

Mountain Science Center
University of Tsukuba

Mountains cover the majority of land in Japan, and forests spread across 70% of the country's land. Much of Japan's society, culture, and traditions are rooted in the mountains and forest.

Indeed in 2016, the national holiday, "Mountain Day" was established for these reasons. On the other hand, Japan is also a marine nation surrounded by the ocean. These natural features are reflected in the widespread research and education conducted throughout Japan in Forest Science and Marine Science.

Although the mountain areas are often the subject of research and education in individual research labs at universities and research organizations, an adequate system of research and education for the comprehensive exploration of mountains does not currently exist. For this reason, at the University of Tsukuba our aim is to establish a study of Mountain Science that spans science, agriculture, and engineering.



Mountain Science Center
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What is a Mountain?

What are mountains exactly?

Somewhere significantly higher than its surroundings, somewhere with a high elevation, somewhere with a substantial slope.

There are many definitions. According to these definitions, 20 – 30% of the world's land surface is mountains, and it is said that 10 – 20% of the world's population lives in the mountains.

There is an even larger population downstream from mountains, and the people who live here are affected by both the gifts and the disasters that the mountain brings.

Hearing the word "mountain" may only evoke thoughts of lofty and steep mountains, but at the Mountain Science Center at the University of Tsukuba, we think of the mountains intimately intertwined with our lifestyles in a broad sense, and cover what people familiarly consider mountains as well as everything from the mountain's summit to its foothills, satoyama, which is the area between the foothills and arable flatland, and forests.

What is Mountain Science

Mountains are formed in the earth's foundation (geosphere), and there are a wealth of creatures living there (biosphere) that are intricately involved in people's lives (anthroposphere).

It is said that half the world's people are reliant on mountain resources. In the mountainous country of Japan, the proportion of people who depend on the mountains is even higher.

Looking across the mountain from its summit to its foothills, we can find water and other resources flowing here, and there are dramatic changes in its environment, including the temperature.

Thinking of mountains as this kind of system and exploring its connection to the geosphere, biosphere, and anthroposphere, will give us a proper understanding of mountains and how to maintain them appropriately. This will also lead to utilizing the mountains' gifts and avoiding its disasters.

We are aiming to establish Mountain Science as the academic field exploring mountains in this comprehensive manner.

In mountainous areas, a number of issues arise: a decrease in biodiversity, disasters (from heavy rain- and snowfalls, and sediment movement), forestry stagnation, aging populations and depopulation of mountain villages, decline of upland communities, and damage from animals. These issues are all complicatedly intertwined. Resolving them is also a task for Mountain Science.

In the mountain-rich country of Japan, these issues stand out acutely.

Finding the remedy for these urgent issues will lead to resolving the world's mountain issues as well.



What is the Mountain Science Center (MSC)?

The MSC was founded in April 2017, by combining Sugadaira Montane Research Center (since 1934) and the forest section of Agricultural and Forestry Research Center, consisting of Ikawa forest (since 1962), Yatsugatake forest (since 1949), and Tsukuba Experimental Forest (since 1973). Thirty-eight faculty members (as of September 2025) spanning the fields of biology, agriculture, earth science, and environmental science teach here. Many faculty members from Tsukuba Campus of the University of Tsukuba also concurrently teach here.

The purposes of MSC



Development of an academic field

Establish the academic field of Mountain Science to comprehensively explore the relationship between mountain environments and human activity from the perspective of the geosphere, biosphere, and anthroposphere and lead Japan and the world in Mountain Science research.



Creating a community

Achieve environmental conservation, disaster prevention/reduction, and economic revitalization of mountainous regions and communities and contribute to the creation of safe and secure communities through the cooperation of industry, government, and academia.



Fostering talent

In addition to a Master's Program specializing in Mountain Science promoted through the cooperation of four universities (University of Tsukuba, Shinshu University, University of Yamanashi, and Shizuoka University), foster talented well-versed in Mountain Science who can solve the numerous issues involving mountainous regions and communities.



Highlights

Aspects of MSC

1 Three solution-driven research divisions

We have established new research divisions (Division for Understanding Mountains, Managing Mountains, and Utilizing Mountains) and we are promoting Mountain Science research through the fusion of existing research fields.

2 Mountain Science Research Initiative

Establishing the Mountain Science Research Initiative to strategically build a cooperative relationship between research divisions, and within and outside the university, will lead to the smooth development of regional collaborations, industry-government-academia collaborations, and international and domestic joint research endeavors.

3 Establishing Mountain Science as a comprehensive science

Mountain Science, the study of mountainous areas and forests that account for 70% of the land in Japan, is still in the process of being formed. We are establishing Mountain Science as a comprehensive science and will lead the world with outstanding research.

4 Creating mountain jobs and contributing to regional revitalization

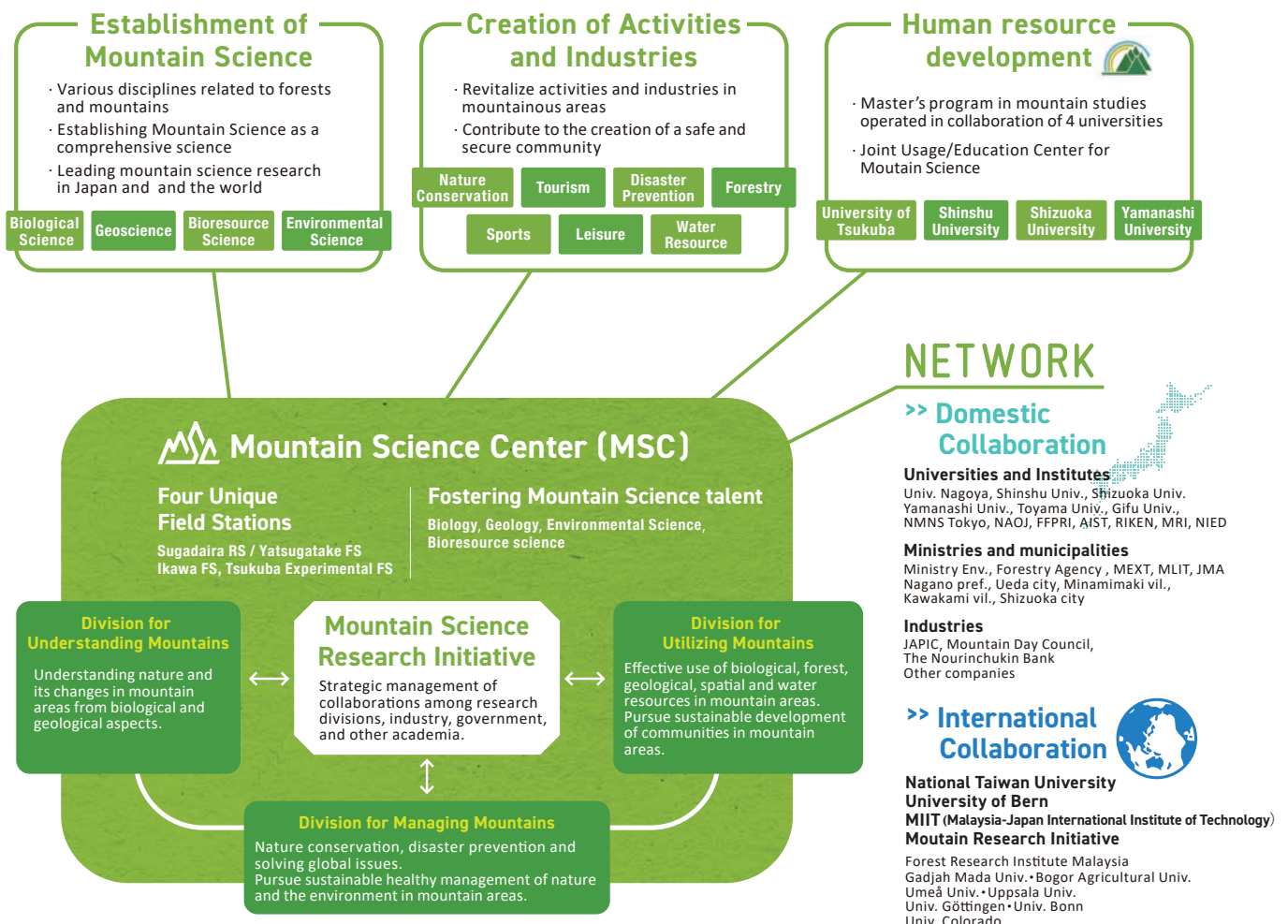
We are contributing to the creation of safe, secure, and healthy communities through the revitalization of a variety of work in mountainous areas and communities, such as forestry, tourism, disaster prevention and reduction, water resources, and sports, as well as the creation of mountain jobs.

5 Fostering new talent well-versed in Mountain Science

As the core organization of the Mountain Studies Master Degree Program, we are fostering new talent engaged in mountainous regions and communities

6 Alluring fields

We are developing research and education that make full use of the Alluring field locations of the Sugadaira Research Station, Yatsugatake Forest Station, Ikawa Forest Station, and Tsukuba Experimental Forest, which comprise the Mountain Science Center.



Various Mountain Fields

Sugadaira Research Station

Sugadaira, Nagano

Yatsugatake Forest Station

Nobeyama, Nagano

Ikawa Forest Station

Ikawa (Southern Alps), Shizuoka

Tsukuba Experimental Forest

Tsukuba, Ibaraki



We also connect to fulfilling network of cooperative universities and other world-wide universities and institutes.



University of Tsukuba, Tsukuba Campus

Tsukuba, Ibaraki

• Many teachers of biology, agriculture, geoscience, and environmental science.

• The administrative office of Mountain Science Center.



Sugadaira Research Station



Yatsugatake Forest Station



Ikawa Forest Station



Tsukuba Experimental Forest

The Establishment of Mountain Science

We will establish the field of Mountain Science to comprehensively explore mountains from the perspective of the geosphere, biosphere, and anthroposphere across the fields of basic science, agriculture, and engineering.



Basic Sciences

Ecology, Systematic Taxonomy,
Genetics, Meteorology,
Topography, Geology,
Hydrology, Geography

Engineering Sciences

River Engineering,
Environmental Engineering,
Forest Engineering,
Civil Engineering,
Social Technology,
Risk Engineering

Mountain Science

Agricultural Sciences

Natural Aspects

Silviculture, Forest Soil Science,
Mountain Afforestation, Erosion Control Engineering,
Forest Protection Science, Forestry

Social Aspects

Forest Policy, Forestry Business Administration,
Environmental Economics, Forest Aesthetics, Mountain Village Sociology

INTO THE FIELD



COE for Education of Mountain and Natural History Science

(FY 2018-2027, MEXT Joint Usage Education Centers)

The diverse subject of Mountain Science, which covers biology, agriculture, earth science, and environmental science is set on the fields of various mountain areas and is open to university and graduate students nationwide. It is divided into the fields of mountains, forests, grasslands, and satoyama (foothills). We hope you'll join in engaging directly with living organisms, and discovering the nature of the mountains, and the efforts of people. Mountain Science education is offered in the form of open exercises, commissioned exercises, and research instruction. This education takes place at field stations. Please see the overview of field stations below for details regarding the location of each field station and its facilities.

Location of each field station and its facilities

 <http://www.msc.tsukuba.ac.jp/en/en-kyoiku/>



What are the Joint Usage Education Centers?

It is a system that was established in September 2009 by the Minister of Education, Culture, Sports, Science and Technology to support initiatives at universities for developing diverse and advanced education at national, public, and private universities by promoting the shared use of the human and physical resources each university possesses to provide high quality education that meets the needs of students and our diversifying society.

 http://www.mext.go.jp/a_menu/koutou/daigakukan/1292089.htm



Master Degree Program of Mountain Studies



Master Degree Program of Mountain Studies



The Master Degree Program of Mountain Studies is a new postgraduate course created and offered through the collaboration of four universities: the University of Tsukuba, Shinshu University, Shizuoka University and the University of Yamanashi. The aim of this program is to cultivate people capable of addressing the specific needs of mountainous areas, including environmental issues and sustainable ecosystem management. The degree of "Master of Science in Mountain Studies" will be conferred upon completion of this program.

 <https://msc.tsukuba.ac.jp/en/en-ms-degree-programs/>



Introduction to Field Stations

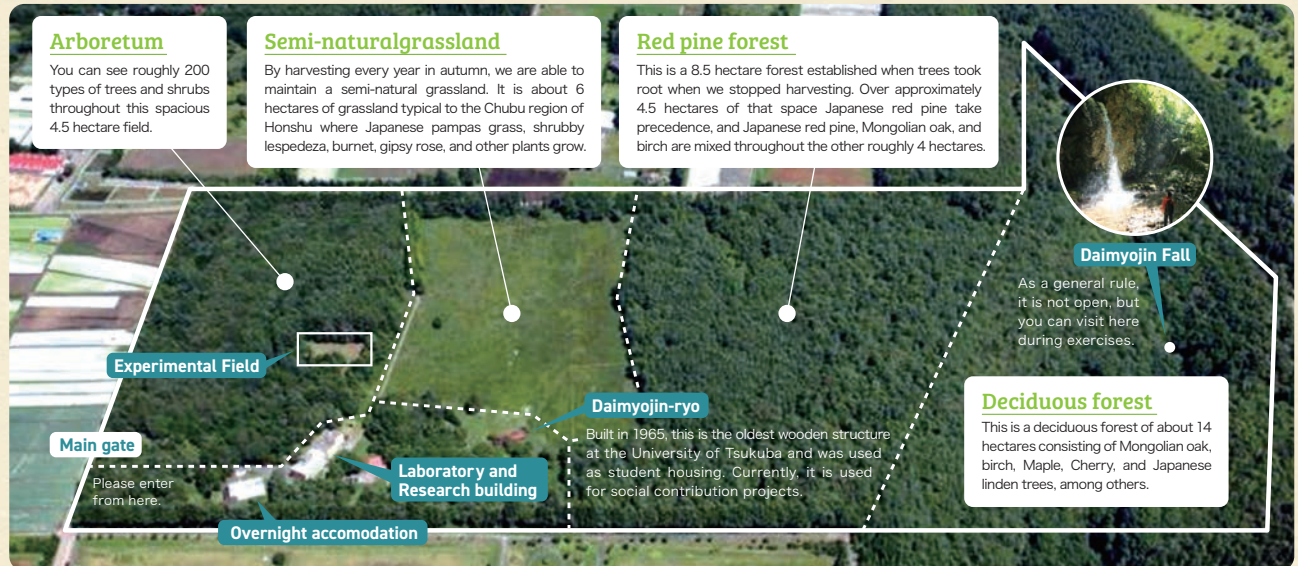
■ Sugadaira Research Station
■ Ikawa Forest Station

■ Yatsugatake Forest Station
■ Tsukuba Experimental Forest

Sugadaira

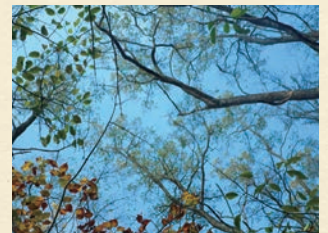
Research Station

We opened these on and off campus facilities in the Chubu region of Honshu at an elevation of 1300 m promoting research, education, and contributions to the community across the fields of biological science, earth science, and agricultural, and other fields. The arboretum is open to the public on weekdays from 9 a.m. to 4 p.m. Please inquire at any time regarding research and educational uses or nature observation open to the general public.



Plant Succession Example

Before the facilities here were established, the space was an expansive grassland, but after planned management, it is now somewhere good examples of vegetation in a variety of successive stages can be observed up close. In the foreground there is a grassland maintained with annual harvesting. Beyond that lies a red pine forest established through natural renewal when harvesting was stopped around 1970. In the same way, a mixed forest of red pine and deciduous broad-leaved trees began here around 1945. Even further beyond that is a coppice regenerated deciduous broad-leaved tree forest born from the tree stumps left after a firewood forest was felled. The trees here are more than 90 years old. This broad range of transition stages supports a large amount of biodiversity. The further back you progress, the longer the amount of time has passed for each transition stage as if you are slipping back in time.

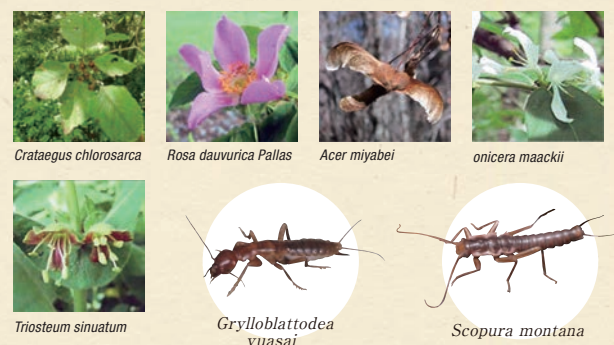


Mountain Biodiversity Studies

Since its establishment in 1934, we have been promoting mountain biodiversity studies, which includes natural history, classification, generation, ecology, genealogy, and reciprocal actions based on the three main pillars of plants, which create the framework of the ecosystem, insects and arthropods, which have the largest known diversity, and fungi and microorganisms, which have the largest unknown diversity. There are approximately 400 kinds of herbaceous plants and trees, 29 of the 32 orders of insects living on earth, and 86 of the 136 orders of fungi that can be observed and collected on the premises resulting from amassed know-how over many long years.

Glacial Relict

Species that were once widespread during the ice age had their growing seasons shortened as the climate warmed, and those that survived distributed throughout the limited remaining habitats are called glacial relicts. Many such creatures can be seen in Japan's steep alpine belt. Meanwhile, Sugadaira has a cold climate similar to Wakkanai (the northernmost city in Japan) with gentle topography preferred by glacial relicts that include plants growing here such as the *Rosa davurica*, Miyabe maple, Shibata maple, *Crataegus chlorosarca*, *Triosteum sinuatum* Maxim., *Lonicera vidalii*, *Lonicera maackii*, and *Lonicera morrowii*, and the habitation of animals such as *Grylloblattodea*, and *Scopura longa*.



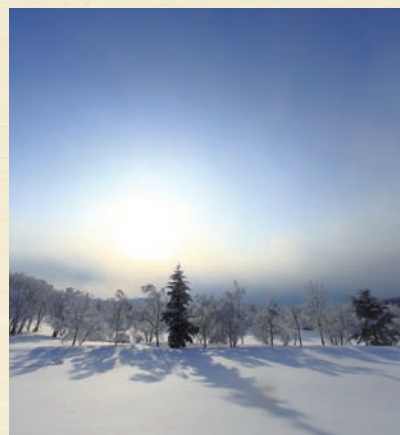
Precious Semi-Natural Grassland

This area is a semi-natural grassland of 6 hectares maintained with harvesting via human interference. The more than 60 cm deep black Andosol here is estimated to be grassland environment deposits that have continued for approximately 5500 years starting in the Jomon period. Grasslands have been cultivated and maintained with natural disturbances and human-led fires and grazing and are thought to account for 10% or more of Japan's land from hundreds of thousands of years ago to beyond the ice age. However, the grasslands have declined rapidly in recent years due to the suppression of natural disturbances by humans and abandonment of artificial grasslands and now account for a mere 1% of land in Japan, which means that the numerous organisms that have inhabited the grasslands since ancient times are now in danger of extinction. It is extremely rare for an academic institution to be in possession of a grassland dominated by diverse native plants and utilize in research and education that includes operational experiments.

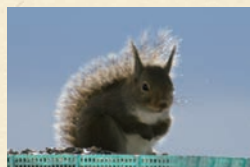


Low Temperature Environment in Winter

The cold of winter here is harsh with temperatures below freezing even during the day in the middle of winter for days on end. The average temperature in February is minus 5.5 degrees Celsius. December through April produces a roughly one-meter accumulation of snow, but as it is located in the Japan Sea weather sphere, there are many sunny days and you can observe winter birds and find footprints in the snow left behind by Japanese serow, squirrels, and other wild animals in the winter ecosystem that can be witnessed here. Exercises and research on snowy and ice climates that make use of the high-elevation and low-temperature environment are also conducted here.



Field Course in Biology during snow season



Japanese squirrel



Field course in Meteorology and Glaciology

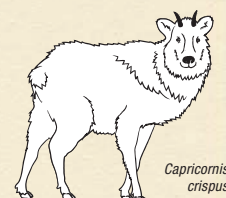
Low air temperature environment in winter

Ikawa

Forest Station



The Ikawa Forest Station occupies the upper middle basin of Higashigouchi stream, a tributary of The Ooi River. As the slope is steep and the ground is brittle, collapsed areas can be found throughout. Across the vast secondary forest of more than 1300 hectares, you can observe the vegetation changing in accordance with the altitude. The Ikawa Forest Station Administrative Office, which is the operation base for the forest station, is located 25 kilometers down the Ikawa River from the forest station. It is equipped with accommodations for a maximum of 28 people, a kitchen, bath, toilet, and internet (Wi-Fi).



Two of Major Fault Lines and Sediment Movement

The Ooi River upper river basin is sandwiched between two of Japan's major fault lines, the Median Tectonic Line and the Itoigawa-Shizuoka Tectonic Line making the area subject to intense crustal deformation and the foundation in the area here collapses easily. Sandstone and shale formed on the ocean floor end of the Cretaceous period (approx. 60 million year ago) rose at an accelerated rate over the last several million years and at the same time severely corroded. As a result the Ikawa Forest Station boasts one of the country's highest sediment yields and the sediment movement here is more active than any other university-owned field in Japan. A debris avalanche occurs virtually every year, and research is conducted on erosion control and topography that make use of this phenomenon. The movement of the forest's soil and water is surveyed in exercises for acquiring knowledge and skills regarding the forest's function and usage. We measure the effects climate change, changes in forest vegetation, and deforestation have on micro weather systems and soil movement, as well as carbon and nitrogen circulation. Topography and erosion control engineering research is also often conducted here.



Earth flow sediment

Bears Stripping

In the Ikawa Forest Station, which is a treasure chest of wildlife, damage from bears stripping the bark from trees leaves them worthless for construction use and is seriously hurting the forestry industry.



Yatsugatake Forest Station



Yatsugatake Forest Station

There are three fields within the organization of the Yatsugatake Forest Station. Megumi Forest (literally meaning forest of blessings, administrative office on site, 14 hectares) is in the southern portion of the Nobeyama highland. Two kilometers to the northwest of the Megumi Forest lies the Yatsugatake Forest (80 hectares, hereinafter this is what the term "Yatsugatake Forest" refers to) and the Kawakami Forest (189 hectares) sits four kilometers to the southeast. These places are inhabited by rare organisms such as Japanese primrose, Japanese dormice, and the Luehdorfia puziloi butterfly, and education and research on forests, parasitic fungi, soil, and hydrology are conducted here.



Primula sieboldii

Yatsugatake Forest

Located on the gentle slope stretching from the foothills on the east side of Yatsugatake's main peak, Akatake, at an elevation of 1400 – 1450 meters. It is a natural forest occupied predominantly by Mongolian oak and birch trees (90%) mixed with lower shrubs such as hazel. The forest floor is mainly covered in *Sasa nipponica*. It is our policy to preserve these broadleaf forests. The soil is composed of Mesozoic sedimentary and Neogene period rocks and covered in Yatsugatake eruption residue and a layer of sandy foothill gravel. Black forest soil is distributed across the surface, which has poor drainage and breathability. As there are no large mountain streams among such soil and forest, recessed areas and small grooves are easily wet and transitional moors with mostly *Moliniopsis japonica* are scattered throughout. The surrounding area is mostly agricultural land pioneered after the war.

Megumi Forest

At an elevation of 1350 meters, there is a nature trail maintained among the surrounding facilities, which include an administration building and accommodation building, and it is open to the public for activities such as wild vegetable harvesting and mushroom picking. While growing the young forest of broad-leaved deciduous trees used by people, we are aiming to be an experiential outdoor facility where people can enjoy the gifts of the local grasses and flowers, forests, and trees.



Megumi Forest



Kawakami Forest

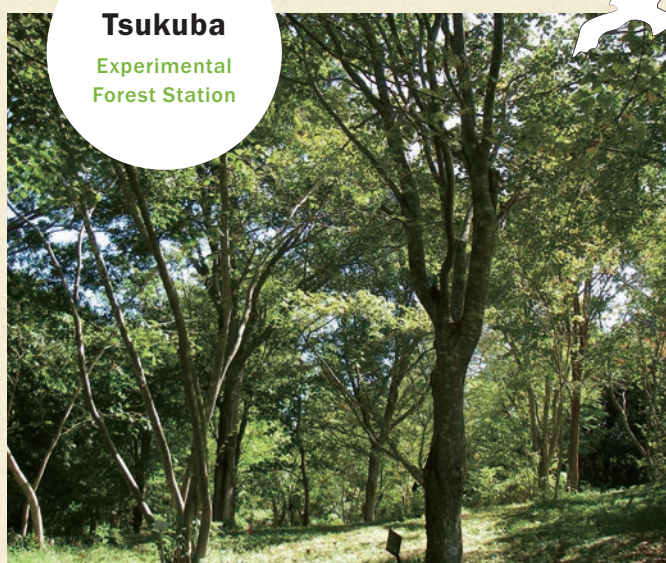
The Kawakami Forest is located in the elevation range of 1360 – 1790 meters on the westernmost end of the Kanto mountain range. It is an artificial forest composed mainly of larch (70%) and the remaining portion is a secondary forest composed of Mongolian oaks and birch trees. The forest station is on the border of Nagano and Yamanashi Prefectures and at the same time forms a watershed for both the Pacific Ocean and Japan Sea sides. Within the forest there are five incised valleys that feed into Misawa a branch of the Yadegawa River, which is a tributary of the upper Chikuma River. As such migrating sediment soil is distributed throughout the mountainside. The geology is made up of slate and other sedimentary rocks from the Mesozoic era, but on top of that there is a deposit layer of andesite from Mt. Iimori's volcano and the surface is covered in a base layer of weathered andesite and volcanic ash and covered in brown and black forest soil. The soil structure is mature making it better suited to an artificial forest than the Yatsugatake Forest Station. Small area dispersion clear-cutting (regeneration cutting) to induce a mosaic forest is implemented under a forest management plan.



Glirulus japonicus

Tsukuba

Experimental
Forest Station



Botanical garden

The topography of the experimental forest station is made up of a layer of Kanto loam. When building the University of Tsukuba, rice paddies and wetlands were filled with soil dressing, and the soil features have now become complex. At Hyotaro Pond adjacent to the botanical garden, we conduct water quality surveys and catch and survey aquatic organisms with the aim of improving the environment. In the botanical garden, approximately 300 species of mostly native Japanese trees have accumulated. The orchard is mainly managed to provide replenishing plants to the botanical garden. The bamboo forest is used as a resting place for raw wood injected with mushroom fungi in exercises. The amounts of sunlight and water are adjusted to control the amount that develop. Over 0.21 hectares on the northern side, konara oak, sawtooth oak, and other trees are cultivated from seedlings as raw wood for mushroom growing and used in exercises and research. There is a botanical garden management building that acts as the base of operations for these activities.

Botanical garden, insects and fungi

The botanical garden is used as a place for plant-related education and research and relaxing on campus, but its value is not limited to plants alone. As a variety of trees are planted, a variety of insects and fungi come to inhabit them, so it is also used as a site for researching insects and fungi. A new variety of wasp has also been discovered in the botanical garden.



Insect trap



Shiitake cultivation

The Hyotaro Pond and aquatic organisms

At the Hyotaro Pond, surveys of the water quality and aquatic organisms continue to be regularly conducted. As a result, we were able to learn that a large number of non-native species, including bullfrogs, bluegills, and crayfish inhabit the pond. Although, this is certainly not a desirable ecosystem, we have used the situation to our advantage in exercises experimenting with the expulsion of non-native species and as a place to test effective non-native species expulsion methods.



the Hyotaro Pond

Field station comparative data



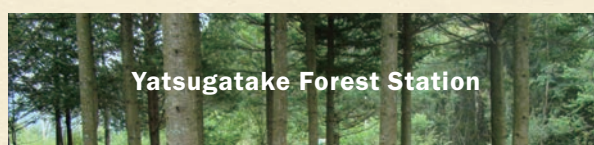
Sugadaira Research Station

latitude	36.52473°N
longitude	138.34855°E
elevation	1315 m
annual average temperature ※1	8.0 °C
monthly average temperature ※1	-4.8~21.0 °C
Annual precipitation ※1	1416 mm
Maximum snow depth※	101.0 cm
Site area	35 ha (6ha of grassland, 4ha of red pine forest, 4.5 ha of mixed forest, 14 ha of deciduous broad-leaf forest, 4.5 ha of Arboretum)
Facilities and equipments	Overnight accommodation (44 people, Meals provided) Laboratory (40 people) Lecture room (30 people) Canopy tower (21m high) DNA sequencer Electron microscope (transmission type/scanning type) Microscope (stereoscopic microscope (40), optical microscope (40)) Various incubators Various Refrigerators/freezers minibus (26 people) Various vehicles
Staff members ※2	Faculty member (3), Researcher (3), Technical staff (4), Clerical staff (2), Part-time staff (6)



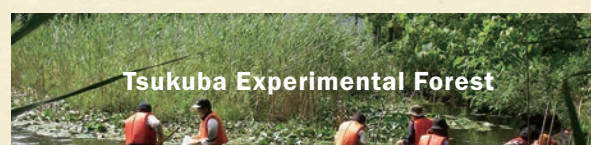
Ikawa Forest Station

latitude	35.21752°N (office premises)
longitude	138.22300°E (office premises)
elevation	755 m (office premises)
annual average temperature ※1	13.1 °C
monthly average temperature ※1	2.3~24.2°C
Annual precipitation ※1	3911 mm
Site area	1760 ha of experimental forest, 0.47 ha of office premises
Facilities and equipments	Overnight accommodation (24 people) and Administration Building Dining room and Lecture room Microscope (stereoscopic microscope, optical microscope 7 units) Incubator Muffle furnace Reflection stereoscope Power shovel Various vehicles
Staff members ※2	Faculty member (1), Technical staff (2), Part-time staff (1)



Yatsugatake Forest Station

latitude	35.94413°N
longitude	138.46972°E
elevation	1350 m (Megumi Forest)
annual average temperature ※1	9.1 °C
monthly average temperature ※1	-2.4~21.3°C
Annual precipitation ※1	1670 mm
Site area	80 ha of Yatsugatake Forest, 14 ha of Megumi Forest and office premises, 188 ha of Kawakami Forest
Facilities and equipments	Overnight accommodation (38 people) Seminar room (30 people) Laboratory (30 seats) Microscope (stereoscopic microscope, optical microscope 24 units) Incubator Various vehicles
Staff members ※2	Faculty member (1), Technical staff (2), Part-time staff (1)



Tsukuba Experimental Forest

latitude	36.11641°N
longitude	140.10133°E
elevation	28 m
annual average temperature ※1	16.2 °C
monthly average temperature ※1	4.6~28.2 °C
Annual precipitation ※1	1297 mm
Maximum snow depth※	0 cm
Site area	3.4 ha of field, 2.2 ha of Botanical garden
Facilities and equipments	Training room (36 people) Laboratory Microscope (stereoscopic microscope, optical microscope) Incubator (2) Compact excavator Various vehicles
Staff members ※2	Faculty member (1), Technical staff (1), Part-time staff (2)

※1 Based on the Japan Meteorological Agency's "Past Meteorological Data Download" (<https://www.data.jma.go.jp/risk/obsdl/index.php>), using 2024 data from the nearest JMA observation station to each field facility.

※2 As of 2025.

【Open Facility and sharing facilities】

<https://msc.tsukuba.ac.jp/field-facility/fld-01/fld-01-outline-equip/>



【Open Data】

<https://msc.tsukuba.ac.jp/field-facility/data/>





Mountain Science Center
University of Tsukuba

Sugadaira Research Station

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✉ suga-jimu@msc.tsukuba.ac.jp



From Ueda Railway Station (JR Hokuriku Shinkansen, Shinano Railway, Bessyo Railway), take Ueda Bus for 1 hr and get off at "Sugadaira-kogen Davos". Walk for 10 min.

Ikawa Forest Station

1621-2 Ikawa, Aoi, Shizuoka, Shizuoka 428-0504, Japan
TEL +81-54-260-2419 / FAX +81-54-260-2626
✉ ikawa@msc.tsukuba.ac.jp

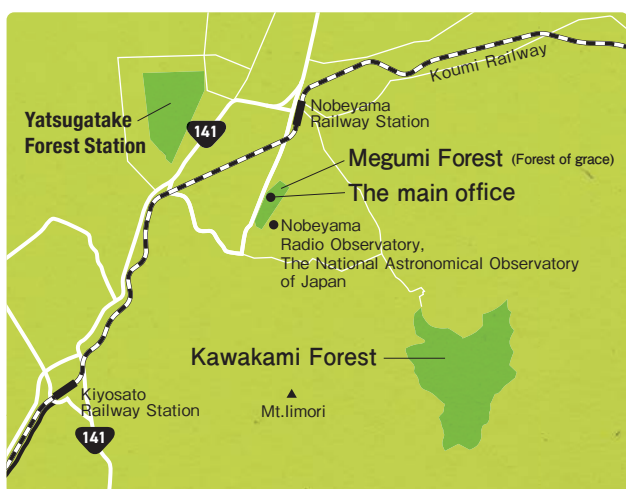


Walk for 20min from Ikawa Railway Station (Ooigawa Railway).
Or, drive for 90 or 110 min from Shizuoka smart-IC or Shimada-Kanaya IC, respectively.

Yatsugatake Forest Station

(Yatsugatake Forest
Megumi Forest
Kawakami Forest)

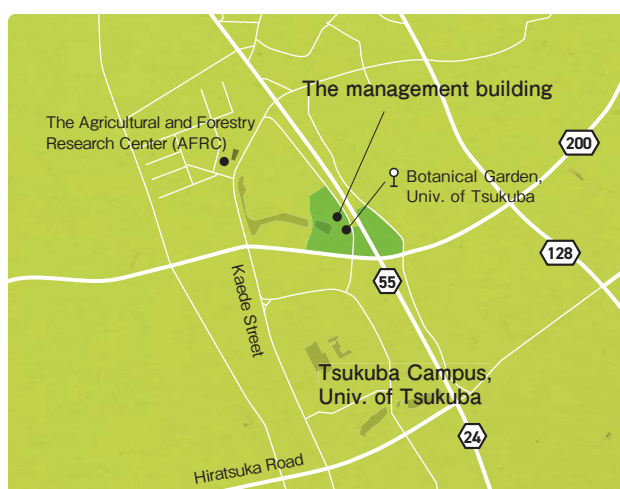
462-4 Nobeyama, Minamimaki, Minamisaku, Nagano 384-1305, Japan
TEL +81-267-98-2412 / FAX +81-267-98-2397
✉ yatsuen@msc.tsukuba.ac.jp



Walk for 20 min from Nobeyama Railway Station (JR Koumi Railway).

Tsukuba Experimental Forest

1-1-1 Tennodai, Tsukuba, Ibaraki 305-8577, Japan
TEL +81-29-853-2555, +81-29-853-2544 / FAX +81-29-853-6612
✉ forest-1@msc.tsukuba.ac.jp



From Tsukuba Railway Station (Tsukuba Express), take Kantetsu Bus and get off at "University Botanical Garden". Walk for 3 min.

Mountain Science Center

Laboratory for Environmental Disaster Prevention Research 101, University of Tsukuba
1-1-1 Tennodai, Tsukuba, Ibaraki 305-8577, Japan

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🖥️ <https://msc.tsukuba.ac.jp/en/>

