Proceedings of
"The 8th Symposium of Asian University Forest Consortium"

October 22-26, 2018

College of Agriculture and Life Sciences,

Seoul National University, Seoul, Korea

Organized by

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

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University Forests Consortium in Korea

Welcome from the Dean of College of Agriculture and Life Sciences, Seoul National University

I would like to express my heartfelt gratitude to Director Fukuda, Kenji of the University of Tokyo Forest, Director Tsai, Ming-jer of National Taiwan University Experimental Forest, Professor Kamata, Naota of the University of Tokyo Forest, Professor Phua, Mui How of Universiti Malaysia Sabah, Professor Shin, Joon-Hwan of Dongyang University, representatives in academics and other distinguished speakers, ladies and gentlemen,

It is a great pleasure and opportunity to give a few words at "The 8th Symposium of Asian University Forest Consortium. On behalf of all the member of Seoul National University Forest, I would warmly like to welcome you for attending this international symposium. I would like to express my sincere thanks and congratulations to Professor Im, Sangjun, director of Seoul National University Forests, and all the members of organizing committee of this symposium. The Asian University Forest Consortium was first organized in 2002, Japan, for providing the opportunity to exchange experiences and promoting collaboration among university forests in Asian countries. Since then, the symposium has been held in several countries, and contributed to improve the relationship of Asian university forests. Several experts and students from the University of Tokyo (Japan), National Taiwan University (Taiwan), Kasertsart University (Thailand), and Universiti Malaysia Sabah (Malaysia) are joining this symposium. I am sure that this workshop will give valuable chance for experts and students to discuss about long-term data on climate, hydrology, LTER study plots and plantations through university forests. After one and half-day discussion, participants will visit forest and ecological research sites near Nambu university forests. Two and half-day excursion will bring us more productive and joyful time. Finally, I do hope all of you have a valuable time and your stay here will be interesting and enjoyable.

Thank you for your participation in the SAUFC.

Lee, Suk-Ha
Dean, College of Agriculture and Life Sciences
Seoul National University

Outline of Schedule

	Oct-21	Oct-22	Oct-23	Oct-24	Oct-25	Oct-26
6:00	Arrive at Incheon, Gimpo airport Move to Hoam Faculty House			Breakfast		
7:00		Breakfast	Breakfast	Move to Mt. Jiri	Breakfast	Breakfast
8:00		Go to Campus	Check out	Excursion in Research Plot	Move to Jang Seong	Check out from HFH
9:00		Symposium (NICEM Bldg)	Research Group Session (SPC Bldg.)			
10:00					Excursion in Cypress Healing Forests	Move to airport
11:00		Lunch	Wrapping-up			
12:00			Lunch		Lunch	
13:00			Move to SeoCheon	Lunch	Return to HFH	
14:00	Check into HFH*	Poster Session1		Move to Gwang Yang		
15:00		Poster Session2	Excursion in National Institute of Ecology	Excursion in Private Timber Company		
16:00						
		Refresh Time	Move to Gwang Yang			
17:00						
18:00	Dinner (HFH*)	Banquet (HFH*)		Dinner	Dinner	
19:00			Dinner			
Accomm.	HFH*	HFH*	CGH**	CGH**	HFH*	

HFH* : Hoam Faculty House

CGH**: Chusan Guest House, Nambu University Forests

Program of Oral and Poster Presentation and Index Abstracts

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10:00-10:20	SHIN, Joon-Hwan (Professor, Dongyang University), Korean traditional forests for ecosystem services	17
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10:40-11:00	TSAI, Ming-Jer (Professor, Director of EXFOR, NTU), Sustainable forest management-bring people from urban to Experimental Forest, NTU	19
11:00-11:20	PHUA, Mui How (Professor, UMS), Above-ground biomass changes of intact and degraded montane rainforests in Borneo	20
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13:33-13:36	**P03:** Mr. SARAGIH, Syaiful Amri (UTF), Trap captures of ambrosia and bark beetles in relation to maple tree	25

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13:39-13:42	**P07:** Dr. SAWADA, Haruo (UTF), The work of the general manager of technical staff at the university of Tokyo Forests	29
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13:48-13:51	**P13:** Mr. KIMURA, Kota (UTF), Fundamental plant survey in the University of Tokyo Hokkaido Forest	35
13:51-13:54	**P15:** Mr. HARAGUCHI, Ryusei (UTF), Detection and absolute quantification of *Serpula himantioide*s in decayed wood of *Chamaecyparis pisifera* by real-time PCR method	37
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13:57-14:00	**P19:** Dr. SANGRAM, Narapong (KU), Effect of gases and particulate matter from electricity generation process on the radial growth of teak plantations surrounding Mae Moh power plant, Northern Thailand	41
14:00-14:03	**P21:** Dr. CHENG, Chih-Hsin (NTU), Stand development and annual aboveground net primary production with Japanese cedar and *Taiwania* plantations in Xitou	43
14:03-14:06	**P23:** Mr. EU, Song (SNU), Structure analysis of aged small erosion control dam using finite element method	45
14:06-14:09	**P25:** Ms. JIN, Chaelyeong (KNU), Varied tits (*Sittiparus varius*) and their associated microbiome	47
14:09-14:12	**P27:** Mr. TRAN, Hai Long (SNU), Scientific solutions for restoration and sustainable management of poor/ degraded natural limestone forests in Cat Ba Archipelago Biosphere Reserve, Vietnam	49
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15:09-15:12	**P08:** Ms. BYEON, Siyeon (SNU), Leaf N allocation changes of four temperate tree species growing under elevated CO_2 in open top chambers	30
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15:21-15:24	**P16:** Mr. PHETCHARABURANIN, Teerawach (KU), Integrated land use planning for highland farmer in Na Luang sub-watershed at Wiang Sa district, Nan province, Thailand	38
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Venue : SPC Bldg. Rm# 201		
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RG1-6(10:10-10:30)	Dr. TANAKA, Nobuaki (UTF), Toward a collaborative study 'Long-term water balance analysis of university forests under different climate zone'	58
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RG2-3(9:00-9:15)	Dr. LARDIZABAL, Maria Lourdes T. (UMS), Species composition of bark and ambrosia beetles in three land use types at long Mio, Sipitang, Sabah	62
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October 23 (TUE)

Research Group Parallel Session 3: Management (RG3)

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October 23(TUE)

11:10-11:30 Wrap-up Meeting

Venue: SPC Bldg. Rm# 101

11:30-12:30	Lunch	

*Not all authors of papers, but only presenters are listed in the tables above.
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KNU: Kongju National University, Korea
NTU: National Taiwan University, Taiwan
NU: Niigata University, Japan
SNU: Seoul National University, Korea
UMS: Universiti Malaysia Sabah, Malaysia
UTF: The University of Tokyo Forests, Japan

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Plenary Session

Introduction of Seoul National University Forests

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Abstract

Seoul National University Forests (SNUF) was established in 1913 in order to contribute to education and research of forest science and forestry. SNUF has a main office at the SNU campus in Seoul, and there are three forests in the mid and southern part of South Korea: Chilbosan University Forest, Taehwasan University Forest, and Nambu University Forest. Chilbosan University Forest (CUF) is located in Suwon-si and Hwaseong-si in Gyeonggi-do. In CUF, education and research on raising seedlings and trees are ongoing inside nurseries and greenhouses. Research on urban forestry is also ongoing. Taehwasan University Forest (TUF) is located in Gwangju-si in Gyeonggi-do. TUF has a flux tower that can measure carbon, air and matter cycling, and also has a debris barrier for hydrological research. TUF is 90 minutes from Seoul and convenient location to conduct research on nature. Nambu University Forest (NUF) is located in Gwangyang-si and Gurye-gun in Jeollanam-do. NUF is a large forested area with 16,213 ha and thus profitable to conduct research. NUF has 880 sites for permanent vegetation monitoring, and research installations such as hydrological facilities and an observation garden. With the construction of the Forest Research and Education Center in 2018, a variety of education and research areas will be extended. The three forests support education and research with their own unique forest conditions and facilities. Recently, SNUF is providing education and research services for various social groups, not only for SNU students.

Education, research activities and long-term data in UTokyo Forests

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Abstract

The University of Tokyo Forests (UTF) was established in 1894 to contribute to education and research in forestry. UTF which owns 7 regional forests in Japan has accumulated valuable long-term monitoring data and techniques for sustainable forest management over 100 years. UTF has provided practice field for undergraduate and graduate courses of Dept. of Forest Science and other departments, university-level seminars in UTokyo and from other domestic and foreign universities. UTF has also provided research fields and long-term data for wide range of researches in forest-related sciences. The UTF staffs also conduct their own research projects on forest ecology, hydrology, management, human-forest relationships, etc., and they belong to four educational units (laboratories) to supervise students of Dept. of Forest Science and Dept. of Ecosystem Studies. International collaboration between UTF and Asian university forests is promising to develop education and research of forest science in Asia.

Korean traditional forests for ecosystem Services

Joon Hwan SHIN[1]

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Abstract

The Korean peninsula is located between the Asiatic Continent and Pacific and has a continental climate. Korean suffered from the cold and dry wind of winter and the flood of summer. Korean tried to settle these problems by planting trees near their village since the Silla Kingdom(BC 57-AD 935). Korean people have considered the landscape around them as a system they live in and depend on. They have also identified their surrounding landscapes as subsystems of a bigger system such as a regional or a national system. The structure and dynamics of the system at each scale are mostly driven by a small set of key processes, and then the linked set of hierarchies governs the behaviour of the whole system. The tradition have developed into resilience thinking and, in turn, contributed to the historical conservation of Korean topography and to greening Korea in modern times.

Capacity building of forest education and research in the University Forests Consortium in South Korea

Kyu-Suk KANG[1,*], Ji-Min PARK[2], You-Lim Jang[3], Jong-Bin Jung[4] and Pil Sun PARK[5]

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Abstract

In order to strengthen University forest's education and research, the Korea Forest Service had launched a research project in 2015. This would initiate to build up the University activity in forests, improve the system of forestry education, and facilitate the extension of research finding. This will contribute to growth in the forest education and research sector that keeps consistent priority for biodiversity monitoring, conservation and sustainable management of forest resources. This project will continue for six years with two phases. The second phase is started with two sub-projects in 2018. The first one is to construct the base of vitalization for sharing the University forests and the education system. It includes a survey of fauna, an investigation of community structures of insects, and a monitoring of watershed hydrology. The other one is to build the capacity of the education of overseas forests. From this capacity building program, graduate students will visit tropical forests and learn about overseas forest resources and management status. In addition, a research on the genetic variation of *Chamaecyparis obtusa* is collaborated with Japan, Korea and Taiwan research teams under the consortium of Asian University forests.

Acknowledgments

Sustainable forest management-bring people from urban to Experimen tal Forest, NTU

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Abstract

The Experimental Forest (EXFO), National Taiwan University (NTU) was originally established in 1902. The major objectives of the EXFO are: 1.) teaching and field practice; 2.) academic research; 3.) resource conservation; and 4.) demonstration in forest management. Xitou Nature Education Area (XNEA) is one of the famous forest recreation parks in Taiwan. Over 2 million people visit and enjoy forest eco-tourism in each year in XNEA. XNEA was established since 1970. Annual average air temperature is 16.6 $^{\circ}$C, ranged from 11.0 to 20.8 $^{\circ}$C. Well facilities such as accommodation for forest recreation, conifer plantation in subtropical forest and convenient traffic system from urban to forest are the advantage to attract tourists. However, adopted research results to forest eco-tourism such as forest therapy research is niche and differentiation to other forest recreation parks in Taiwan. Differentiation of forest eco-tourism and interdisciplinary research are the key of sustainable forest management.

Above-ground biomass changes of intact and degraded montane rainforests in Borneo

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Abstract

Borneo's rainforest is the biodiversity hotspot and also important in global carbon cycle. The anthropogenic pressures on montane rainforests have also been growing; necessitates increasing attention for forest conservation actions such as 'Reduction of Emissions from Deforestation and Forest Degradation-plus' (REDD+). Quantifying the above-ground biomass changes of these forests is the core component of REDD+. We used high-resolution optical imagery (IKONOS-2) to identify intact and degraded rainforests in the mountains of Northern Borneo. The preprocessed IKONOS imagery was segmented and classified using object-based classification approach. The classification result is matched with an ecological classification based on AGB and biodiversity's similarity. We then examined the AGB growth rate between 2012 and 2018 with 44 ground-based plots dispersed in intact and degraded forests, within which all stems > 10 cm in diameter were measured and identified to species or genus. The intact and degraded forests not only dissimilar in biodiversity and had different AGB density, but were also significantly different in AGB growth rate. The results indicate the possibility of differentiating the AGB changes in the same forest type with different forest condition, which is useful to REDD+ implementation.

Poster Presentation

Discriminating high-value broadleaf trees from UAV (Unmanned Aerial Vehicle) imagery in the University of Tokyo Hokkaido Forest, Japan

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Abstract

Information of large-sized high-value timber trees provides a useful tool for forest managers for species level monitoring and silvicultural planning because these trees play important ecological and economic roles in forest management. In this study, we examined the potential of UAV imagery for the discrimination of large high-value trees. We targeted castor aralia (*Kalopanax septemlobus*), one of the most valuable timber species of cool-temperate mixed forests in northern Japan. Imagery taken over long-term permanent plots in mixed conifer-broadleaf forest of the University of Tokyo Hokkaido Forest were used to derive three-dimensional (3D) models and orthoimages of the forest canopy. Canopy trees were classified into high-value timber species of castor aralia, other broadleaf trees and conifers using known tree positions. Spectral and textural metrics were derived from manually segmented sample individual tree crowns. Object-based image analysis and random forest algorithm were performed for the classification. Results indicated that UAV imagery has the potential for classification of large-sized high-value trees with acceptable accuracy.

Pyramiding of male-sterile genes in *Cryptomeria japonica* D. Don with the aid of closely linked markers

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Abstract

Gene pyramiding is a breeding method used to combine multiple useful genes. In this study, we used the markers closely linked to the two male-sterile genes *MS1* and *MS2* for the effective development of individuals doubly heterozygous for these two genes. This is the first example of gene pyramiding through marker-assisted selection (MAS) in forest trees. Two markers, which are closely linked to either *MS1* or *MS2*, were used in MAS. On the basis of the linkage phase between the markers and male-sterile loci, we selected five F_1 individuals as parents for artificial crossing. The 268 seedlings obtained from six artificial cross combinations were used. Chi-squared tests showed no significant deviation from the expected Mendelian ratios of genotypes, indicating that MAS using markers closely linked to the male-sterile genes worked very well. Fifteen individuals that showed unexpected genotypes were probably recombinants.

Trap captures of ambrosia and bark beetles in relation to maple tree weakening

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Abstract

Branch diebacks on a maple (*Acer amoneum*) were observed at The University of Tokyo Tanashi Forest. Ambrosia beetles *Euwallacea fornicatus* and *Euwallacea interjectus* were collected from one of the dead branches. In this research, ambrosia and bark beetles were collected on seven healthy and three weakened maple trees by sticky traps and ethanol-baited traps. Insect holes on a trunk surface < 1.8m from ground level and the appearance of each canopy were recorded. Greater numbers of beetles were captured by sticky traps on weakened trees. On healthy trees, greater numbers of beetles were collected by ethanol-baited traps but no hole was found. *E. interjectus, E. fornicatus*, and *Platypus calamus* bored into weakened trees. *E. interjectus* was found first although some other species started to be captured by the sticky traps before the attack. There remains a possibility that these species had attacked higher positions before colonization by *E. interjectus*.

Quantification of species-specific drought tolerance for plantation tree saplings using morphological and physiological parameters

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Abstract

Physiological responses and water relation of eleven plantation tree species' saplings were quantified for their drought tolerance ability. Four different irrigation regimes; control (100% precipitation), light drought (40% reduction), strong drought (80% reduction) and 20 years average precipitation were applied with 30 cells of each treatment at the experimental site of Mt. Giri. To quantify the morpho-biochemical responses, we analyzed the leaf size, leaf mass area (LMA, g cm^{-2}), leaf N and ΔC^{13}. To quantify the physiological responses, we measured A/Ci photosynthesis response curve by controlled internal CO_2 concentration (Ci) to estimate the maximum carboxylation rate (Vcmax) and maximum electron transport rate (Jmax) and plant transpiration were estimated by using the external heat ratio method. The preliminary results showed there was significant effects of precipitation reduction, for example *Prunus sargentii* 4.25, 3.75, 3.25 and 2.75 g H_2O day^{-1} per treatment respectively, and species specific differences in drought tolerance.

Genet distribution of *Racodium therryanum* in the nursery of *Picea glehnii* in UTokyo Hokkaido Forest

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Abstract

Snow blight caused by *Racodium therryanum* is the most serious problem in seedling production and natural regeneration of *Picea* spp. in Hokkaido. The sexual stage of this fungus has not been found and little is known about how it spreads. We developed five microsatellite (SSR) markers to elucidate the reproduction of *R.therryanum* in the nursery of *P.glehnii*. From two study plots (Ⅰ and Ⅱ, 30 cm×10 m each) in the nursery, a total of 45 (22 and 23, respectively) isolates were collected, and they were classified into 19 (A~S, 10 and 13, respectively) genotypes. Genotype A and B in plot I and B in plot II were distributed throughout the plots. These clonal distributions indicate that *R.therryanum* spreads by asexual reproduction. On the other hand, each of 14 genotypes was found from only one seedling. The existence of diverse and small-sized genets indicate that *R.therryanum* may also undergo sexual or parasexual reproduction.

Species-specific variations in diameter growth rate under environmental factors

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Abstract

These days, the droughts occur stronger and more frequently worldwide. And also, the drought in future will get strong and, the pattern and frequency of the drought will be changed in Korea under many climate change scenarios. In fact, there were heavy drought in Korea in 2014 to 2016. This drought is expected to affect the growth of trees. The purpose of this study is to investigate if the drought affect on the diameter growth of trees, and to analyse which environmental factors affect most on different species of trees. The results showed no significant correlation between annual growth rate and annual precipitation. The species-specific patterns of growth although they have been grown in same environment, and the major environmental factors that affect the radial growth vary from species to species, and the diameter growth rate of some species was closely related to the environmental conditions of previous year.

The work of the general manager of technical staff at the University of Tokyo Forests

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Abstract

Executive Office of the University of Tokyo Forests (UTF) located in Yayoi campus, was established to coordinate various activities in the seven branch forests and Education and Research Center. The role of the office is to coordinate educational, research, public, personnel, financial and international affairs as a center of excellence in forestry, and to promote cooperation between the branches and other organizations. The General Manager of Technical Staff (GMTS) is belong to Executive Office.

The Director of UTF appoints GMTS according to the decision of the steering committee meeting of UTF. GMTS serves for three years and can be the reappointed to the post for once. This report give an overview of GMTS work. This duties of GMTS include allocations of Technical staff, planning of budget for forestry management and adjustment and training of a forestry product income.

Leaf N allocation changes of four temperate tree species growing under elevated CO_2 in open top chambers

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Abstract

Under elevated CO_2, forest productivity is predicted to grow due to accelerating photosynthesis rate. However, increasing productivity requires high amount of nitrogen, which is commonly limited in many ecosystems. Nitrogen is mainly invested in photosynthetic organs, and its allocation to leaf plays crucial roles in tree growth. So, we investigated leaf N allocation of four species in Korea, which have been growing under future atmospheric conditions (ambient,x1.4,and x1.8). There was decrease in leaf N content in *F. rhynchophylla* and *S. alnifolia* under the elevated CO_2 (p=0.0479). Analysis of N allocation in the cell showed N into Rubisco and chlorophyll in *Q. acutissima* was higher in ambient x 1.4 than in ambient (p-value =0.0437). In the case of *S. alnifolia*, nitrogen fraction of rubisco was lower under elevated CO_2 (p=0.01), but that of the chlorophyll increased (p=0.042). Our results imply the species-specific adaptation to future climate and needs of management plan.

Forest roads in the University of Tokyo Chiba Forest

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Abstract

Forest roads, which we define as motorable roads in forests, are important infrastructure for forest management. There are 13 forest road routes in the University of Tokyo Chiba Forest. The total length of these forest roads is 23,699 m, and have a density of approximately 11 m/ha. The mountain slope is generally very steep; the geological structure is mostly marine deposits consisting of sandstone, mudstone, and tuff, and the surface soil is thin, enabling the roads to be cut through the mountain. We manage most of the forest roads directly. We planned the forest roads in the most suitable locations and demolished rocks to build these roads through the mountain, operating the construction machinery ourselves. We use our own wheel loader, excavator, and dump truck to build and repair the forest roads. However, the geological characteristics mentioned above indicate a tendency of the roads to collapse easily. We have had to frequently repair several forest roads recently, after collapse following typhoons or heavy rain, and we have not been able to establish any new forest road.

Developing a machine learning based automatic plant phenology observation

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Abstract

Climate change has had a significant impact on plant phenology. Digital repeat photography is one of the most popular technique to study plant phenology. This study aims to develop an automatic observation system including detection algorithms for phenological events. For individual observation equipment, a small computer named raspberry-pi was used and we installed them Seoul National University Forests to collect image data. We implemented image processing and machine learning techniques to detect each phenological events. Leaf-out, leaf-coloring and leaf-fall could be successfully detected using RGB chromatic coordinates. On the other hand, we implemented two different algorithms for detection of flowering and compared the performance of each algorithms. First we used HSV color space conversion and k-NN algorithm, and for the second method we implemented convolutional neural network. As a result, the accuracy of k-NN algorithm showed 74.87% and convolutional neural network showed 99.82%, indicating superior performance of the neural network.

Acknowledgements

How to climb trees in the University of Tokyo Chiba Forest

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Abstract

In the University of Tokyo Chiba Forest (UTCBF), we need to work on trees, both to collect seeds for breeding rare trees, and to prune tree branches. This work is very dangerous because of the height, which may be up to 10 m, but it can be done safely using an elevated-platform vehicle. However, since we do not own an elevated-platform vehicle, we have to rely on its costly rental. Even if we are able to rent this vehicle, because the forest roads are at a low density and the mountain slope is very steep in the UTCBF, we are not able to use it everywhere. Therefore, it is necessary for workers to climb the trees manually. We use various climbing aids, for example different types of ladders, a traditional climbing tool called 'Burinawa' which is a rope made from palm bark and has wooden sticks attached at both ends; and a modern tree climbing rope. The type of equipment we use depends on the height of the tree to be climbed and the ease of carrying the equipment.

Lepidopteran fauna of University Forest in Korea

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Abstract

This study was carried out to investigate biological resources and long-term ecological monitoring of university forest. Investigation was conducted at Taehwasan and Nambu University Forest in 2015 and 2016, respectively. Total 147 Lepidopteran species were identified and composition rate of Noctuidae, Geometridae and Pyralidae were 30, 17 and 17% in Tawhwasan University Forest, respectively. Total 257 Lepidopteran species were collected and composition rate of Noctuidae, Geometridae and Pyralidae were 30, 22, and 17% in Nambu University Forest, respectively. Among them, 4 legally protected species and 8 export restricted species were identified. Our result could be used as long-term ecological monitoring data of University Forests.

Acknowledgments

Fundamental plant survey in the University of Tokyo Hokkaido Forest

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Abstract

Collecting and providing fundamental environmental data to support educational and research activities is one of the essential roles of university forests. To fulfill this role, the University of Tokyo Forests are maintaining fundamental data necessary for research activities on plants, vertebrates, birds, insects, climate and hydrology. For the plants we have been making a list of flora, collecting plant specimens, and taking ecological photos since 2002. So far, in the University of Tokyo Hokkaido Forest, we have confirmed 894 plant species of 416 genera belonging to 118 families. We have also collected 7,765 specimens of 871 plant species, and have taken 1,726 photos of 408 plant species. All of the data are compiled in a database using Excel software, and specimens are stored in the herbarium. In this presentation we report on these plant surveys since 2002.

Effect of pheromone dose and trap height on male capture of black pine bast scale, *Matsucoccus thunbergianae,* and development of new pheromone synthesis method

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Abstract

Black pine bast scale, *Matsucoccus thunbergianae* Miller et Park (Homoptera: Matsucoccus), is major pest of *Pinus thunbergii* and causes serious damage to balck pine forest of Korea. In this study, we investigated the effect of pheromone dose and trap height on captures of the male *M. tunberginae*. In field experiments, *M. tunberginae* males showed dose-dependent attraction to matsuone above 100 µg and up to 3200 µg. When the trap was installed 0.5 m above the ground, more adults were attracted than traps installed 1.0 and 1.5 m above the ground. To reduce synthesis procedures, time and labor, we developed a new synthetic route to matsuone, and conducted field experiments. Although newly synthesized matusone was less attractive than matsuone synthesized by old method, the new synthetic route could be an economically favorable alternative over the previous method for field application.

Detection and absolute quantification of *Serpula himantioide*s in decayed wood of *Chamaecyparis pisifera* by real-time PCR method

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Abstract

In the University of Tokyo Chichibu Forest, *Chamaecyparis pisifera* butt-rot which is presumed to be caused by *Serpula himantioides* has spread out. To examine the distribution of *S. himantioides* in decayed woods, we have designed specific primers derived from the rDNA ITS region and tried to detect *S. himantioides* in a decayed wood of *C. pisifera* by quantitative real-time PCR with intercalator method. Real-time PCR assays with the specific primers were positive for *S. himantioides* and negative for *S. lacryman*s of the same genus and *Coniophora puteana* of the same family. For absolute quantification, a standard curve was constructed by plasmid inserted with a fragment of rDNA ITS region of *S. himantioides*, where strong linearity ($R^2 > 0.99$) was validated in the range of 10^1 to 10^8 copies. The rDNA copy number of *S. himantioides* was highest in the adjacent area to the most decayed wood.

Integrated land use planning for highland farmer in Na Luang sub-watershed at Wiang Sa District, Nan province, Thailand

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Abstract

Monoculture activities are the one of the influencing leading causes to deforestation, land degradation and there have been affecting to hydrological services from watershed and plant products reduction. It will be occurred when the land is unsuitable management. Hence, there should be integrated management planning between socio-economic and environmental dimensions. In this study, hydrological services should be evaluating and forecast using SWAT model. It was divided into three scenarios including present land use, trend and sandbox scenario. The result show total forest area was decreasing during 2013-2016 approximately 20 % and maize area has been increasing 40 %. Nevertheless, the forest still provides runoff, approximately 43 % of rainfall, was much more significant than the sediment yield that is good hydrological services from forest. The land use suitability analysis, it was found sandbox scenario that is the best preliminary for making suitable and reasonable land use management on highland.

Keywords: Land use planning, hydrological services, Nan province, SWAT model

Understanding the needs of residents and the potential of local forest as resources to support health of local residents

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Abstract

We are conducting action research aimed at the construction of a social system that utilizes local forest resources that contributes to the realization of a sustainable local community by redefining local forests as resources to support the health of local residents, targeting Yamanakako village. We investigate and clarify the consciousness structure on the forests of local residents, basic information on health, the actual state of how to relate to the forest, and using the materials of the administration and the published remote sensing data etc. on the current situation of the resource side, Yamanakako village information on the entire forest itself and the social environment surrounding the forest are grasped in a plan. We'll analyze needs and resource potentials, propose effective actions to utilize the recovery function of forest in the community, and to verify the practice. We'll participate observation analysis on changes occurring in the area in these processes.

Predicted of hydrologic response base on land use planning under climate change scenarios in upper Nan watershed

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Abstract

This study aims to predict of hydrologic response base on land use planning under climate change scenarios in upper Nan watershed, Thailand, using the representative concentration pathway (RCP) 4.5 and 8.5 scenarios of the fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). Land use planning was used by the policy of national park in Nan province, Thailand which increases forest area with 3 and 10 %. The soil and water Assessment Tool (SWAT) model was applied to simulate the streamflow using meteorological data over a twenty year period from 1998 to 2017. The SWAT model produced an acceptable performance for calibration and validation, yielding Nash-Sutcliffe efficiency (NSE) value greater than o.5. The result has shown streamflow each scenario were increased in wet period and decreased in dry period while annual streamflow was decreased. This found that climate change had influent to streamflow was decreased although the forest area was increased.

Effect of gases and particulate matter from electricity generation process on the radial growth of teak plantations surrounding Mae Moh power plant, northern Thailand

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Abstract

The objectives of this study were to investigate radial growth patterns and influences of polluting gases and particulate matter on the radial growth of teak plantations surrounding the Mae Moh Power Plant. Twenty-four 32-year-old teak trees were selected from Mae Jang and Mae Moh plantations, which were 5 km and 15 km from the Mae Moe power plant, respectively. Forty-eight sample cores were collected from the 24 trees (two cores per tree). The growth patterns of all the cores were analyzed following the standard methods of dendrochronology. The relationships between the growth pattern and the amounts of sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter were measured as average daily rates and then analyzed. The study showed that the best-fit model for the relationship between the radial current annual increment at breast height (CAIdbh) and time (Y) was an exponential equation. The fitted equations were: $CAI^{dbh} = 10.657e^{(0.031Y)}$ for Mae Moh plantation and $CAI^{dbh} = 12.518e^{(0.032Y)}$ for Mae Jang plantation. The coefficient of determination for the fitted equations was 0.410 and 0.423 for the Mae Moh and Mae Jang plantations, respectively. Moreover, carbon monoxide (CO) and sulfur dioxide (SO2) had a statistically significant effect on radial teak growth (RT) in the Mae Jang plantation, with a coefficient of determination of 0.69 ($RT_{mj} = 0.571 + 0.429(CO) - 0.023(SO2)$).

Monitoring of phenology of breeding Varied Tits (*Sittiparus varius*) and Great Tits (*Parus major*) and leaf bud burst in Nambu university forest of Seoul National University

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Abstract

Rapid change in climate can cause mismatch of phenology in forest ecosystems and disrupt interactions between organisms, hence ecosystem functions. It is essential to investigate phenological relationships between species in different trophic levels for predicting the effect of future climate change. To investigate relationships between phenology of vegetation and avian breeding activity, we mounted time-lapse cameras to acquire daily photography of canopy at eight long-term nest box monitoring sites along elevational gradient in SNU Nambu university forest from 2016 to 2018. Average leaf burst dates and egg-laying dates of Varied Tits (*Sittiparus various*) and Great Tits (*Parus major*) were postponed along altitudinal increase. Hatching dates of birds matched leaf burst timing, which is related to the increased caterpillar prey availability following the spring leaf out. Multi-trophic level long-term monitoring can provide information for predicting the effect of climate change in forest ecosystems.

Stand development and annual aboveground net primary production with Japanese cedar and *Taiwania* plantations in Xitou

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Abstract

Forest management strategies that maximize carbon (C) stocks serve as the possible means to reduce global warming. In this study, we aimed to quantify the C pools dynamic in the Japanese cedar and *Taiwania* plantations in Xitou, central Taiwan, and test their age-related patterns. The stands were selected across the chronosequence with stand age ranged from 37 to 90 years for Japanese cedar plantations and from 22 to 73 years for *Taiwania* plantations. Total ecosystem C stocks which summed from each individual C pools ranged between 220 and 347 Mg C ha^{-1}. Of the measured forest components, a clear increasing trend of living biomass C pools with stand age was found in both plantations. However, no significant age-related pattern was observed for other C pools. Our results indicated that both plantations have high ecosystem C stocks and could continue to sequester C but only in living tree biomass.

Species-specific carbon and hydrological responses to three-year drought in temperate forests, Mt. Taehwa, Seoul National University Forests

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Abstract

In the future, longer and severer drought events are expected as climate change progresses. Forests ecosystems, which play a major role in global hydrological and carbon cycle, could be in turn affected by the drought. Here, we investigated the responses of natural broadleaved forests (TBK) and *Pinus koraiensis* forests (TCK) to three-year drought using stand-level eddy covariance data from 2015 to 2017. As a result, net ecosystem exchange (NEE) during 2015 and 2016 at TCK were similar. However, NEE sharply increased during June and July in 2017 due to the increase in ecosystem respiration (E_R). It seems to be driven by gradual decrease of soil water content (SWC) by ~0.06 and its effects on the conifer forests' physiological responses. In contrast, not only NEE and E_R, but SWC at TBK was relatively more consistent than TCK. From the results, TBK seems to be less affected from drought than TCK.

Structure analysis of aged small erosion control dam using finite element method

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Abstract

In Korea, more than 11,000 of erosion control dam have been installed in forested watershed to reduce damage from disasters, such as landslide or debris flow. After construction, erosion control dams are suffered from aging degradation, which induce partial or permanent decrease of strength and resilience of those structures. Especially, degraded dams are more vulnerable to unexpected disasters such as debris flow. Thus, accurate examination of aging effect is important to erosion control dam design considering long term management. In this study, we conducted numerical analysis of aged erosion control dam. We modelled an erosion control dam that is recently constructed. Moreover, we applied static pressure (hydraulic and earth pressure) and dynamic force (debris flow impact force) to aged dam strength considering age degradation model. With finite element methods, we analyze structural stability of load combination considering disaster events and sediment deposition stages.

Acknowledgement:

Water competition of trees under different species composition in temperate forest Mt. Baegun, Seoul National University Forest

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Abstract

Korean temperate forests are expected to change from conifer to broadleaved forests. However, there is still uncertainty in mechanism behind this change. Therefore, we investigated the differences in water uptake scheme between conifer and broadleaf species in the temperate forests of Korea, Mt. Baegun. The species-specific water uptake depth was estimated by measuring δ^2H and δ^{18}O ratio from the branches of individual species and by comparing them with those of soil water from 5 depths (10, 30, 50, 100 and 120cm). The results showed that conifers absorbed majority of their water from 10 to 50cm depth, and they were able to uptake from even deeper soil in July. In comparison, broadleaf species acquired water primarily in the upper soil layers (above 30cm). Our results could be essential for the prediction of species composition under climate change by providing species-specific adaptation ability connected to its water uptake scheme.

Varied Tits (*Sittiparus varius*) and their associated microbiome.

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Abstract

Microbiome associated with most of the bird's body surface, including skin, respiratory, digestive, and secretory organs, are known to affect their host physiologically and ecologically. However, little research has been done on the relationship between microbiome and their hosts. Fundamental research is needed for understanding their inter-relationship and their physioecological effects on hosts. We will study the effects of various environmental factors on interactions between microbiome and their hosts, through long-term monitoring of varied tits. We wanted to know the effects of food source and nest environmental (temperature, humidity) changes on intestinal microbiome, growth, and health of birds, by studying varied tit at Mt. Baekunsan in Gwangyang (South Korea). We are collecting 13 days old varied tit's Feces and bloods from nest-boxes in study area and are analyzing their microbiome. This will provide a broader understanding of the interactions between varied tits and microbiome.

Acknowledgments

Effect of bird digestion on Kudzu (*Pueraria lobata*) seed germination

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Abstract

Kudzu (*Pueraria lobata*) destroys existing vegetation and kills trees with its vigorous growth. Kudzu primarily reproduces by asexual reproduction with rhizomes. Sexual reproduction was known to be rare due to its low seed germination and establishment rates. However, its aggressive invasion of open areas indicates the potential of other mechanism to faciliate seed regeneration of Kudzu. This experiment was conducted to investigate the effects of bird digestion on Kudzu seed germination. We used Japanese quail (*Coturnix japonica*) for the experiment. During pre-experiment, high fungal contamination of seeds were found. Therefore we tested both the effects of bird digestion and fungi on Kudzu seed germination. Bird digestion promoted the germination of the Kudzu seeds ($p < 0.01$) by increasing the permeability of seed coat through physical and chemical action. The pre-experiment showed that the seeds digested by bird were not contaminated by fungi (*Alternaria* sp.). Seed germination rates were not significantly different between seeds with or without fungal contamination. The fast early growth and physiologically active substances of germinating Kudzu seeds prevented fungal invasion from exterial seedcoat to internal organs.

Scientific solutions for restoration and sustainable management of poor/degraded natural limestone forests in Cat Ba Archipelago Biosphere Reserve, Vietnam

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Abstract

Vietnam has a natural area of 33.12 million hectares, of which forestry land occupies 18.77 million hectares, accounting for 56.67%. Vietnam has abundant natural resources, high biodiversity and endemism. However, due to prolonged war and unsuitable policy mechanism, forests have been heavily destroyed, especially limestone natural forests. It has a great impact on the viability of the forest, the ecological imbalance, the forest development in the negative direction. The limestone forests in Cat Ba have rich structures and complexes. However, most of this type of forest has become poor, many species in the forest are scarce and threatened to extinction. Once the limestone forest ecosystem is destroyed, the ability to recover is very difficult. Thus, comprehensive solutions for forest restoration and management on limestone mountains is essential for the development of the Cat Ba Biosphere Reserve in general and the survival of species inside the Reserve in particular. In this study, we set up sample plots to collect data of the natural forest landscapes as well as the enrichment planting model in the Reserve. Preliminary data analysis has been conducted on growth rate, tree and species density, and quality. From the result we can compare the differences between the natural degraded forest landscape and enrichment planting, to find the appropriate solution for restoring the forest in the study area.

Research Group Session

Water balance of Chusan experimental watershed, Nambu University Forest, Seoul National University in the 1930s

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Abstract

To identify hydrological response along with forest recovery in Korea, rainfall and water level observation data obtained since the 1930s in small plantation forests of Chusan Experimental Watershed, Seoul National University Forests was analysed. In this study, we calculated water balance of the No.1 (Bukmoongol, 15.98ha) and an adjacent No.2 (Baramgol, 15.67ha) experimental watersheds in the 1930s. The rainfall was measured in the meteorological observation field in front of the office building by the syphon type rain gauge. The recording chart of the rain gauge was read manually to produce hourly rainfall data. Theoretical equation of rectangular notch was used to convert water level to discharge. The annual rainfall in 1931, 1932, 1933 and 1934 were 1414.2, 1032.2, 1884.4 and 1742.6 mm respectively. The annual discharge in the No.1 and No.2 watershed in 1931 were 577.9 and 1089.9 mm respectively. This result suggests that the catchment area of the both watershed is based on surface topography but the hydrological watershed boundary may not be same with the one identified by the surface topography.

Preliminary comparison of cloud patterns between Alab, Sabah and Xitou, NTUEF

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Abstract

Typical cloud forest can be found in the area from subtropical to tropical in Asia where are generally filled with dense mist and fog. Xitou region (1200 m a.s.l.) can be identified as the epitome of mid-elevation cloud forest ecosystems in Taiwan. On the other hand, Mount. Alab (1900 m a.s.l.) in Sabah might also be a tropical cloud forest. For the purpose of understanding cloud patterns between subtropical and tropical forest, the 1-km spatial resolution cloud top height dataset from 2003 to 2017 were analyzed. The results showed significant seasonal patterns of cloudiness ratio in Xitou. In summer, 90% of the days could be classed as cloudy whereas, in winter, this number dropped to 50%. Comparatively, it was always above 90% for a whole year in Mount Alab. A total solution of integrating visibility sensor, time-lapse camera and remote sensing technology for monitor cloud/fog patterns are under discussion.

Runoff curve number determination of forest land cover using rainfall-runoff data in different climate zone

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Abstract

The hydrologic methods developed by the Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service (SCS)) was widely used to estimate direct runoff for a given rainfall from small agricultural, urban, and forest watersheds. However, the application of the curve number procedure to forested watershed is still controversial and uncertain because little guidance has been developed for modifying runoff curve number in different land cover and geographical characteristics on forested watershed. A steep forested watershed has a slower response time for initiation of runoff, a lower peak discharge, and a smaller amount of runoff than the agricultural or urbanized watershed. In this study, SCS curve number method was introduced for evaluating storm runoff from forest watersheds in University Experimental Forests. Rainfall-runoff data, which were collected from small forest watersheds, were used for understanding the effects of land cover, topology and soil moisture on stormflow generation. Little relationships have derived from the observation. Revised runoff curve numbers were also suggested for forest watersheds. Overall, SCS method is the most useful tool in the estimation of runoff volume from forest watersheds, even though accurate estimation of curve number is still in questionable.

Streamflow dynamics in a small tropical cloud montane forest catchment: A preliminary observation at Mt. Alab, Crocker Range Park, Sabah

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Abstract

This paper discussed preliminary result of a study carried out in an Experimental Catchment of Mt. Alab, Crocker Range Park (CRP). The area is covered predominantly by tropical lower montane forest with elevation approximately 1800 m. Streamflow monitoring activity from this catchment indicates that stream discharges is naturally sustained by base flow which contributes 14% of the total streamflow. However, during storm event, quick flow is more dominant. The flow duration curves of the stream showed that the high magnitude flows of >20 mm day^{-1} are experienced in less than 10% of the time, while river discharges of <1 mm day^{-1} occurred 80% of the time. Daily runoff coefficient ranged between 0.1 and 0.99 with some values that exceeded 1.0 typically occurred in bimodal event. Preliminary observation suggests that the dynamics of the stream were apparently related to localize horizontal precipitation, vegetative cover, bank storage and fog deposition.

Application monthly rainfall-runoff polygons and runoff coefficients for long term runoff analysis

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Abstract

Monthly rainfall-runoff polygons and runoff coefficient were analyzed long term runoff. The two landuse types as mixed deciduous forest and forest restoration area of Nan watershed research station were measured daily rainfall and runoff. The results ware found that monthly rainfall-runoff polygon shapes of both area were the closed polygon. It could be indicated that the average monthly runoff coefficient in different year as smallest runoff coefficient in dry year (0.048), larger runoff coefficient in normal year (0.095) and largest runoff coefficient in wet year (0.156). The calculated runoff coefficients throughout the wet season have the high runoff coefficient for both of area. At all year and both of area, the polygon sides for the rainfall amounts in the months of February–April are almost vertical. This steep slope indicates that the amounts of runoff are negligible but they have a significant groundwater recharge and evaporation.

Keywords: Rainfall–runoff polygon, Monthly runoff coefficient, Nan province

Toward a collaborative study 'Long-term water balance analysis of university forests under different climate zone'

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Abstract

A study 'Long-term water balance analysis of university forests under different climate zone' was proposed as a potential collaborative study, in the Research Group 1 (RG1, Water & Climate) session of the last JSPS-C2C workshop at National Taiwan University. As a leading researcher of the study, I propose here the elasticity analysis (EA) to apply to as many forested catchments under different climate zones as possible. The EA was a kind of meta-analyses, which is designed to examine how catchment runoff is impacted by rainfall and climate variabilities, using long-term catchment water balance data. At the coming RG1 session at Seoul National University, after showing the result from a catchment of Ecohydrology Research Institute, I would like to discuss with audience about feasibility of the study, collaborators, and data availability among participated universities.

Historical evolution of evapotranspiration in the Shirasaka experimental watershed, Central Japan: 85 Years' Observation

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Abstract

Land-use–hydrology studies that utilise long-term measured data provide insights to the effects of historical changes (topographical, vegetation, climatological, phenological, land-use) on the water balance while minimising noise and anomalies found in shorter term studies. By means of the short-term water balance equation, annual evapotranspiration (ET) was estimated for the Shirasaka Experimental Watershed of the University of Tokyo Forests in Aichi, Japan, for data period 1930 to 2015 (85 years). In general, increases in ET was found to coincide with reforestation of pine and leaf-flushing of deciduous trees while decreases in ET coincided with pine wilt, abscission, and increasing age of pine and deciduous trees. ET was also found to vary differently according to season, vegetation type and vegetation age, and ET at any point is the net result of all these factors. More rigorous analysis will reveal a finer resolution of temporal changes and better attribution of factors.

Long-term forest insect research using litter traps: treasures in litter

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Abstract

Litter traps are funnel-shaped cloth-made bag set in the understory of forests, which have been used in a field of forest plant ecology. In this paper, long-term researches in forest insects using liter traps will be introduced. The researches started in 1985. Five litter traps were set at each stand predominated by *Fagus crenata*. Densities of the beech caterpillar, *Syntypistis punctatella* was estimated from dry weight of the insect frass. The population showed c. 10-yr cycle. The magnitude of the cycle was greater in outbreak areas than non-outbreak areas. In the non-outbreak area, shorter pseudo-cycle sometimes appeared because a relative effect of weather was stronger. An interaction between masting of the beech and seed insects have been analyzed from a viewpoint of predator satiation hypothesis. Communities of gall midges on the beech were also studied. In larch plantations, population dynamics of the larch sawfly were analyzed using the insect frass and head capsules.

Application of pheromone trap for the monitoring of forest insect pests in Korea

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Abstract

Insect pheromone is a chemical that triggers a social response in members of the same species. Until now, thousands of insect pheromone have been identified. These insect pheromone could be classified according to their role. Sex pheromone is usually released by female and attracts male for corpulation. Aggregation pheromone is common in bark and long horn beetles, and used for mass attack on their host plants. In this presentation, we introduce recent research on insect pheromone of tree insect pest in Korea. Field application of insect pheromoen for monitoring and control will be also discussed.

Acknowledgments

Species composition of bank and ambrosia beetles in three land use types at long Mio, Sipitang, Sabah

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Abstract

A study to compare the species composition of ambrosia and bark beetle between three land use types was conducted for a period of six months between April to September 2017 at Ulu Padas Forest Reserve, Long Mio, Sabah, Malaysia. The objectives of this study were to a) determine the species of bark and ambrosia beetles that are attracted to Ethanol-bait traps and b) to compare the species composition of bark and ambrosia beetles between the primary forest (PF), secondary forest (SF) and rubber plantation (RP). Ambrosia beetles were sampled using the Ethanol bait-trap method. This method used Ethanol as an attractant to bait the beetles towards the traps in each landuse types. Throughout this study, a total of 1594 ambrosia and bark beetle individuals from 57 morphospecies of eight known and one unknown tribes were recorded. Ambrosia beetles from the subfamily Scolitidae were most abundant, which recorded a total of 52 species and dominated by the tribe Xyleborini with a total of 23 species and Cryphalini with a total of 12 species. Beetles from both tribes were recorded most abundant throughout the three land use types. In terms of diversity, the diversity of beetles in the three landuse type were low, with a range of Shannon Weiner-Diversity index, H' between 1.96 in the primary forest, 1.99 in the rubber plantation and 2.23 in the secondary forest. The Margalef species richness index, D_{mg} was also low in the three landuse types, ranging between 5.029 to 5.481. As a conclusion, preliminary results from this study indicates a low diversity of ambrosia beetles in the study sites. This is due to the six months sampling time reported for this study. Currently, the sampling is still being conducted at the field for a duration of three years in order to capture a better representative of species.

Trends and derivatives of the mountain thermal environment of Alishan and Yushan in central Taiwan

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Abstract

To understand how recent warming affects the thermal environment of high altitudinal areas of Taiwan, we analyzed the spring, autumn, and winter growing degree-day (GDD, °C-days) anomaly series (base period 1961-1990) of the Alishan Station (2413 m) and Yushan Station (3844 m) by using a data-driven framework to extract trends, approximate their 1st and 2nd derivatives (velocity and acceleration), and establish confidence envelopes for those estimates. For the Alishan area, its GDD trends for all three seasons started to show significant increases around the mid 1970s, whereas for the Yushan area, its GDD trends for all three seasons were significantly higher than the baseline around 1980. For the Alishan station, the approximated velocities were almost linear with constant accelerations for the three seasons. For the Yushan Station, the approximated velocities and accelerations were all nonlinear for the three seasons and started to decelerate around the early 1980s.

Wildlife monitoring in the University of Tokyo Forests

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Abstract

Collecting and providing fundamental environmental data is one of the essential roles of university forests. To fulfill this role, the vertebrate group of the Fundamental Data Development Committee of the University of Tokyo Forests has been conducting wildlife monitoring surveys using camera traps since 2011 at the university's seven forests. In each forest, 1-10 camera traps are set throughout the year, and memory cards and batteries are changed every 1-2 months. So far a total of 23 mammal species have been confirmed, with additional unidentified bats and rodents. The number of mammal species confirmed in each forest ranged from nine to fourteen in six of the forests, with only four species confirmed in Tanashi Forest.. These results have been published in the journal "Enshurin" with appendices in pdf format that can be downloaded online. In this talk we introduce our monitoring activities and present a brief summary of results.

Long-term population decline in **wrinkle-lipped free-tailed bat** (*Chaerephon plicatus)* **in western Thailand**

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Abstract

The data of Long-term monitoring on the largest population of wrinkle-lipped free-tailed bat (*Chaerephon plicatus)* in Thailand were derived from 20-year(1998-2018) of monthly bat guano harvest records from a cave at Khao Chong Phran Non-hunting Area. This study was conducted to identify the time series characteristics of guano harvesting trend as the surrogate to estimate population of wrinkle-lipped free-tailed bat. The data on monthly guano harvesting was analyzed using time series lagged regression analysis integrated with environmental and weather data to test for correlation on guano volume. We found that population of wrinkle-lipped free-tailed bat gradually decline throughout the study period despite there is no evidence on the change of per capita population growth rate trend. From the model, the fluctuation of harvesting volume has the seasonal pattern associated with precipitation and other climatic variables. Lagged precipitation of the previous months have positive effects on change in population and growth rate with the maximal magnitude at 3-months lag. On the other hand, the precipitation of current month has a negative effect on guano harvesting of the following month. Additionally, average monthly temperature has a negative association with change in guano volume. The predictive model indicates that the ongoing current climatic trend could lead to the possible future extirpation of the local population of wrinkle-lipped free-tailed bat from 2020. According to the warmer and drier climate in western Thailand, the situation might worsen the trend of local population. Therefore, to maintain the critical ecosystem services of this dominant bat species, the conservation efforts and sustainable utilization must be needed.

Genetic metabolic polymorphisms in *Taiwania cryptomerioides*

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Abstract

Taiwania cryptomerioides Hayata belongs to the Cupressaceae family is an indigenous conifer species in Taiwan. There are more than 500 secondary metabolites have been isolated from woods, barks, roots and needles of *T. cryptomerioides*, including lignans, terpenoids, steroids and flavonoids. Several of the metabolites are reported to have antibacterial, antifungal, antimite, antitermite, and/or antitumor activities. To realize the relationship between heritability and metabolites, different Taiwania families were analyzed with lignan contents. In addition, owing to the pharmaceutical potential and unique structure of bioactive compounds in *T. cryptomerioides*, the transcriptome of each wood development stage was sequenced separately for gene expression analysis. Combined with metabolite analysis, the biosynthetic pathway genes were identified, and their expressions were quantified by RNA-Seq strategy.

Correlation between growth and elevation for outflow of *Acer mono* sap at the Seoul National University forests in Kwangyang

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Abstract

The sap of tree has been widely used as a health drink because it has rich mineral contents. Especially *Acer mono* sap is the most famous in Korea. Recently, as a major source of income for forest products, Korean people have been interested in *Acer mono* sap for various uses such as its processing, distribution, physiological activity, and a high value-added product. So people have on efforts to cultivate *Acer mono* tree resources and improve productivity. Therefore, this study was conducted to monitor the outflow of the *Acer mono* sap at the Seoul National University education forests in Kwangyang region. The study sites were selected at 3 areas from Mt. Baekwoon and Mt. Jiri respectively. The survey was conducted for three years from 2015 to 2017. The 3 trees were sampled for DBH levels, such as 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, and more than 36 cm. According to the sap production and management guidelines in South Korea, the collection hole was drilled 1 hole per 10 cm DBH, so 20 cm DBH trees were drilled 2 holes and more than 30 cm level trees were drilled 3 holes. The depth of the hole was 1.5 cm and the diameter of the hole was 0.8 cm. The height of the hole was less than 2 m above the ground. Amount of the sap was measured once a week by beaker from the beginning of February to the end of March. The correlations between the tree diameter level, the elevation and the sap were analyzed by the SPSS computer program.

Acknowledgments

Reconstructing long-term growth of *Cryptomeria japonica* plantations from archival aerial photography: A preliminary trial

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Abstract

In East Asia including South Korea, Taiwan, and Japan, *Cryptomeria japonica* D. Don ('sugi' in Japanese) is one of the important plantation tree species. Seoul National University (SNU), National Taiwan University (NTU), and the University of Tokyo (UTokyo) hold old *C. japonica* stands, which were planted between 1890s–1920s. Researchers in three universities have been working together for collaborative research activities on long-term *C. japonica* growth under the Core-to-Core Program of the Japan Society for the Promotion of Science (JSPS). We have initiated a joint research project funded by JSPS, with the project title of "Quantitative reconstruction of long-term growth process for old *C. japonica* plantation stands using historical forest management records and past aerial photos". As a preliminary trial, I generated digital surface models (DSMs) and digital canopy models (DCMs) using archival aerial images with Structure from Motion (SfM) photogrammetry to reconstruct the stand parameters.

Survival analysis of tree population in natural forest

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Abstract

The purpose of this study is to apply survival analysis to a tree population in a natural forest stand. The study site was the permanent plot in the University of Tokyo Chiba Forest in the southeastern part of the Boso peninsula, Japan. Tree age data were collected from the target trees with DBH >5 cm in 1999. We measured the number of annual rings as (radius at breast height – 2.5) cm from bark to pith for every target tree to a total of 488 individuals. The number of annual rings represents the age after in-growth if DBH of 5 cm is defined as the in-growth threshold. Data of annual rings were collected by semi-nondestructive measurement using a RESISTOGRAPH. The results implied that the tree mortality probability distribution had a monotonously decreasing shape as observed in the immature natural stand in the study site.

Rehabilitation of *Cryptomeria japonica* plantations as mixed hardwood-softwood forests

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Abstract

Prior to large scale planting of *Cryptomeria japonica* at Xitou Nature Education Area during the early part of the 20th century, the area was previously dominated by Lauro-Fagaceae association. This project is designed as a multidisciplinary project with the goal of understanding the effects of rehabilitating a *C. japonica* plantation as a mixed species plantation on above ground biomass, diversity of ground vegetation, ant population, soil physical and chemical properties, and mycorrhizae population. The experiment will be set up as a one-factorial completely randomized design at a forest stand of 1.7 ha, where all *C. japonica* trees will be removed. A hardwood and a softwood species will be planted with fixed density but at different spatial arrangements. Prior to rehabilitation, 25 healthy and 25 squirrel damaged *C. japonica* trees are retained for stem analysis to reconstruct height growth models to understand the effects of squirrel damage on height growth.

A Stereodendrometer: binocular vision with spherical panoramas for extracting tree attributes

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Abstract

This study applied the principle of binocular vision to extract tree distance and diameter under forest canopies from two spherical panoramas taken at a known vertical distance. The geometry was first comprehensively reported. Twenty-three plots were randomly established in *Cryptomeria japonica* plantations. Sample trees were selected with a small basal area factor (BAF) for measuring diameter at breast height and horizontal distance, and were subsampled with a larger BAF for upper stem diameters. Results indicated that precision decreased with trees further away from a plot center. Tree distance could be accurately and precisely estimated up to a distance of about 10 m. Tree diameters could be accurately and precisely estimated when a tree was within 5 m from plot center or its diameter was less than 20 cm. A likely source of error is the failure to maintain the required vertical displacement between panoramas due to difficult terrain.

Challenges of opening university forests to public and its solutions:
A case of Duke University and Warren Wilson College in USA

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Abstract

It is deeply concerned that opportunity of experience nature is declining consistently across the world. In such situation, university forests might be able to provide a precious experience in the forest to citizens. However, there exists some difficulties for university forests to open their forests to public, such as inappropriate use and liability in case of accident. To explore how university forests which can open themselves to public, this study analyses two cases in USA, Duke University (DU) and Warren Wilson College (WWC). To regulate citizen's use properly, zoning and local rule were applied in both cases, however, how to ensure the regulations seems to be a challenge. To avoid university's liability, different policies are found among two cases. DU applies 'easement' on their land and WWC holds up a policy; not to invite, not to advertise and not to charge. Legal adequateness should be investigated carefully when applying.

Field Excursion

The National Institute of Ecology

The National Institute of Ecology is a high-quality ecological research, exhibition and education space where visitors can observe and experience the five major climates of the world including the Korean Peninsula ecosystem, tropical, desert, Mediterranean, temperate and polar region. Leading researches on domestic and world ecosystem and enhancing national competitiveness, it contributes to the preservation of the environment and the development of the right environment consciousness by providing various experiences and learning places for the people. The National Ecology Park was established in Seochon, Chungcheongnam-do to carry out ecological research and research, restoration of ecosystem and technology development for restoration of ecosystem health.

Figure 1. Ecotium in National Institute of Ecology
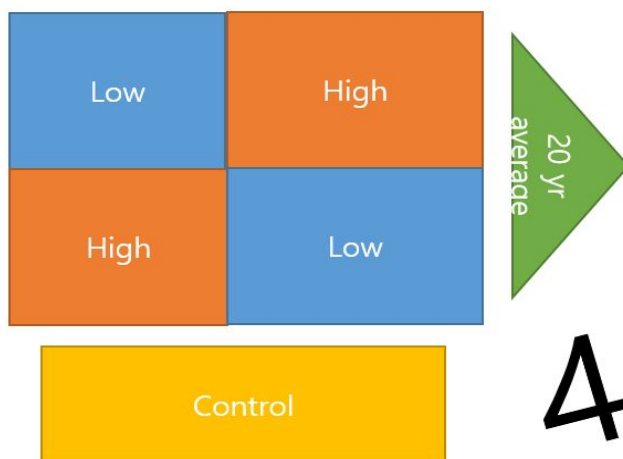
Experimental site in Mt. Jiri

Background: As the frequency and severity of meteorological disasters such as droughts and floods have increased recently, there has been an increasing need for research on ecosystem changes caused by such weather disasters As a part of national long-term ecological research projects, the National Institute of Ecology and Seoul National University are trying to study the physiological and ecological changes of trees through artificial drought treatment (drought) at Mt. Jiri Division of National Institute of Ecology.

Objectives: To measure and evaluate the changes in forest ecosystem due to the changes in rainfall pattern and intensity.

Rainfall control system: Transparent, lightweight and durable ceiling was constructed to control the rainfall intensity. After that, the environment of light and soil was homogenized.

	High intensity rainfall reduction	Low intensity rainfall reduction	20 year average precipitation	Control
Area(m^2)	180.5	180.5	152	152
Treatment	Approximately 80% of the ceiling portion is cover with transparent hard material.	Approximately 40 % of the ceiling portion is cover with transparent hard material.	Light intensity control similar to experiment plot + irrigation	Light intensity control similar to experiment plot

Assessment of plant water stress was evaluated by measurement of growth rates (morphological characteristics of leaves, height, biomass increment) and physiological responses (transpiration, photosynthesis capacity, stability isotope analysis)

Experimental site layout