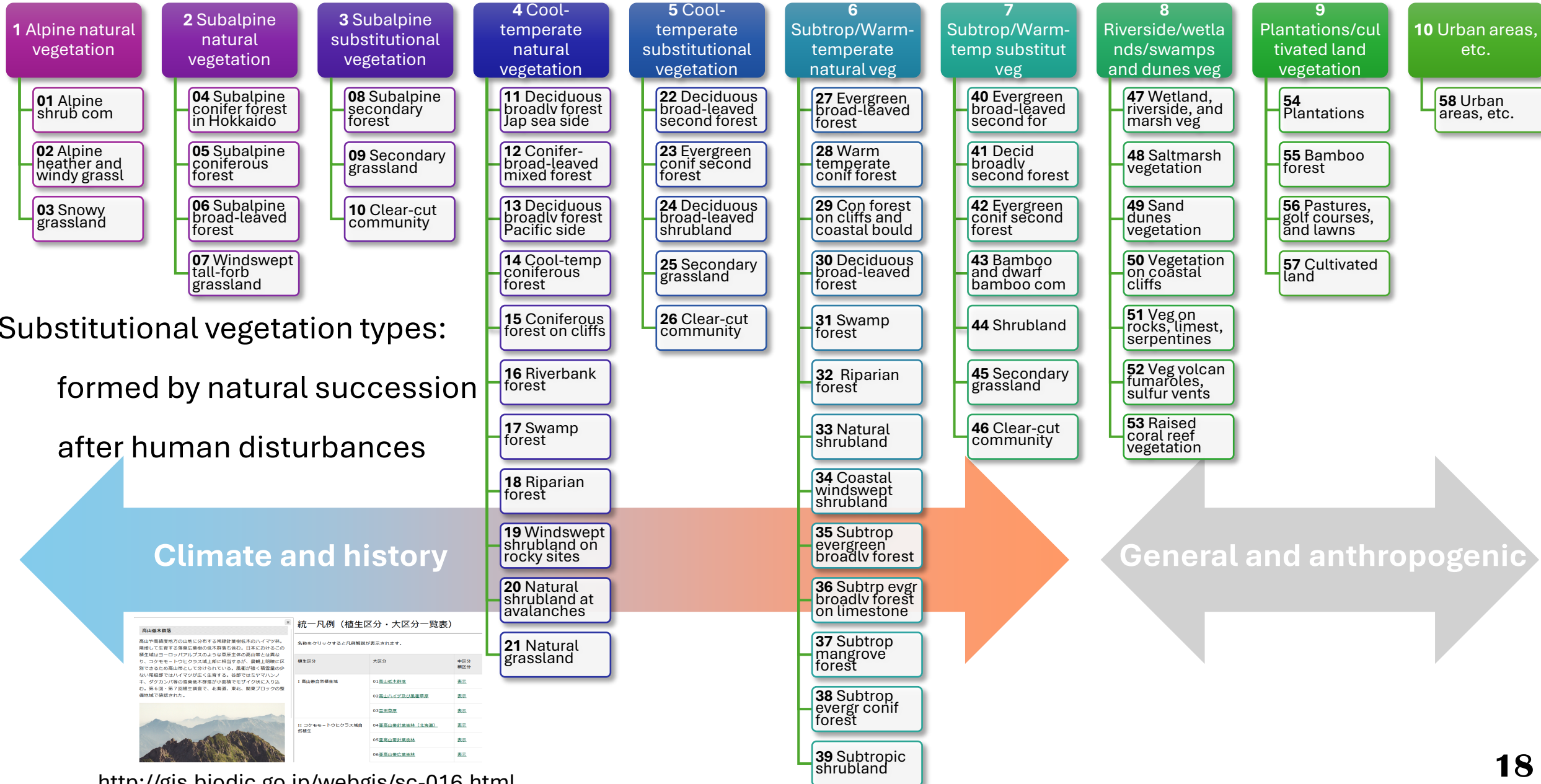
07 Natural barelands

08 Woody areas

09 Perennial snow patches

eg.: *Vaccinium vitis-idaea* and *Pinus pumila* association – 010101


All Vegetation zones and Large categories



Framework

- Compare explanations and examples online
- Review cycle of experts of Japanese classification
- Combination of Large and Middle categories

統一凡例（植生区分・大区分一覧表）		
名称をクリックすると凡例解説が表示されます。		
植生区分	大区分	中区分 細区分
I 高山帯自然植生域	01 高山低木群落	表示
	02 高山ハイデ及び風衝草原	表示
<div>高山ハイデ及び風衝草原</div> <p>高山や高緯度地方の山地の風衝地に分布する矮生低木群落および草原。ミネズオウ、コメバツガザクラ、ウラシマツツジ、エゾマメヤナギ等の矮生低木、北海道ではエソオヤマノエンドウ、チシマクモマグサ、本州ではオヤマノエンドウ、イワツメクサ、イワオウギ、タイツリオウギ、富士山の荒原ではフジハタザオ、オンタデ等が生育する。第6回・第7回植生調査で、北海道、東北、関東、北陸、中部ブロックの整備地域で確認された。</p> 		表示
		(北海道) 表示
		表示
		表示
		草原 表示
		表示
		表示
		表示
		(本海型) 表示
		表示



Global
Ecosystem
Typology

Explore

Analyse

Typology

[Explore](#) > [Realm](#) > [Biome](#) > Functional Group

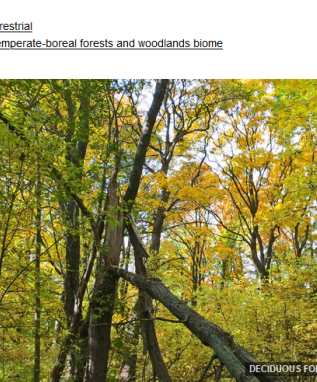
T2.2 Deciduous temperate forests

Realm

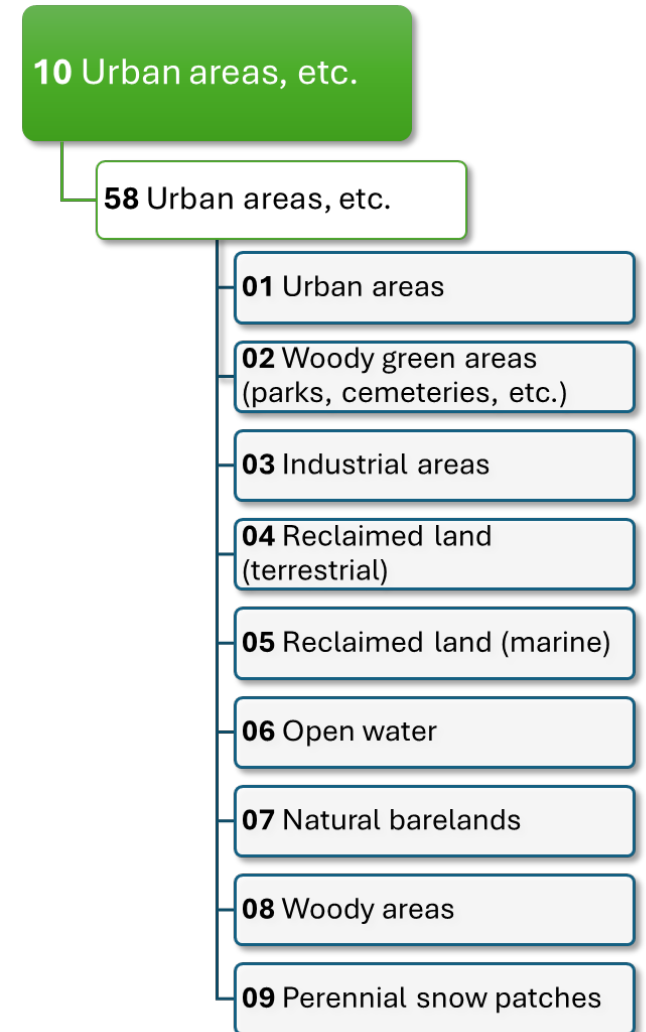
Biome

T Terrestrial

T2 Temperate-boreal forests and woodlands biome

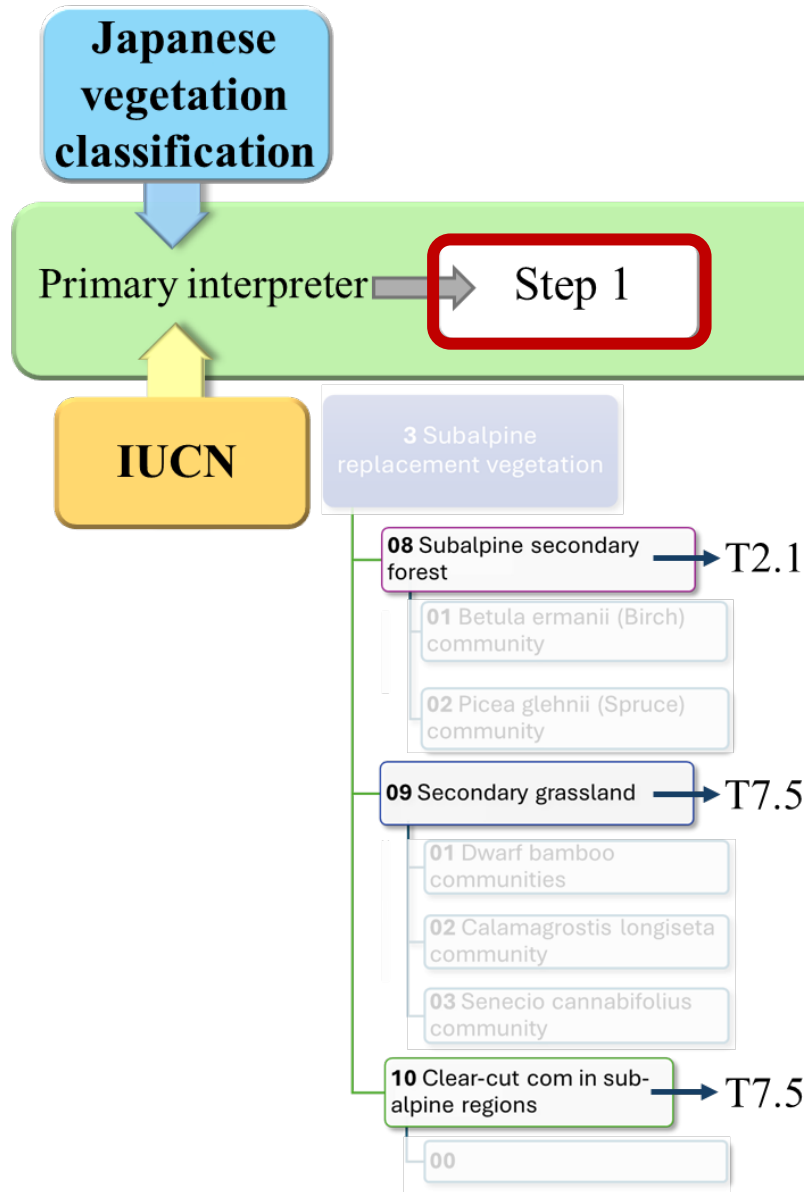


At cool temperate latitudes in the Northern hemisphere, fertile soils and high precipitation support forests dominated by broadleaf deciduous trees, although evergreen needleleaf trees may account for up to one-third of the canopy. Cold snow-prone winters punctuate a limited but highly productive growing season. Fungi and bacteria play vital roles in decomposition of the seasonal leaf fall on the forest floor, with insects and browsing herbivores important in carbon and nutrient cycling. Herbivores such as deer and hares are prey to feline, canine and avian predators. Winter dormancy, hibernation and migration are key strategies enabling survival of plants and animals.



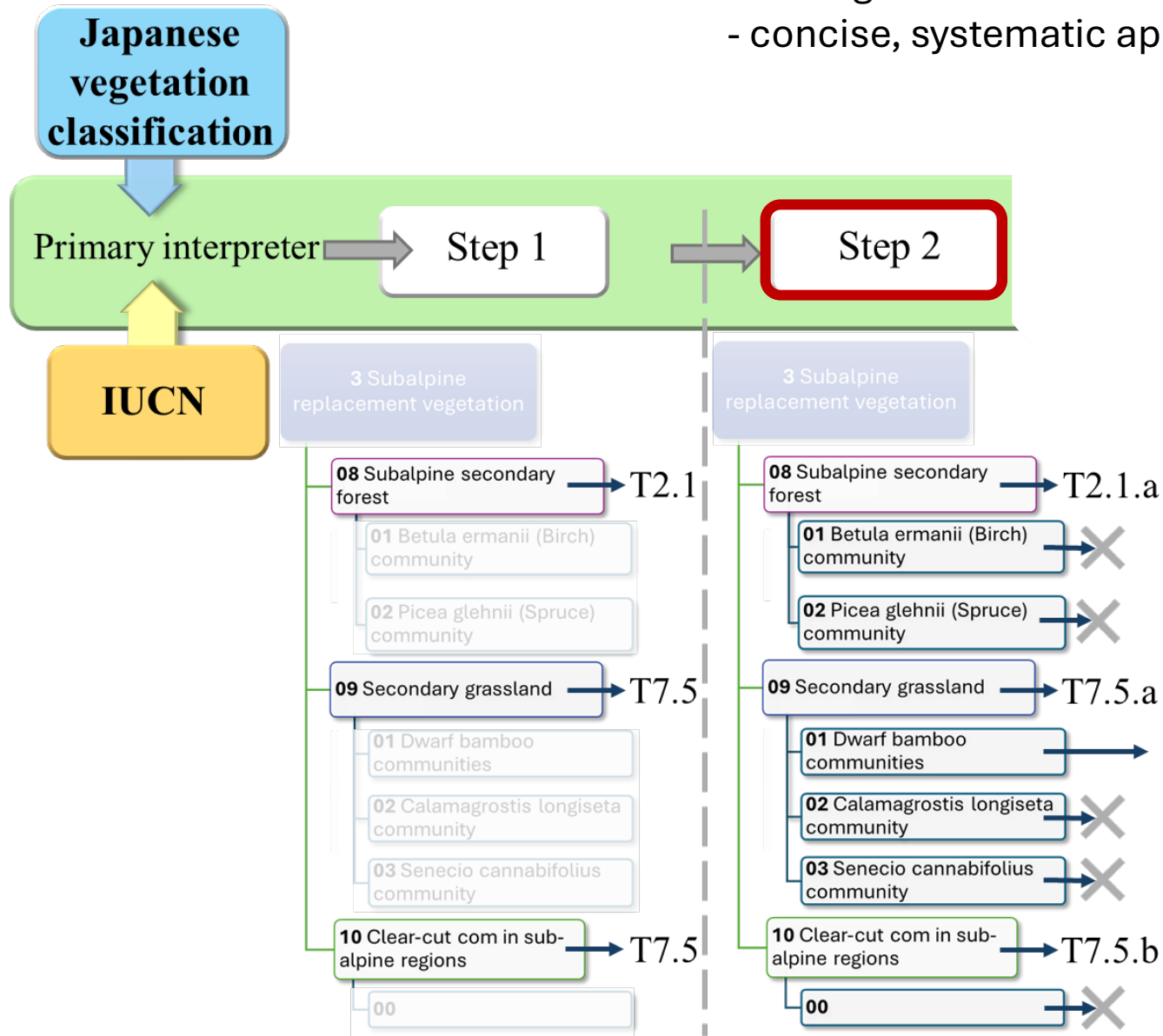
Framework

- Comparing the descriptions of *Large* categories and EFGs, then identifying the EFG which could serve as a parent EFG to each *Large* category



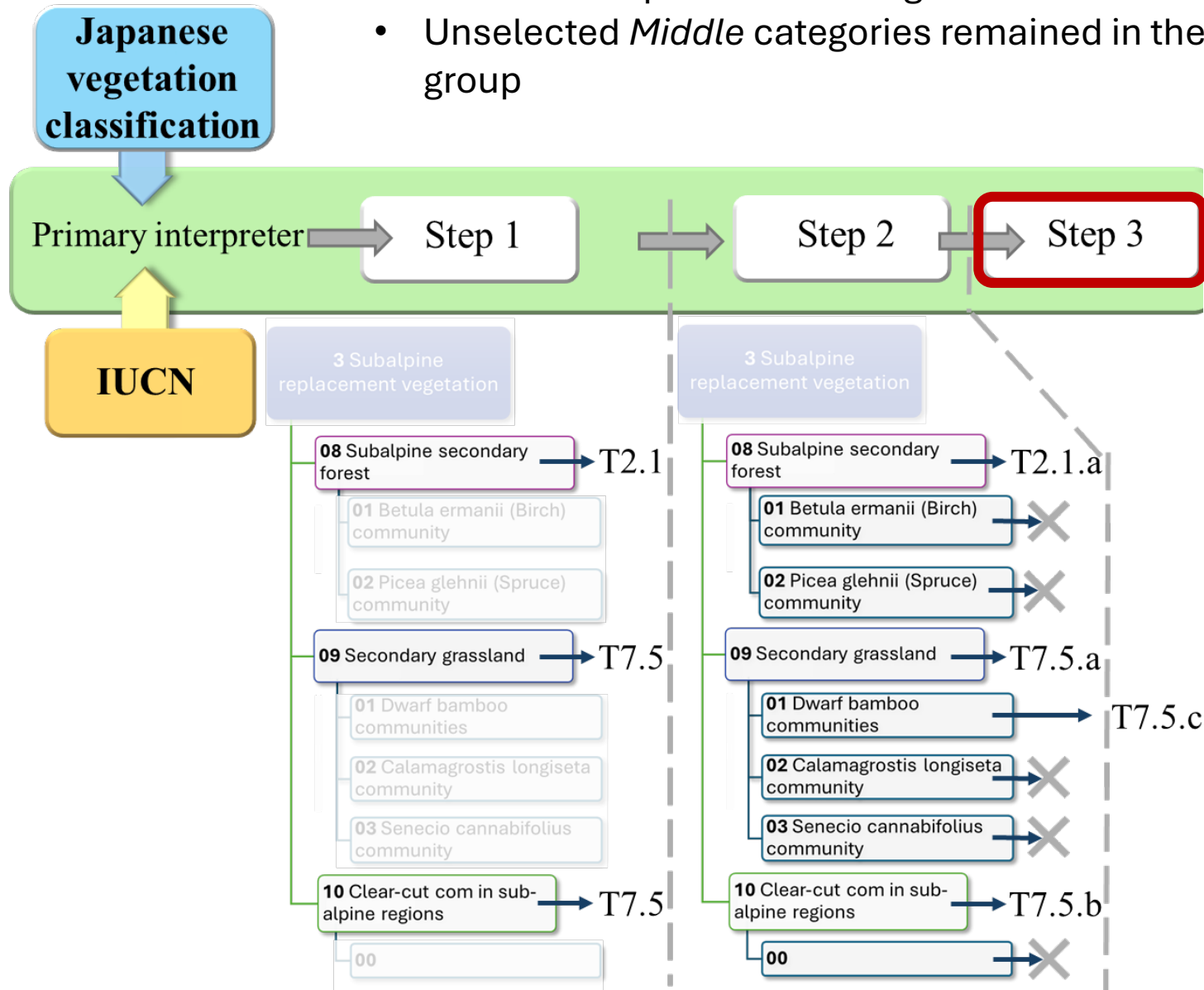
Framework

- Examination of the *Middle* categories in each *Large* category:
 - Selecting those which provide further clarifications without species-level information
 - manageable number of categories (117 in contrast to 411)
 - concise, systematic approach



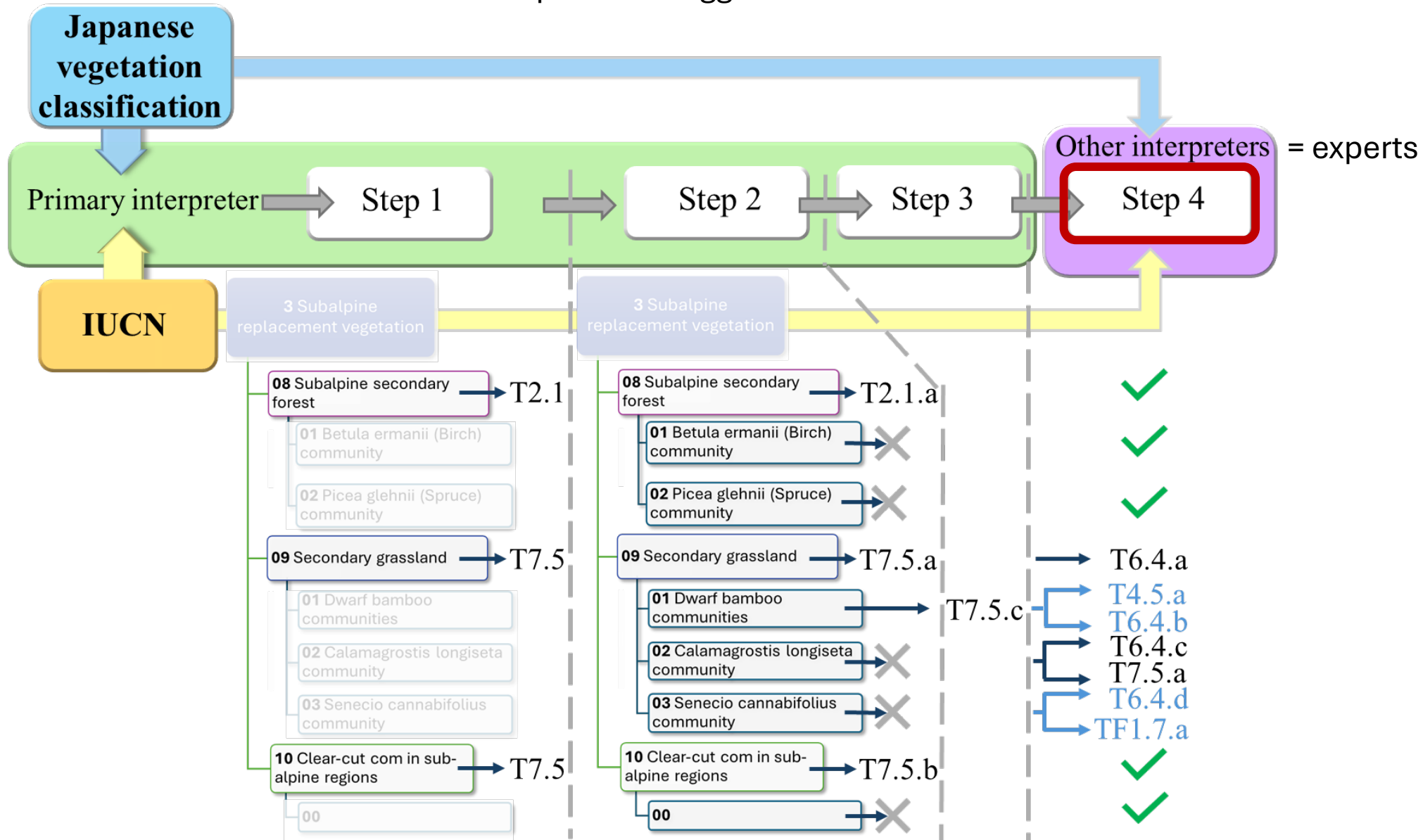
Framework

- Identifying parent EFG for thus selected *Middle* categories
 - can have different parent EFG than their *Large* categories
 - multiple *Middle* categories from same *Large* category can be grouped together
- Unselected *Middle* categories remained in the SET category defined by their *Large* group



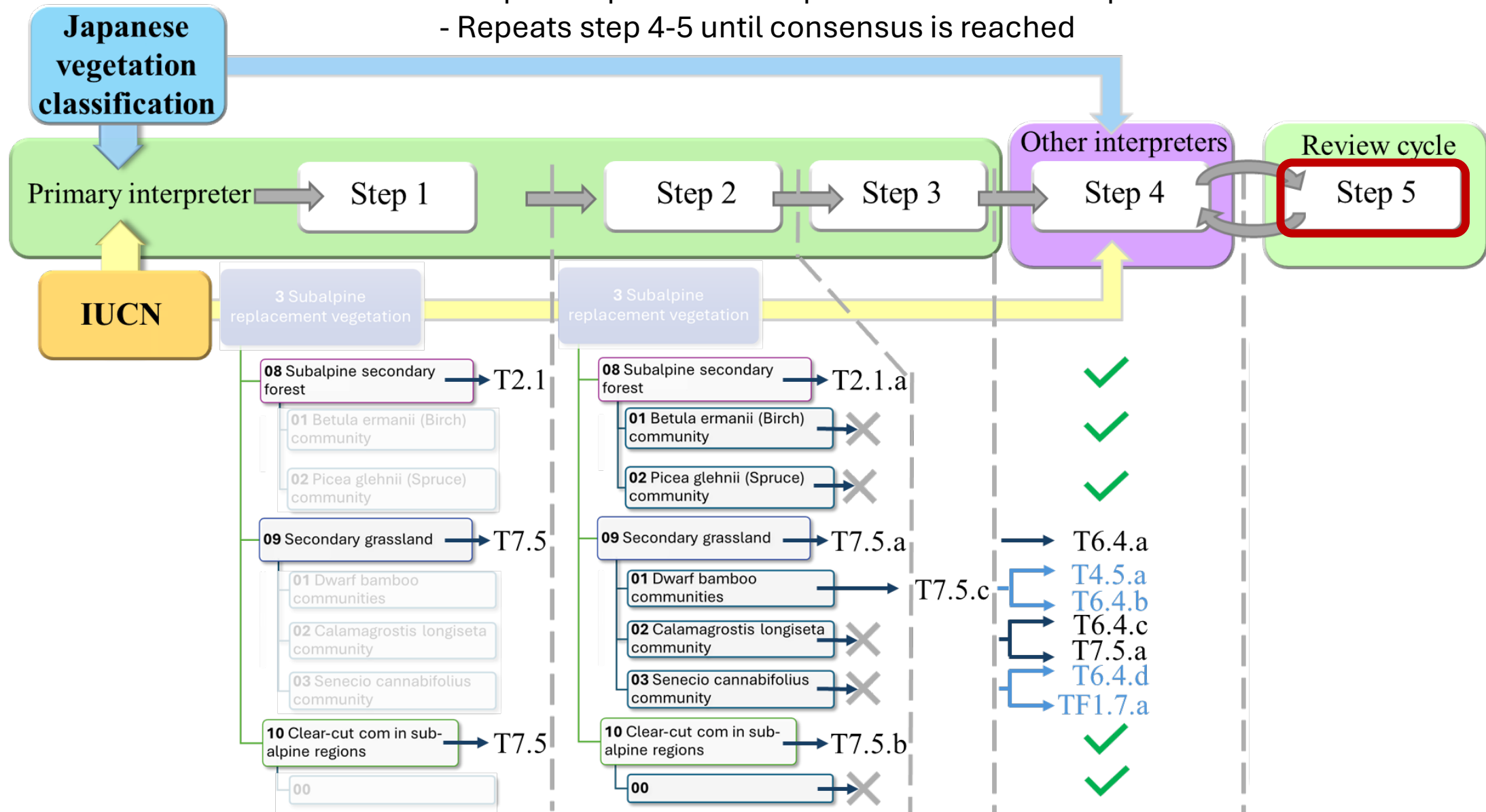
Framework

- This initial corresponding table distributed to experts
 - In-depth knowledge of vegetation categories in addition to descriptions
 - Independent suggestions

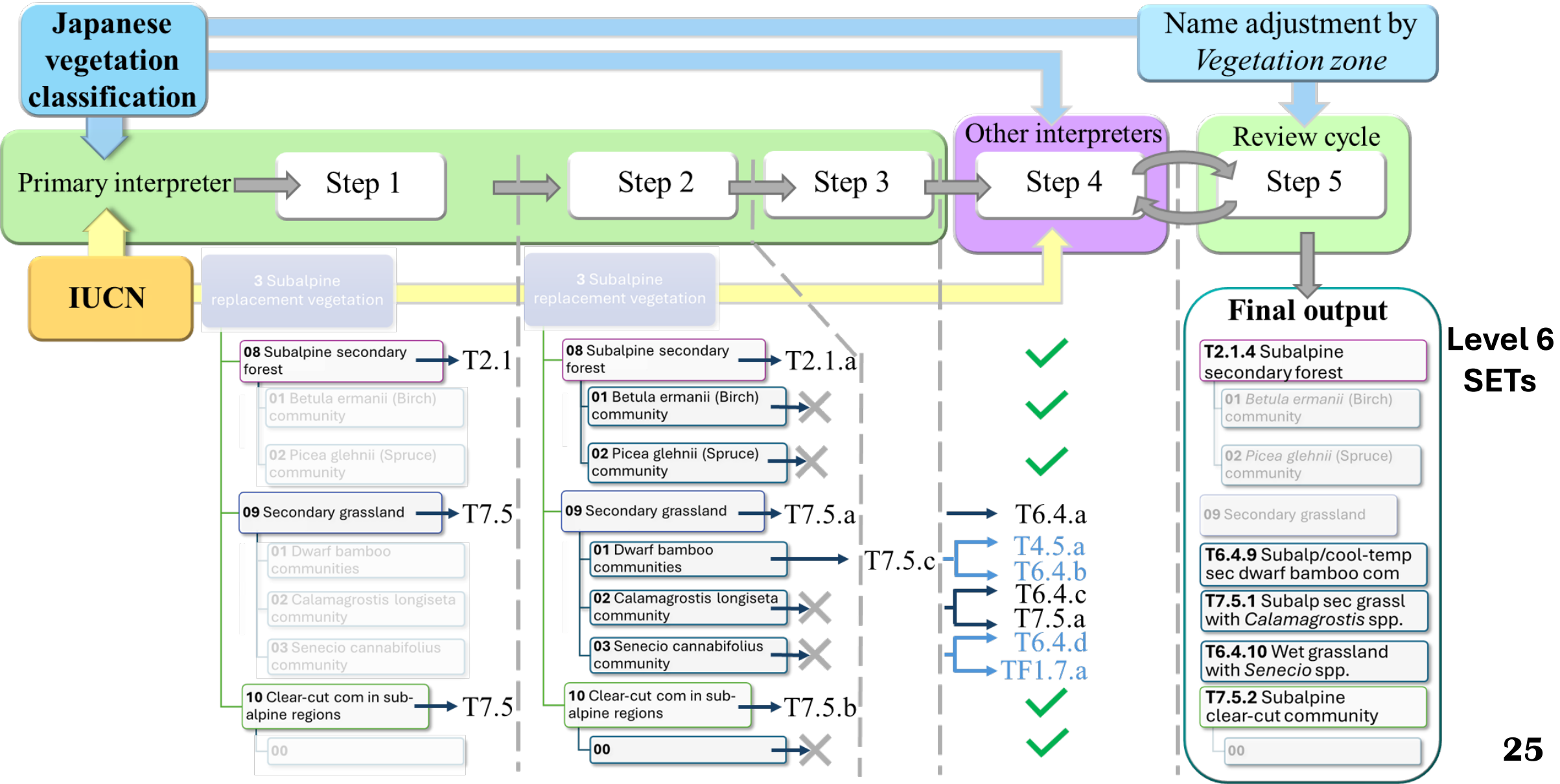


Framework

- Primary interpreter:
 - Summarizes comments
 - Prepares updated correspondence table with queries and comments
 - Repeats step 4-5 until consensus is reached

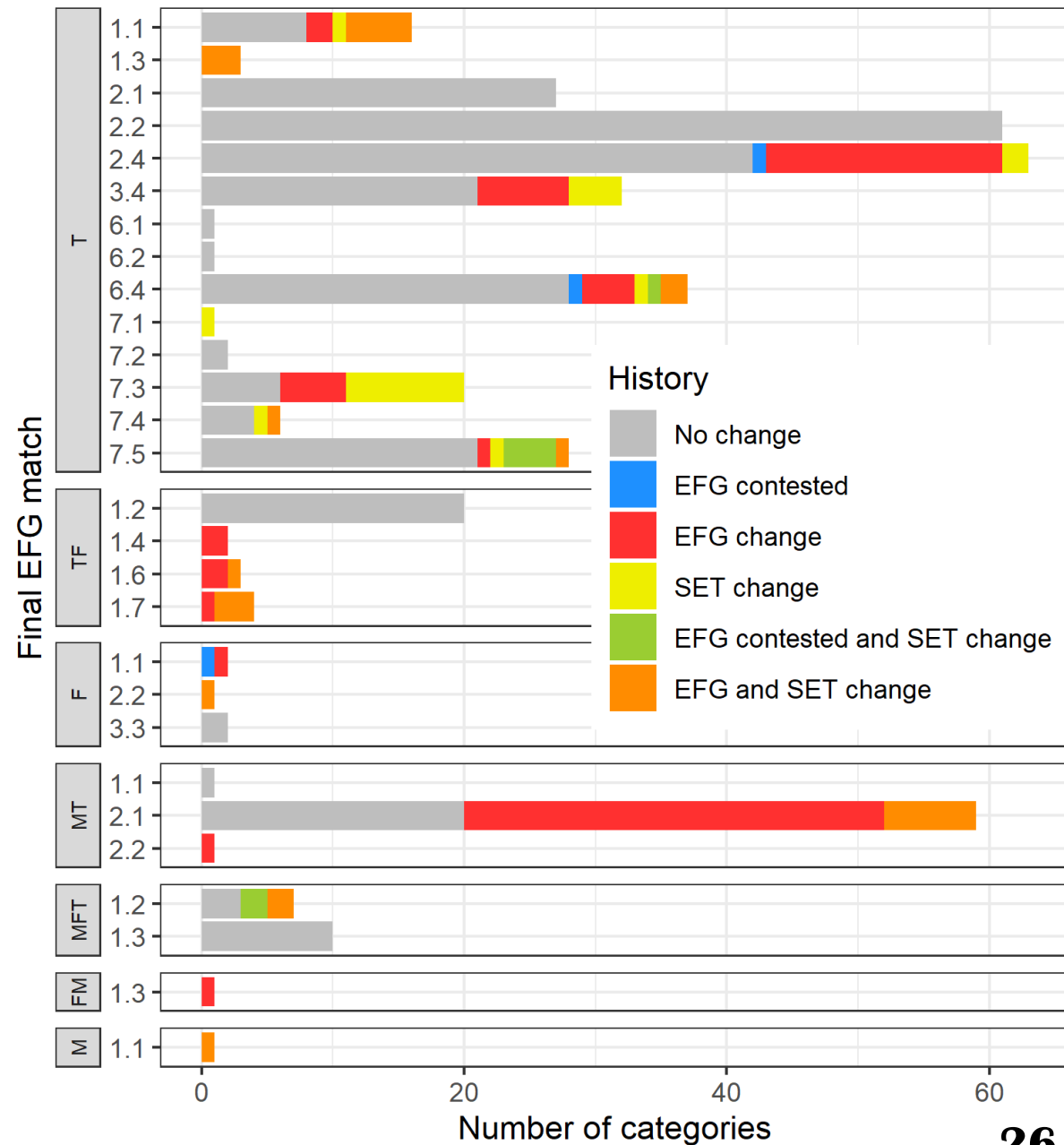


Framework



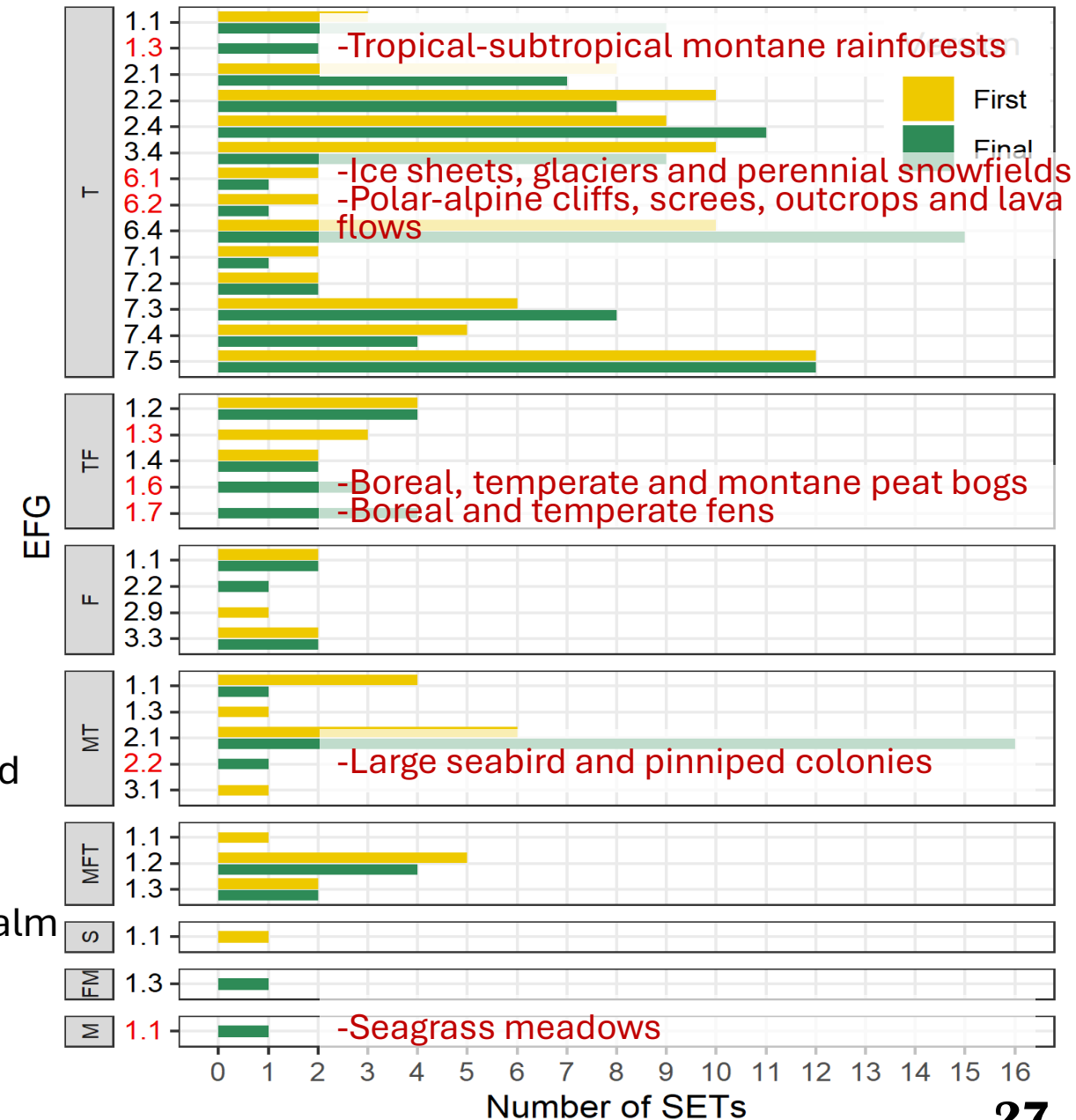
Outcomes

- Systematical match of parent EFGs mostly unchanged
 - Contested matches > discussions about changing EFG
- Parent EFG change most common
 - Experts recommended multiple EFGs > **Challenges**
- SET and EFG + SET change had equal frequency
- EFGs where most changes happened:
 - MT2.1 – Coastal shrublands and grasslands
 - T2.4 – Warm temperate laurophyll forests



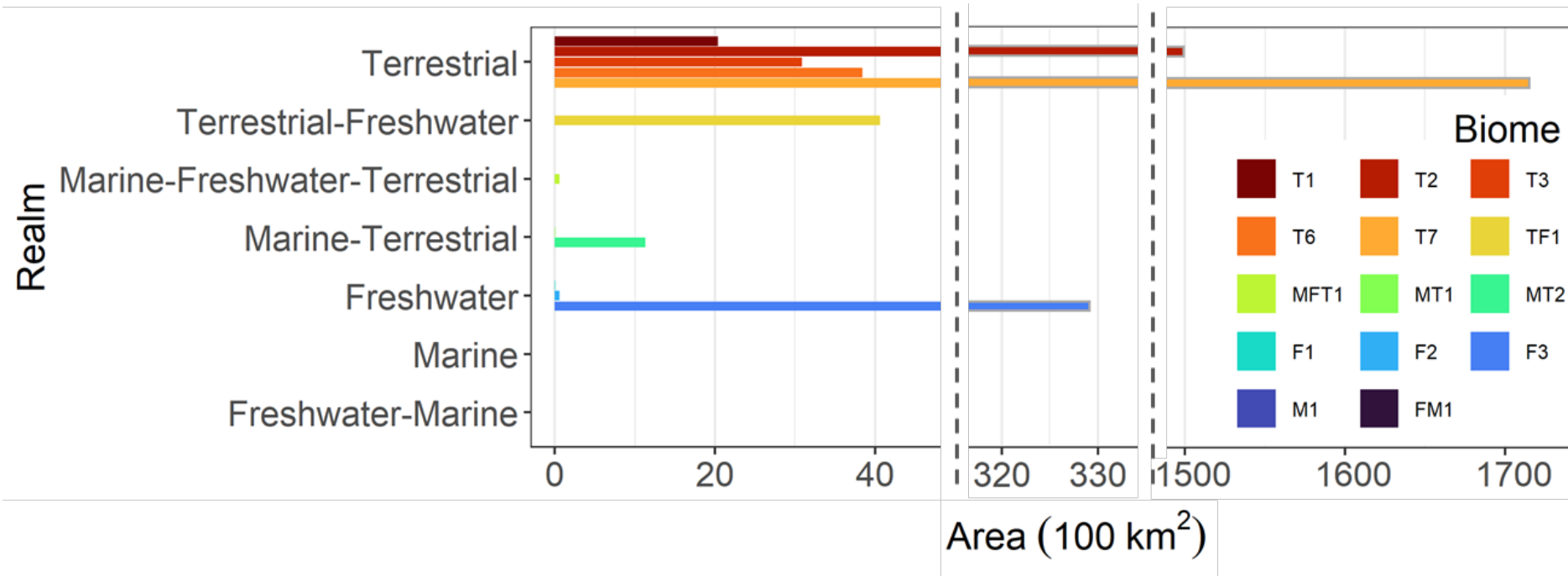
Outcomes

- 133 SETs established belonging to 28 EFGs
 - Review cycle increased the number of SETs from 115
 - More *Middle* categories extracted
 - Full history of discussions available
- Seven new EFGs acknowledged
 - T1.3, T6.1, T6.2, TF1.6, TF1.7, MT2.2, M1.1
 - 25 EFGs from the global 46 EFGs could not be identified
 - Dataset focused only on terrestrial vegetation
 - Further expansion is anticipated outside Terrestrial Realm



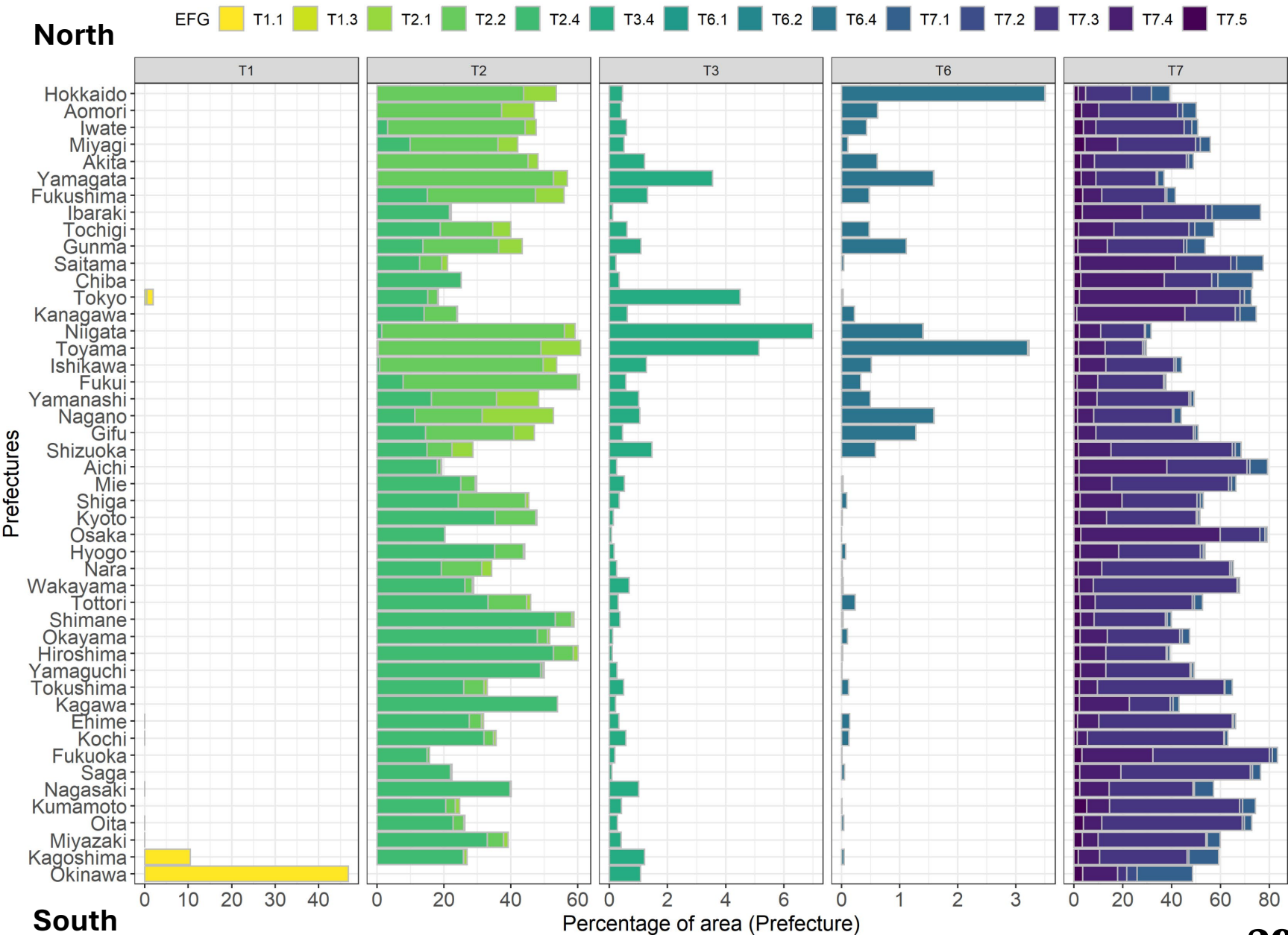
Outcomes

- *Biomes* with largest surface area within our dataset:
 - T7 – Intensive land-use (46.5%)
 - T2 – Temperate-boreal forests and woodlands (40.7%)
- Area of Biomes outside of Terrestrial *Realms* are not indicative
 - Not included in the dataset



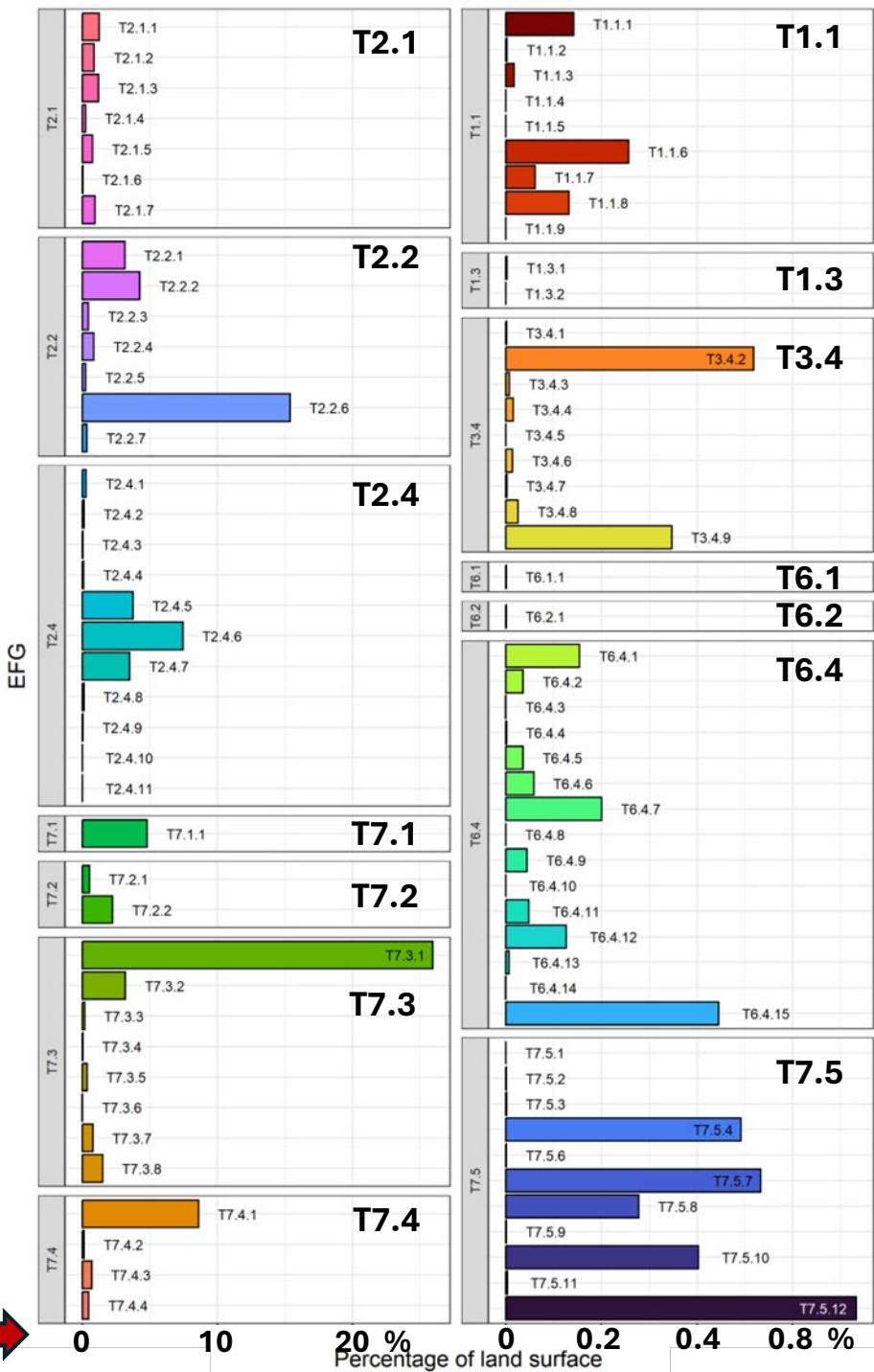
Outcomes

- Distinct N-S gradient
 - T1 – Tropical-subtropical forests
 - T6 – Polar-alpine (cryogenic)
- Geographical range of T1.1 (lowland rainforests) pushed northward
- High cover in all prefectures:
 - T2 – Temperate-boreal forests and woodlands
 - T7 – Intensive land-use

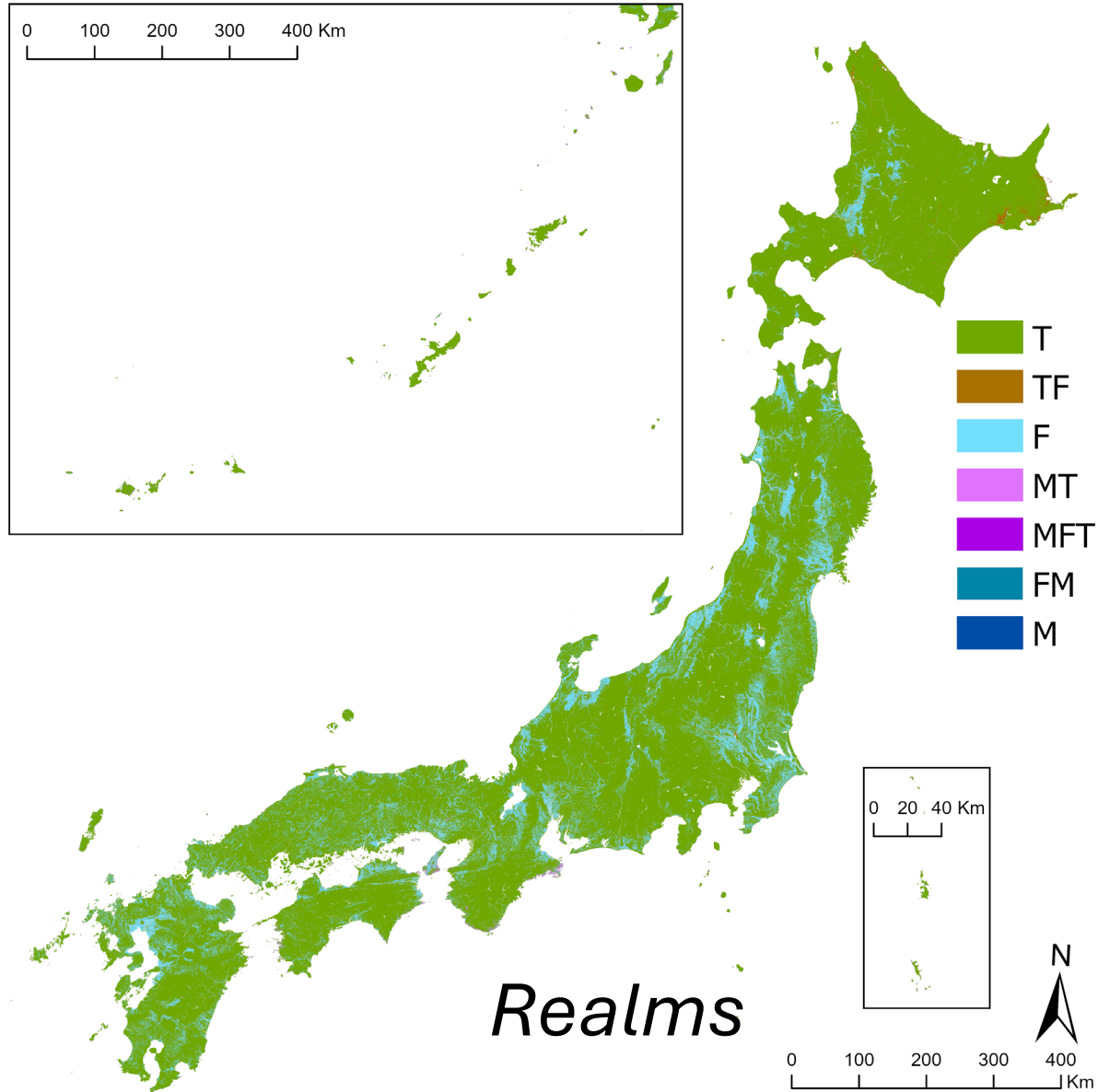


Outcomes

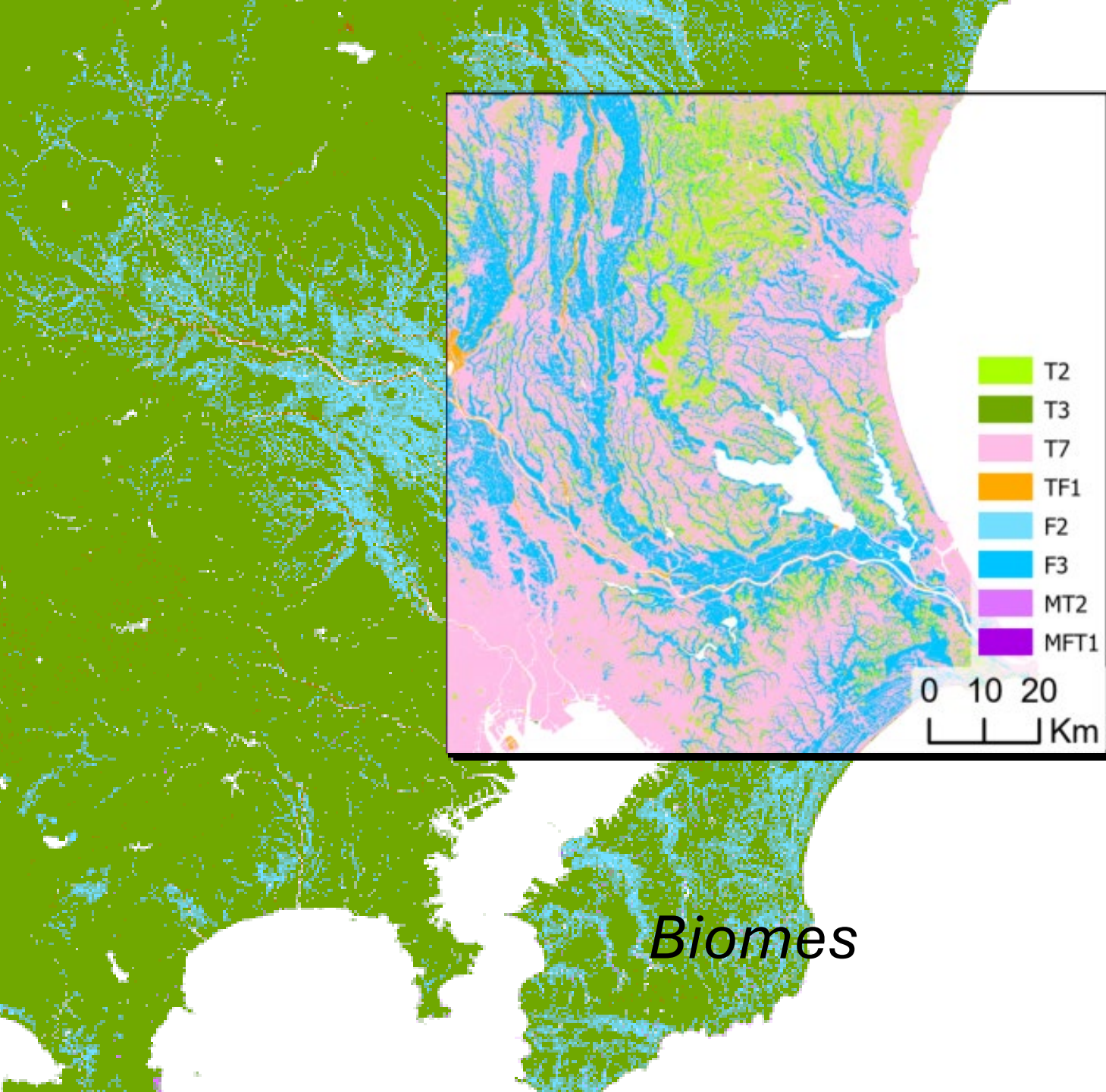
- Newly identified EFGs account for less than 1% among all *Realms*
- Within the Terrestrial *Realm* highest coverage:
 - T7.3.1 – Evergreen coniferous plantations (25.9%)
 - T2.2.6 – Cool-temperate deciduous broad-leaved secondary forest comes second (15.4%)
- Within the Terrestrial *Realm* lowest coverage:
 - T7.5.1 – Subalpine secondary grasslands with *Calamagrostis* spp. (2.12 km²)
 - T6.4.10 – Wet grasslands with *Senecio* spp. (2.65 km²)



Outcomes

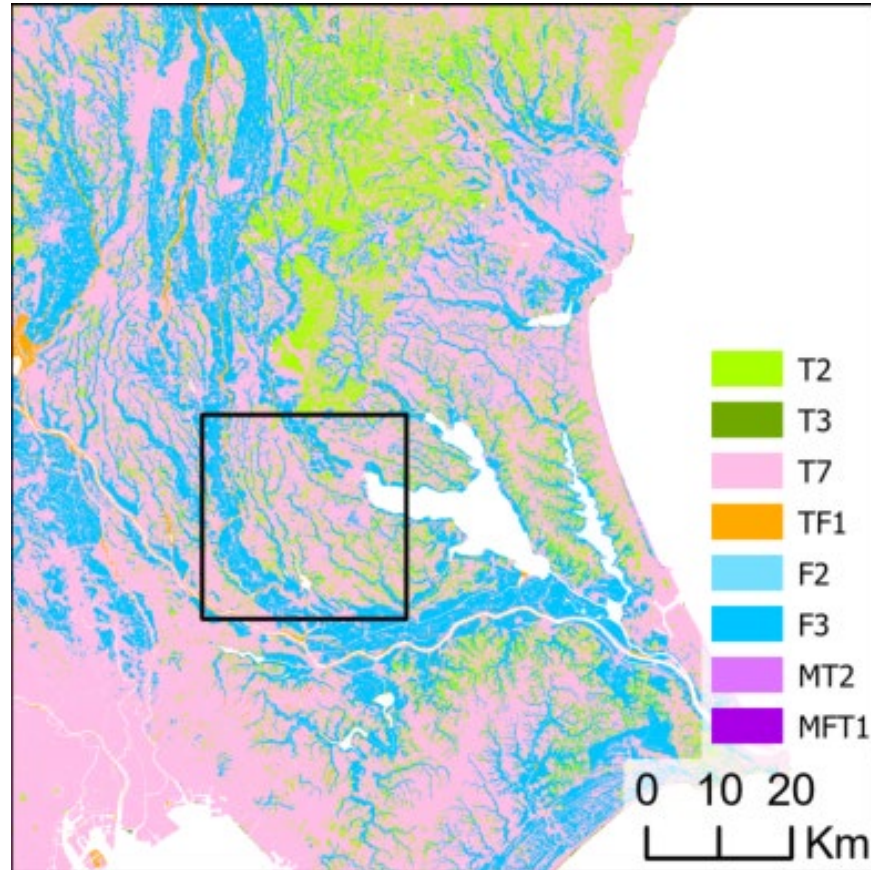


- Spatial data published alongside
- Covers whole Japan, divided by prefectures
- Past and future compatibility based on Identification code

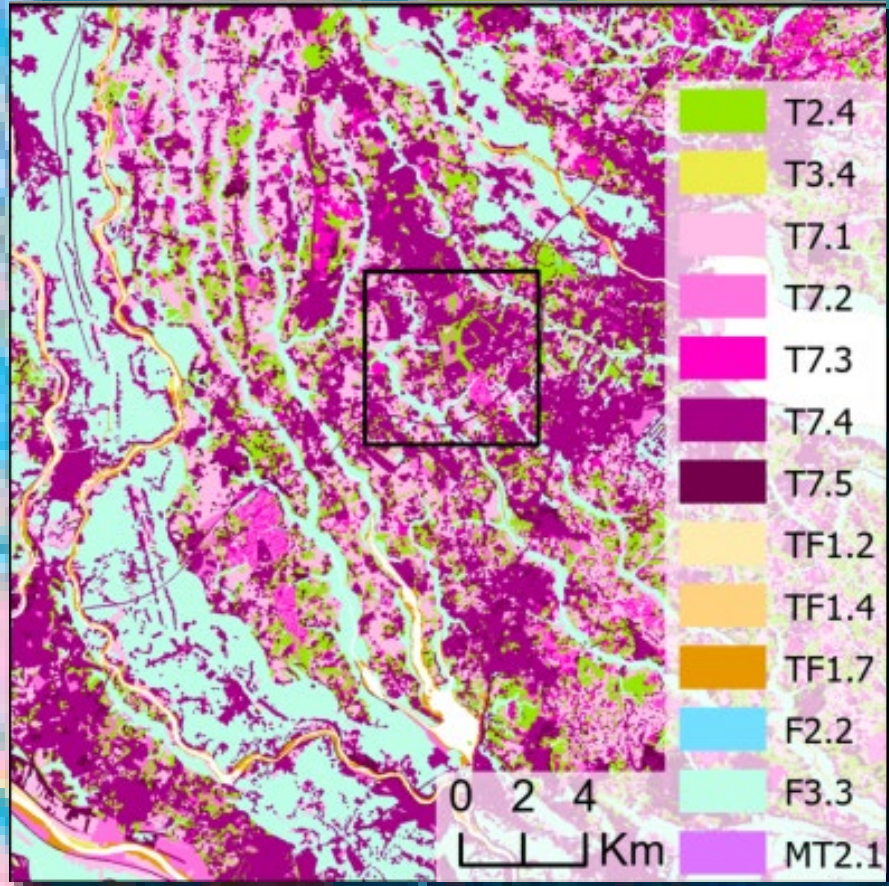


- Ibaraki area
- White color: Freshwater/Marine
 - Not covered in this dataset

Outcomes



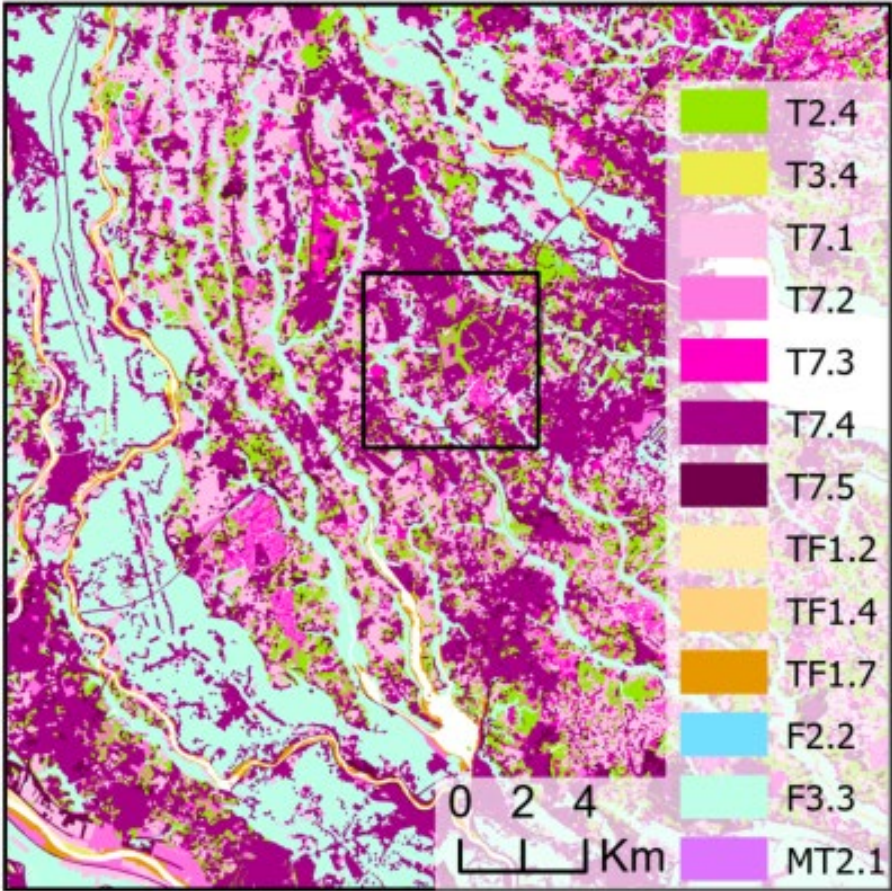
Outcomes



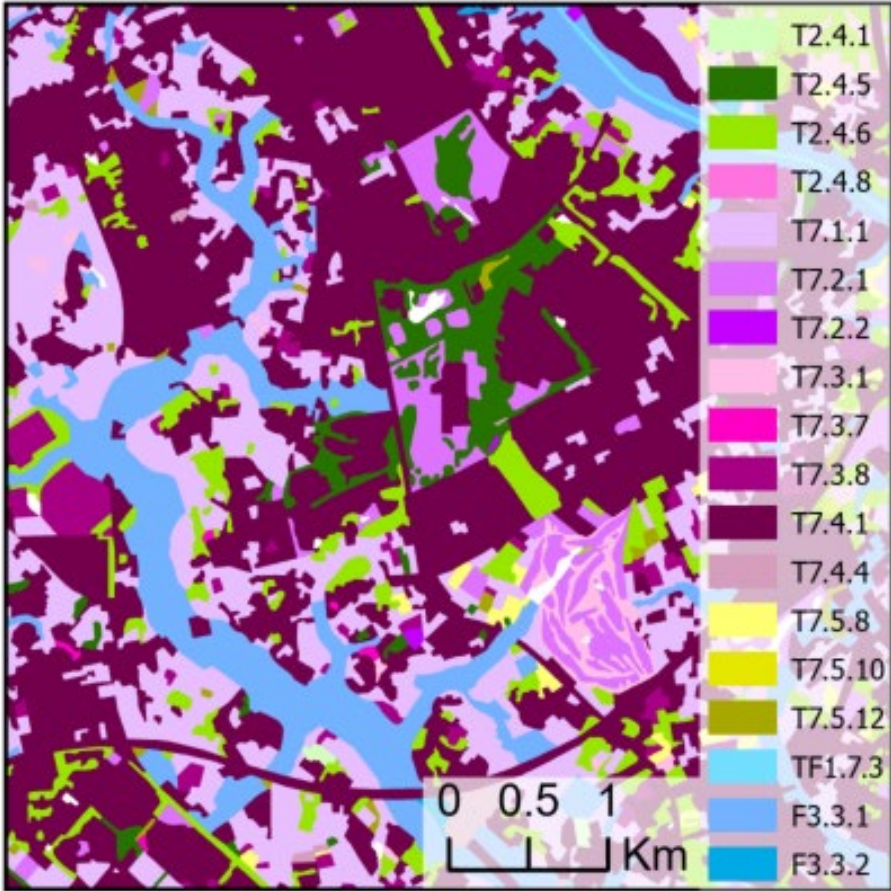
EFGs

- Tsukuba area
- Purple shades: urban areas
- Blue shades: fens, rice paddies

Outcomes



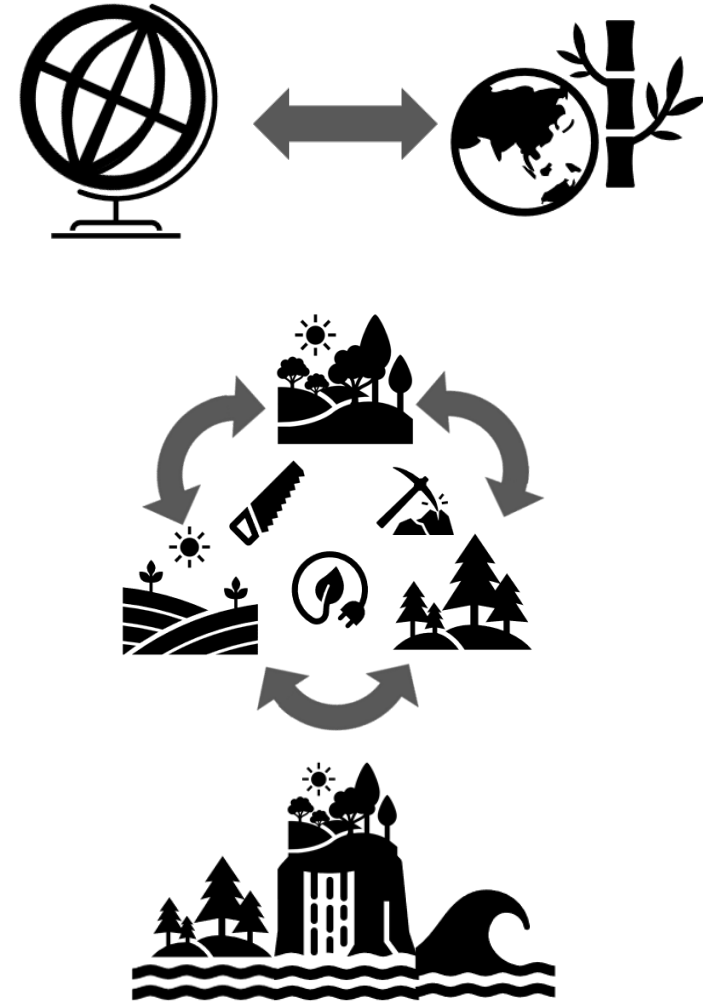
EFGs



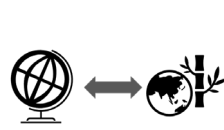
SETs

Challenges

- Unique vegetation types to Asia, not represented in current EFGs
 - e.g. bamboo and dwarf bamboo communities
- Categorizing communities along natural succession and human disturbances
- Transitional vegetation types



Challenges



- Mix of native and introduced bamboo species
- Introduction of *Phyllostachys edulis* from China around 1730 (Kitamura and Murata 1979)
- Extensive planting in first periods
 - Cultivated forests or plantations (T7.3)
- Reduced management and natural spread in past decades > frequent co-occurrence with native species
 - Natural shrublands (T6.4 or MT2.1)



Challenges



- Substitutional vegetation types
 - Communities formed by natural succession after human disturbances
 - Relatively high level of naturalness
- Intensive land-use or natural *Biomes*?
 - Case by case
 - Looking at history, description

Natural



Substitutional



Challenges



- Transitional vegetation types
 - Needed multiple expert discussion cycles
- Transitional Biomes, e.g.
 - TF1.4 (marshes) and TF1.7 (fens)
 - MFT1.2 (intertidal) and MT2.1 (coastal)



Challenges



- Transitional vegetation types
 - Needed multiple expert discussion cycles

- Climatic transitions

- T1.1



Tropical-subtropical

T2.4

Warm-temperate

- Anthropogenic transitions, e.g.

- T7.5



Degraded

T6.4

Natural

- Other countries in the region might encounter similar challenges
- Regional needs will become clearer if more countries develop their SETs
 - Currently limited
 - EFGs for South-Korea (Lee et al. 2025)



Summary

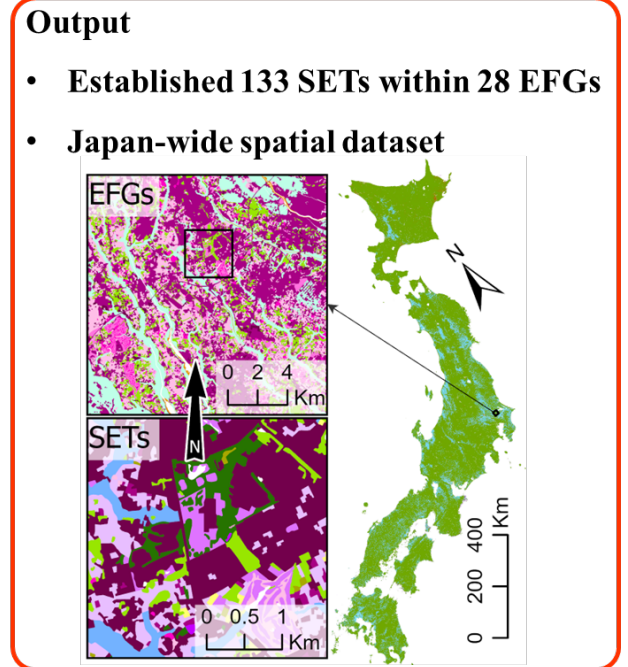
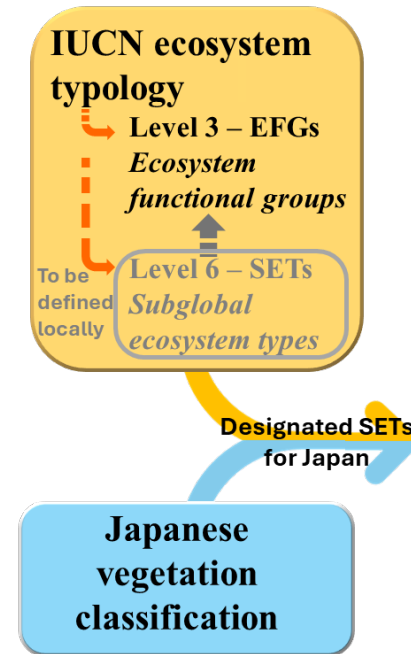
- MOE vegetation maps had many advantages
- Resulting dataset has high resolution
 - Lack of high resolution often represents a problem
(e.g., Capotorti et al. 2023)
- High resolution data supported the acknowledgement of new EFGs
 - Mostly small in size and geographically restricted
- Access to species composition data
 - Can assess habitat conditions to determine parent EFG
 - Possibility of further subunits

Summary

- Frameworks aligns with guidelines recommended by IUCN (IUCN 2025)
 - Multiple experts, uncertainty traceable
- Acknowledges
 - new EFGs in Japan
 - expanded range of others, such as T1.1
- SET with largest area: T7.3.1 – Evergreen coniferous plantations
- High number of SETs in MT2.1 and T6.4
 - Coastal and temperate alpine grasslands and shrublands
 - Geographically complex and heterogeneous landscapes
 - High ecological and biogeographical diversity

Take home message

- Connected IUCN ecosystem typology and Japanese vegetation classification
- Accompanying high resolution spatial dataset
- Future possibilities:
 - Connection with Essential Biodiversity Variables
 - KM-GBF indicator calculation
 - Nature Positive Initiative



Thank you for your attention!

Questions?

Contact: lea.vegh@nies.go.jp

