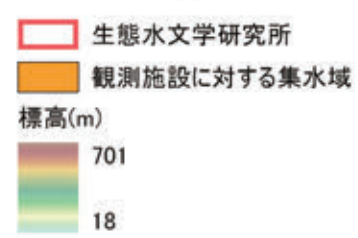




Ecohydrology Research Institute, The University of Tokyo Forests 2023

Graduate School of Agricultural and Life Sciences, The University of Tokyo





五位塚事務所から赤津宿泊施設まで車で約15分
 五位塚事務所から犬山作業所まで車で約60分



Ecohydrology Research Institute

1. History and overview

Ecohydrology is an interdisciplinary field that studies the interactions between water and ecosystems, including the balance, temporal changes, processes, and mechanisms of water, nutrients, carbon, soil, sediment, and energy flow into, within, and out of ecosystems. In 2011, The University Forest in Aichi was renamed as the Ecohydrology Research Institute (ERI), which drives research on ecohydrology within the Tokyo University Forests.

The research forest and test site of the ERI, affiliated with the Faculty of Agriculture, Tokyo Imperial University, was established in 1922 on a degraded hill as an experimental and research training site for forest hydrology and erosion control engineering for the University of Tokyo. From the outset, various types of erosion control construction were implemented, and through land exchanges with Seto city and Inuyama city in Aichi prefecture, almost all of the 1,294 ha of hills are now covered with vegetation.

2022 marked the 100th anniversary since the ERI was founded. Hydrological observations continue to this day, with ERI serving as a base for ecohydrological research.



Ecohydrology Research Institute

東京大学生態水文学研究所

A video introducing the Ecohydrology Research Institute can be viewed with the QR code on the right.



2. Location and environmental characteristics

ERI has an administration office with a research laboratory located in Goizuka-cho, Seto city, 20 km northeast of Nagoya, and three



Photograph 1 Akazu Research Forest

research forests. The Akazu Research Forest (AKRF, 745 ha) is situated in the eastern part of Seto city, spreading over the Owari district from the foothills of Mt. Mikuni along the border of Gifu prefecture in the north to Mt. Sanage in the south, while the eastern edge borders with the Mikawa area. The Inuyama Research Forest (IRF, 442 ha) is located in the eastern part of Inuyama city, approximately 20 km north of Nagoya. The Ananomiya Research Forest (ANRF, 77 ha) is located to the north of Seto city.

AKRF and almost all of ANRF lie on deeply weathered Mesozoic granite. The average inclination is 25° in AKRF (altitude 244–692 m) and 19° in ANRF (altitude 130–272 m). The majority of the Inuyama Research Forest (altitude 70–218 m) is situated on Neogene

strata, and Palaeozoic sandstone is found in some of the upper areas.

Based on the records collected at the Shirasaka Meteorological Observatory in the AKRF over the past 45 years (1976–2020), the average monthly temperature in January, the coldest month, is 1.6 °C and in August, the hottest month, is 24.7 °C. The annual average temperature is 13.0 °C. Annual average precipitation is approximately 1840 mm, indicating that the climate is warm and humid.

3. Forest characteristics

When the research forests were first established, the ridgelines in the AKRF were almost bare land, while both the IRF and ANRF were almost completely bare with only a few trees bordering mountain streams. Since then, cypress

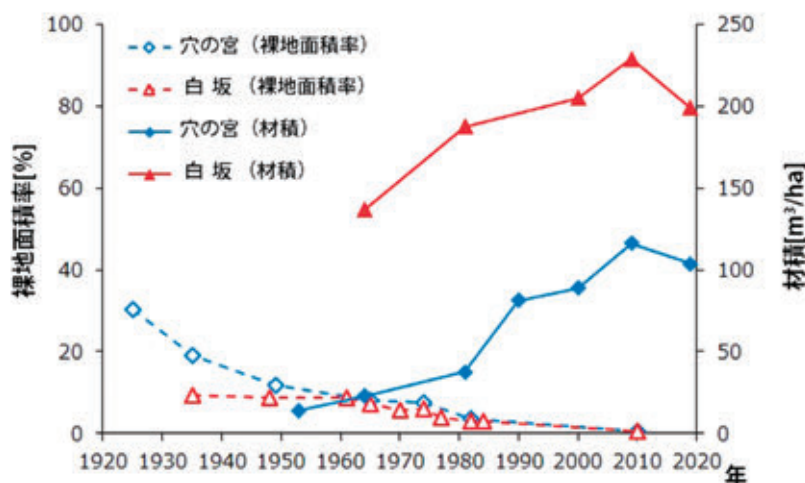


Figure 1 Reduction in the area of bare land (dotted line) due to reforestation and transition from denuded hills and increase in accumulation (solid line).

Red = Shirasaka watershed, blue = Ananomiya watershed

Ecohydrology Research Institute

and cedar have been planted as part of erosion control and forestry. The forest is broadly divided into naturally regenerated (76%) and planted forest (24%). In the naturally regenerated forest, jolcham oak, Japanese red pine (*Pinus densiflora*), cypress, and Sielbold Maple (*Acer sieboldianum*) are found in the upper layer, while evergreen broad-leaved trees such as Japanese camellia (*Camellia japonica*) East Asian eurya (*Eurya japonica*), and Japanese cleyera are found in the middle and lower layers.

4. Facilities

The AKRF lodging facilities have lodging and lecture rooms for student practical training, which can also be used by researchers at the AKRF. Long-term dormitories are also available on the grounds of the Goizuka office for researchers.

5. Education

The ERI is a base for educational programs of both natural and social

sciences dealing with the interactions between forests, water, and humans, for both undergraduate and graduate students at the University of Tokyo. This institute promotes and supports lectures and practical training, and research guidance for bachelor, master, and PhD theses. As the only research organization at the University of Tokyo that handles research on the interactions between forests, waters, and humans, this institute also contributes to education for undergraduate students of the Junior Division, College of Arts and Sciences, through graduate schools, faculties, and research institutes outside the Graduate School of Agricultural and Life Sciences, Integrated Courses, and University-Wide Experience Seminars.

Education is also offered for both undergraduate and graduate students at other universities.

6. Research

ERI promotes research on the effect of forest processes and material circulation

(such as water, nutrients, and carbon) at the watershed scale. This research is aimed at comprehensively evaluating forest ecosystem services and develop technology to enhance ecosystem functions by characterizing the state of water, soil, and sediment; the relationship between society the forest and water; and the position and trade-offs with other ecosystem services. Research often considers the intersections between natural sciences, humanities, and social sciences to assess the history, current status, and future of use of forest ecosystem services by society.

To this end, various facilities and survey fields have been established at the ERI.

● Hydrological, meteorological, and water quality observations at the AKRF and ANRF

Runoff monitoring using measuring weirs (facilities for measuring the volume of water in a river) have been ongoing for more than 90 years in the



Photograph 2 Measuring practice as part of student experiments



Photograph 3 Students removing sand from the weir

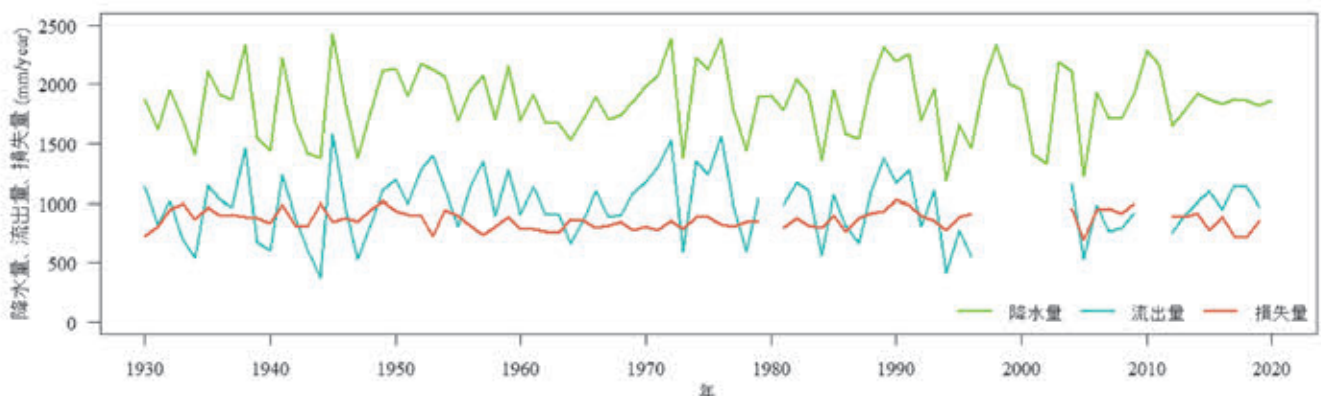


Figure 2 Long-term fluctuations in the annual precipitation, runoff, and water loss in the Shirasaka Experimental watershed. Green = precipitation, blue = runoff, red = water loss. The volume of water loss is calculated as the precipitation minus the runoff, roughly indicating the amount of evapotranspiration from the forest.

AKRF Shirasaka and Higashiyama Experimental Watersheds as well as in the ANRF, resulting in the accumulation of long-term runoff data. Combining these data with meteorological data, such as rainfall and temperature, observed over the same period can be used to clarify the effect of climate change and changes in forest vegetation on the forest water balance. Stream water quality surveys are also being conducted in the AKRF Shirasaka watershed to clarify the impact of forest disturbances, such as disease and insect damage, on water quality.

● Forest ecosystem surveys in AKRF

The Shirasaka Small Watershed Fixed Test Site (2.67 ha) has been established in the AKRF, and a 1 ha quadrat within this site has been registered as a core site for forest and grassland surveys as part of the Ministry of the Environment Monitoring Sites 1000. Various surveys on the forest ecosystem are conducted within this quadrat, including tree censuses (identification of tree species and measurement of tree trunk diameter) and litter/seed traps surveys, as well as research to elucidate long-term changes in the forests.

● Large-scale AKRF field experiment sites in the AKRF and IRF

Runoff and vegetation research are being conducted simultaneously at two adjacent small watersheds in the AKRF. Future research plans include clarifying the impact of economic operations, such as tree felling, in one of the small watersheds. In the IRF, research is being conducted to determine how runoff changes during rainfall and with low river levels by thinning an unmanaged Japanese cypress plantation in a small watershed. Although the scale of the IRF study is smaller than that at the AKRF study, the IRF has a slope-scale lysimeter field test facility, which investigates the flow of water on the surface of the soil, flow of water in the soil, and amount of evapotranspiration from plants and the soil.

7. Extension

The ERI has concluded local exchange agreements with Seto City and Inuyama City, and regularly holds events for local residents. Public events are also regularly held by the ERI support group “Shidekobushi no Kai” and Inuyama Research Forest User Council. The institute also

promotes the communication of knowledge to the community of research commissioned by Toyota city, a neighboring municipality, which assesses the impact of forest management processes, such as thinning, on the watershed protection function, and environmental impact assessments of rivers in Seto city.



Photograph 4 Shirasaka flow-measuring weir

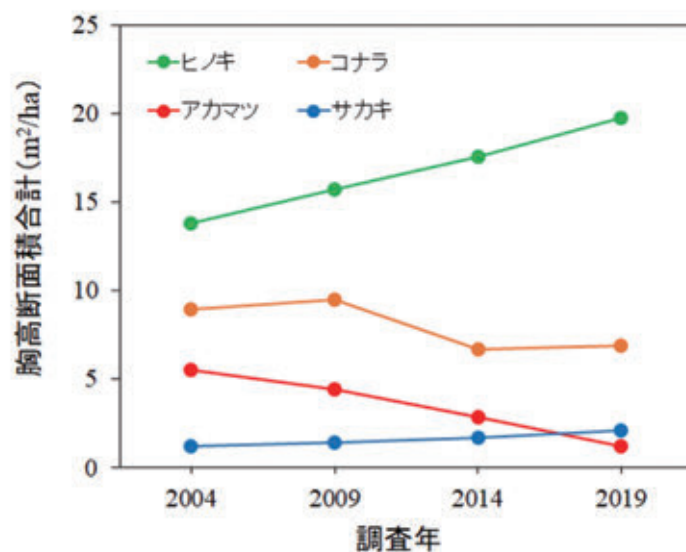


Figure 3 Changes over time in the total basal area at breast height (m² ha⁻¹) for four main tree species in the Shirasaka Small Watershed Fixed Test Site 1 ha quadrat. green = Cypress, orange = jolcham oak, red = Japanese red pine, blue = Japanese cleyera. A large number of jolcham oak died due to oak wilt disease between 2009 and 2014.

8. Others

1) Forestry Heritage: Gorge Construction Buildings Designed by Dr. Kitaro Moroto, the pioneer of modern erosion control in Japan

The ERI was originally established to restore bare mountain slopes, which had become common throughout Japan, especially in western Japan, during the Meiji and early Showa period. The devastation of forests and frequent flooding at that time was regarded as a national problem, which was tackled by Dr. Kitaro Moroto (Professor, Tokyo Imperial University), the founder of modern erosion control engineering. Dr. Moroto applied the knowledge he acquired while studying in Austria and France through theoretical techniques to the conditions in Japan, and contributed greatly to the dissemination of these techniques and development of human resources in this field. The University Forest in Aichi was Dr. Moroto's most influential experimental field.

The erosion control infrastructure implemented in the Oguro district in the 1930s is a model for small-scale mountain stream conservation throughout Japan. Therefore, site visits to the Oguro district have been incorporated into the Degraded Land Technology Seminars run by the Ministry of Agriculture and Commerce and in practical training courses at universities. The present day Inuyama forest was regenerated by Dr. Moroto's

erosion control practices and subsequent efforts of the University Forest in Aichi.

The Gorge Construction Buildings Designed by Dr. Kitaro Moroto, the Founder of Modern Sabo in Japan, which contributed to facilitating Dr. Moroto's erosion control engineering system and training of many engineers, was registered as Forestry Heritage sites by the Japanese Forest Society in 2017.

2) Ecohydrology Research Institute archives

Approximately 4,000 documents



Photograph 5 Forest compartment 10 in the Inuyama Research Forest in 1951



Photograph 6 Forest compartment 10 in the Inuyama Research Forest in 2020

and photographs collected by the ERI since its inception in 1922 are available in the archives on the ERI website, including photographic records of erosion control and greening construction, water volume and meteorological measurements, and student practical training; there are also many contemporary photographs taken of the area near the eastern part of the Owari hills, which has changed dramatically since 1922.



Photograph 7 Earth-fill weir with concrete drainage channel (photograph taken in 1929)



Photograph 8 Ecohydrology Research Institute archives website



Figure 4 Location of the Gorge Construction Buildings

Certification targets: Earth-fill weir with concrete drainage channel, wire gabion weir × 17, earth-fill weir, bridge × 2 (including ruins)



Photograph 9 Location of Kitamura erosion control works (established in the early Showa period, starting in 1929)

User guide

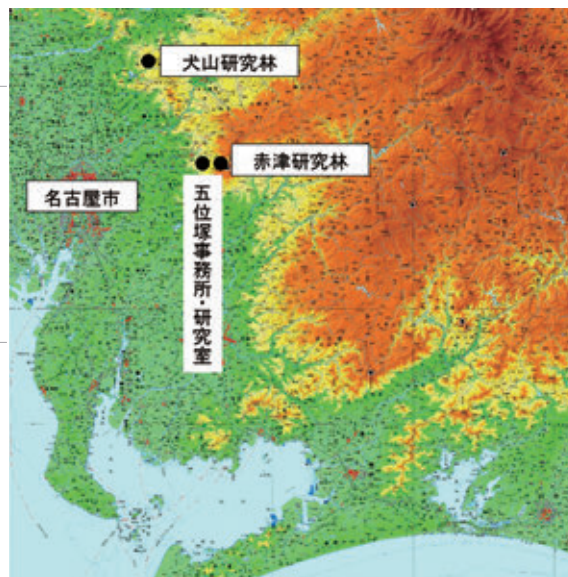
To use the ERI, it is necessary to submit a Use Application Form, list of the ERI users, and obtain permission in advance. Please note that we may not approve your request, depending on the intended use. If you wish to stay overnight, please contact the ERI regarding the availability of accommodation before submitting an application. The application form can be downloaded from the ERI website.

Contact details for usage inquiries

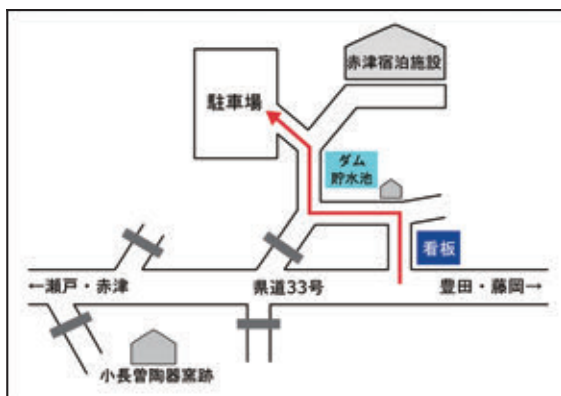
Ecohydrology Research Institute Goizuka office and laboratory
 11-44 Goizuka-cho, Seto, Aichi, 489-0031, Japan
 TEL +81-561-82-2371 FAX +81-561-85-2838
 Access: Nagoya - (JR Chuo Main Line 11 minutes) -
 Ozone - (Meitetsu Seto Line 25-35 minutes) - Owari- Seto -
 (Bus 10 minutes) - Goizuka (1-minute walk) - Goizuka office

Lodging facility

Name of lodging facility: ERI Akazu lodging facility
 Capacity: 30 people *Lecture room capacity is 36 people
 (when using desks)
 No meals provided (self-catering)
 1-1 Kitashirasaka-cho, Seto, Aichi, 489-0014, Japan
 TEL +81-561-21-1185
 Access: Owari- Seto - taxi - Akazu lodging facility



Location of office and university forest



How to get to Akazu lodging facility: take Prefectural Route 33 towards Fujioka, the sign on the left marks the entrance.

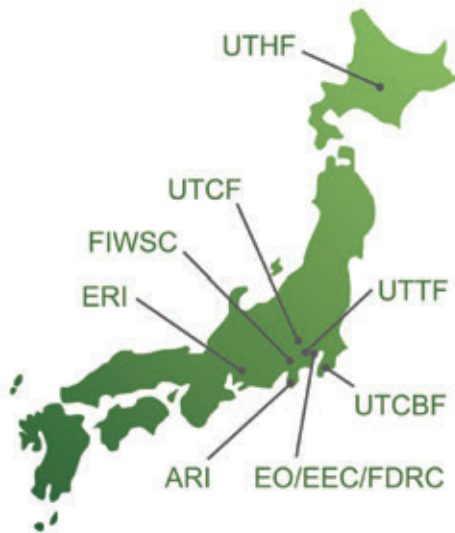




The University of Tokyo Forests,
Graduate School of Agricultural and Life Sciences,
The University of Tokyo



UTFs website



UTCBF: The University of Tokyo Chiba Forest
UTHF: The University of Tokyo Hokkaido Forest
UTCF: The University of Tokyo Chichibu Forest
UTTF: The University of Tokyo Tanashi Forest
ERI: Ecohydrology Research Institute
FIWSC: Fuji Iyashinomori Woodland Study Center
ARI: Arboricultural Research Institute
EO: Executive Office
EEC: Education and Extension Center
FDRC: Field Data Research Center

The University of Tokyo Forests, Graduate School of Agricultural and Life Sciences,
The University of Tokyo, Ecohydrology Research Institute (ERI)

■ Goizuka office 11-44 Goizuka-cho, Seto, Aichi, 489-0031, Japan TEL +81-561-82-2371 FAX +81-561-85-2838

■ Akazu lodging facility 1-1 Kitashirasaka-cho, Seto, Aichi, 489-0014, Japan TEL +81-561-21-1185

Website: <https://www.uf.a.u-tokyo.ac.jp/eri/>

E-mail: eri@uf.a.u-tokyo.ac.jp



Cover photograph
Upper left photograph: Tour route on the ridgeline of the Akazu Research Forest
Upper right photograph: The Akazu Research Forest tour event
Middle left photograph: Bedload sediment observation seminar
Middle right photograph: Distant view of Mt. Sanage (Akazu Research Forest)
Bottom photograph: Higashiyama flow-measuring weir