



Seed plant diversity of different forest types in Liangshui National Natural Reserve

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Abstract

Background

Thirty years ago, there was a monograph of vegetation and plant diversity in the region prepared by the Department of Forestry at the Northeast Forestry University (unpublished), but the variety of plants in the region has changed significantly over the past 30 years. In future years, the authors hope to publish a new monograph and this research is to prepare for this work. This study aimed at reporting the characteristics of plant diversity in five different forest types in Liangshui National Natural Reserve, China, each with three 25 × 25 m tree quadrats, twelve 5 × 5 m wide shrub quadrats and twelve 1 × 1 m wide herbaceous quadrats. Censuses of each forest type were conducted in 2016.

New information

The five main forest types presented differences in structure, diversity and species richness.

Keywords

China, diversity, quadrat, Liangshui Natural Reserve, conservation, species inventory

Introduction

The Korean pine forest of Liangshui National Natural Reserve is the most important primitive broad-leaved Korean pine forest in China and it is also one of the modern Korean pine distribution centres (Liu 2015, Zhang et al. 2000). The primitive broad-leaved Korean pine forest area is less than 40000 hm² in China (Liu et al. 2014), while there are 4100 hm² in Liangshui National Natural Reserve, accounting for 11% of the country (Liu et al. 2014). Liangshui National Natural Reserve is rich in biodiversity, preserves several species of the Tertiary plant communities and has an irreplaceable role in maintaining global diversity (Chen et al. 2012, Liu et al. 1993, Ma et al. 2007, Wang 1981, Rong et al. 2009). Korean pine forest has existed on earth for at least 30 million years, but the existing broad-leaved Korean pine forests of the Reserve formed about 3000 years ago. The Korean pine forest in this area is young, the age of the oldest individual is no more than 500 years, with a 1.5 m breast diameter. The tree height here is 15-40 m and seeds produced per plant are about 30 kg (Liu 2015). Although the Liangshui National Nature Reserve is very important, research for the different forests is not comprehensive and the data of plant diversity are still insufficient. In this research, the plant diversity of five different forest types in this area were studied, which provided the basic data for the study of biodiversity in this area.

Project description

Title: Construction of Plant checklist Database in Heilongjiang Province

Personnel: Wang Hongfeng

Study area description: Liangshui National Natural Reserve is located in the southeastern of the Xiaoxing'anling Mountains in Heilongjiang Province, China (47°7'39"-47°14'22" N, 128°48'30"-128°55'50" E). It is made up of hills, the terrain is high in south and low in north. The average elevation is about 400 m, the highest elevation is 707.3 m, the lowest is 280 m, mountain slope is generally 10-15 degrees (The Compilation Group Physical Geography of China 1986). This area belongs to the temperate continental monsoon climate. The extreme minimum temperature is -43.9 °C and the extreme maximum temperature is 38.7 °C. The annual average temperature is about -0.3 °C, positive temperature accumulated is 2200-2600°C. The average annual precipitation is 676 mm, June-August precipitation accounted for more than 60% of annual precipitation. The relative humidity in Liangshui is about 78%. The average annual evaporation is 805 mm, the total sunshine hours are 1848h, frost-free period is 100-120 days, the annual snow period is 130-150 days, frozen soil depth is about 2 m (Liu et al. 2014, Su et al. 2006). The forest types in this region mainly include five types of forest, namely *Ulmus davidiana* var.

japonica—*Pinus koraiensis* forest (UPF), *Betula costata*—*Pinus koraiensis* forest (BPF), *Quercus mongolica*—*Pinus koraiensis* forest (QPF), *Fraxinus mandshurica*—*Pinus koraiensis* forest (FPF), *Tilia*—*Pinus koraiensis* forest (TPF).

Funding: Fundamental Research Funds for the Central Universities (2572015CA14); Construction of the plant checklist database in Heilongjiang province.

Sampling methods

Study extent: The dataset was collected between August 2016 and August 2017.

Sampling description: A square plot approach was chosen to sample forest diversity. A total of five major forest types were selected, namely *Ulmus davidiana* var. *japonica*—*Pinus koraiensis* forest, *Betula costata*—*Pinus koraiensis* forest, *Quercus mongolica*—*Pinus koraiensis* forest, *Fraxinus mandshurica*—*Pinus koraiensis* forest, *Tilia*—*Pinus koraiensis* forest. Each forest type was set with 3 tree quadrats, 12 shrub quadrats with sampling from all the four corners and 12 herbaceous quadrats. The size of the tree quadrat was 625 m² (25 × 25 m) which had four shrub plots (5 × 5 m) distributed on the four corners. Shrub plots 25 m² which also had four herbaceous plots (1 × 1 m) distributed on the four corners. The plant species name were identified according to *The researches of liangshui natural* (Ma 1993), *Arbor flora of Heilongjiang Province* (Zhou 1986), *Flora plantarum herbacearum chinae boreali-orientalis* (Liou 1959), *Silva of Heilongjiang* (Zhou 1985), *Flora of China* (Wu et al. 2013), *Key of Plants of Northeastern China* (Fu 1995), *Flora Republicae Popularis Sinicae* (Editorial Committee of Flora of China of Chinese Academy Science 2004) and a plant checklist was obtained by survey. The number and height of each species were recorded for all plots, the crown of the trees was recorded, the coverage and total coverage of shrubs and herbs were also recorded.

Quality control: The present dataset was updated to match the APGIV classification of angiosperm families (The Angiosperm Phylogeny Group 2016) and all species names were checked for validity (spelling and authorship) against online databases (<http://tnrs.iplantcollaborative.org/index.html>, <http://ipni.org>, <http://plants.jstor.org>, <http://www.ville-ge.ch/musinfo/bd/cjb/africa/recherche.php>).

Step description: The dataset presented here was collected over a period of one year.

Geographic coverage

Description: Data was collected in five different forest types (*Ulmus davidiana* var. *japonica*—*Pinus koraiensis* forest, *Betula costata*—*Pinus koraiensis* forest, *Quercus mongolica*—*Pinus koraiensis* forest, *Fraxinus mandshurica*—*Pinus koraiensis* forest, *Tilia*—*Pinus koraiensis* forest) across the reserve as illustrated in Table 1 Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, Table 8, Table 9, Table 10, Table 11 and Table 12 .

Table 1.

Basic description of five forest types in Liangshui National Natural Reserve, where: UPF = *Ulmus davidiana* var. *japonica*—*Pinus koraiensis* forest; BPF = *Betula costata*—*Pinus koraiensis* forest; QPF = *Quercus mongolica*—*Pinus koraiensis* forest; FPF = *Fraxinus mandshurica*—*Pinus koraiensis* forest; TPF = *Tilia*—*Pinus koraiensis* forest.

Forest types	Habitat	Coverage of shrub layer	Coverage of herb layer	Soil
UPF	River bank or valley	40-50%	About 60%	Gravel soil, thick and humid, about 50-60 cm
BPF	Medium or gentle slope	50-60%	40-50%	Dark brown soil, fertility, about 25-30 cm
QPF	Sunny and steep slope	About 30%	30-40%	Gravel soil, barren and dry, 25-30 cm
FPF	River bank or valley	40-50%	About 60%	Gravel soil, thick and humid, about 50-60 cm
TPF	Medium or gentle slope	50-60%	40-50%	Dark brown soil, fertility, about 25-30 cm

Table 2.

Geographical coordinates of quadrats of five forest types in Liangshui National Natural Reserve.

Forest type	Plot number	North latitude	East longitude
UPF	04-T	47°11'33.52"N	128°52'55.85"E
	11-T	47°11'2.41"N	128°53'59.93"E
	13-T	47°10'57.16"N	128°53'44.97"E
BPF	01-T	47°11'5.39"N	128°53'15.30"E
	12-T	47°11'0.43"N	128°53'45.52"E
	03-T	47°11'43.98"N	128°52'59.89"E
QPF	02-T	47°11'57.73"N	128°53'29.72"E
	14-T	47°8'32.22"N	128°54'3.04"E
	15-T	47°8'41.58"N	128°53'50.70"E
FPF	06-T	47°11'43.84"N	128°53'16.33"E
	07-T	47°10'56.62"N	128°53'32.46"E
	08-T	47°10'44.92"N	128°53'36.05"E
TPF	05-T	47°11'44.71"N	128°53'20.16"E

	09-T	47°10'48.91"N	128°53'39.81"E
	10-T	47°11'0.32"N	128°53'47.68"E

Table 3.

The number of species in each family in Liangshui National Natural Reserve.

Family	Species richness
Rosaceae	11
Betulaceae	6
Umbelliferae	6
Pinaceae	5
Sapindaceae	5
Adoxaceae	3
Compositae	3
Cyperaceae	3
Fabaceae	3
Araliaceae	2
Asparagaceae	2
Dryopteridaceae	2
Gramineae	2
Oleaceae	2
Ranunculaceae	2
Rhamnaceae	2
Ruscaceae	2
Saxifragaceae	2
Tiliaceae	2
Ulmaceae	2
Urticaceae	2

Actinidiaceae	1
Amaranthaceae	1
Athyriaceae	1
Berberidaceae	1
Campanulaceae	1
Cannabaceae	1
Caprifoliaceae	1
Caryophyllaceae	1
Celastraceae	1
Cruciferae	1
Equisetaceae	1
Hydrangeaceae	1
Labiatae	1
Liliaceae	1
Malvaceae	1
Melanthiaceae	1
Oxalidaceae	1
Papaveraceae	1
Phrymaceae	1
Polemoniaceae	1
Primulaceae	1
Pteridaceae	1
Rubiaceae	1
Rutaceae	1
Salicaceae	1
Scrophulariaceae	1
Violaceae	1

Table 4.

The number of individuals in each family of tree in Liangshui National Natural Reserve.

Family	Number of individuals
Pinaceae	535
Sapindaceae	462
Betulaceae	226
Tiliaceae	119
Ulmaceae	96
Fabaceae	43
Oleaceae	22
Salicaceae	20
Rosaceae	10
Rhamnaceae	6
Rutaceae	1

Table 5.

The number of individuals in each family of shrub in Liangshui National Natural Reserve.

Family	Number of individuals
Araliaceae	177
Betulaceae	136
Adoxaceae	124
Caprifoliaceae	107
Rosaceae	77
Oleaceae	30
Berberidaceae	10
Sapindaceae	9
Hydrangeaceae	4

Celastraceae	3
Rhamnaceae	2
Actinidiaceae	1

Table 6.

The number of individuals in each family of herb in Liangshui National Natural Reserve.

Family	Number of individuals
Oxalidaceae	445
Umbelliferae	332
Cyperaceae	305
Saxifragaceae	237
Rosaceae	231
Papaveraceae	194
Athyriaceae	171
Ruscaceae	114
Urticaceae	113
Adoxaceae	101
Gramineae	98
Compositae	55
Ranunculaceae	54
Amaranthaceae	53
Pteridaceae	40
Dryopteridaceae	38
Rubiaceae	37
Melanthiaceae	35
Violaceae	32
Labiatae	29

Asparagaceae	16
Fabaceae	10
Campanulaceae	7
Caryophyllaceae	7
Cruciferae	7
Liliaceae	6
Malvaceae	5
Cannabaceae	4
Polemoniaceae	3
Primulaceae	3
Equisetaceae	2
Phrymaceae	2
Scrophulariaceae	1

Table 7.

The number of individuals in each species of tree in Liangshui National Natural Reserve. (Species names are checked by TPL)

Species	Number of individuals
<i>Acer pictum</i> subsp. <i>mono</i> Thunb.	270
<i>Picea koraiensis</i> Nakai	234
<i>Pinus koraiensis</i> Siebold & Zucc.	189
<i>Betula lenta</i> L.	162
<i>Acer ukurunduense</i> (Trautv. & C.A.Mey.) E.Murray	116
<i>Tilia amurensis</i> Rupr.	103
<i>Ulmus davidiana</i> var. <i>japonica</i> (Rehder) Nakai	80
<i>Acer tegmentosum</i> Maxim.	76
<i>Picea jezoensis</i> var. <i>microsperma</i> (Siebold & Zucc.) Carrière	72
<i>Betula platyphylla</i> Sukaczew	51

<i>Quercus mongolica</i> Fisch. ex Ledeb.	39
<i>Pinus sylvestris</i> var. <i>mongolica</i> Litv.	34
<i>Fraxinus mandshurica</i> Rupr.	22
<i>Populus davidiana</i> (Dode) C.K.Schneid.	20
<i>Tilia mandshurica</i> Rupr. & Maxim.	16
<i>Ulmus laciniata</i> (Trautv.) Mayr	16
<i>Betula dahurica</i> Pall.	9
<i>Larix gmelinii</i> (Rupr.) Kuzen.	6
<i>Rhamnus davurica</i> Pall.	6
<i>Amygdalus davidiana</i> (Carr.) Franch.	6
<i>Maackia amurensis</i> Rupr. et Maxim.	4
<i>Alnus hirsuta</i> (Spach) Rupr.	3
<i>Padus avium</i> L.	2
<i>Sorbus dacica</i> Borbás	2
<i>Alnus cremastogyne</i> Burkill	1
<i>Phellodendron amurense</i> Rupr.	1

Table 8.

The number of individuals in each species of shrub in Liangshui National Natural Reserve.

Species	Number of individuals
<i>Eleutherococcus senticosus</i> (Rupr. & Maxim.) Maxim.	165
<i>Corylus mandshurica</i> (Maxim.) C.K.Schneid.	136
<i>Sambucus williamsii</i> Hance	124
<i>Lonicera japonica</i> Thunb.	107
<i>Sorbaria sorbifolia</i> (L.) A.Braun	51
<i>Syringa reticulata</i> subsp. <i>amurensis</i> (Rupr.) P.S.Green & M.C.Chang	30
<i>Cerasus verecunda</i> Koehne	21

<i>Aralia elata</i> var. <i>glabrescens</i> (Miq.) Seem.	12
<i>Berberis ferdinandi-coburgii</i> C.K.Schneid.	10
<i>Acer tataricum</i> subsp. <i>ginnala</i> (Maxim.) Wesm.	6
<i>Acer pictum</i> subsp. <i>mono</i> Thunb.	4
<i>Deutzia glabrata</i> Kom.	4
<i>Spiraea thunbergii</i> Siebold ex Blume	4
<i>Euonymus alatus</i> (Thunb.) Siebold	3
<i>Rhamnus davurica</i> Pall.	2
<i>Rosa davurica</i> Pall.	1

Table 9.

The number of individuals in each species of herb in Liangshui National Natural Reserve.

Species	Number of individuals
<i>Oxalis griffithii</i> Edgew. & Hook. f.	445
<i>Carex leiorrhyncha</i> C.A.Mey.	279
<i>Ostericum sieboldii</i> (Miq.) Nakai	278
<i>Chrysosplenium lectusochleae</i> Kitag.	236
<i>Filipendula palmata</i> (Pall.) Maxim.	213
<i>Hylomecon japonica</i> (Thunb.) Prantl & Kündig	194
<i>Athyrium brevifrons</i> Nakai ex Kitag.	171
<i>Maianthemum bifolium</i> (L.) F.W.Schmidt	109
<i>Urtica angustifolia</i> Fisch. ex Hornem.	104
<i>Agrostis clavata</i> Trin.	97
<i>Adoxa moschatellina</i> L.	73
<i>Chenopodium album</i> L.	53
<i>Enemion raddeanum</i> Regel	52
<i>Sanicula rubriflora</i> F. Schmidt ex Maxim.	44

<i>Adiantum pedatum</i> L.	40
<i>Saussurea alatipes</i> Hemsl.	38
<i>Galium spurium</i> L.	37
<i>Paris verticillata</i> M.Bieb.	35
<i>Viola chaerophylloides</i> (Regel) W. Becker	32
<i>Meehania urticifolia</i> (Miq.) Makino	29
<i>Sambucus javanica</i> Blume	28
<i>Polystichum tripterum</i> (Kunze) C. Presl	27
<i>Carex breviculmis</i> R.Br.	23
<i>Parasenecio hastatus</i> (Linn.) H. Koyama	16
<i>Geum aleppicum</i> Jacq.	12
<i>Dryopteris crassirhizoma</i> Nakai	11
<i>Lathyrus davidii</i> Hance	10
<i>Polygonatum odoratum</i> (Mill.) Druce	10
<i>Urtica laetevirens</i> Maxim.	9
<i>Adenophora tetraphylla</i> (Thunb.) A.DC.	7
<i>Cardamine leucantha</i> (Tausch) O.E.Schulz	7
<i>Stellaria radians</i> L.	7
<i>Asparagus oligoclonos</i> Maxim.	6
<i>Lilium distichum</i> Nakai ex Kamib.	6
<i>Abutilon theophrasti</i> Medik.	5
<i>Agrimonia pilosa</i> Ledeb.	5
<i>Convallaria majalis</i> L.	5
<i>Humulus scandens</i> (Lour.) Merr.	4
<i>Carex siderosticta</i> Hance	3
<i>Heracleum hemsleyanum</i> Diels	3

<i>Ostericum grosseserratum</i> Maxim.	3
<i>Polemonium caeruleum</i> L.	3
<i>Trientalis europaea</i> (L.) U.Manns & Anderb.	3
<i>Aconitum volubile</i> Pall. ex Koelle	2
<i>Carum buriaticum</i> Turcz.	2
<i>Equisetum hyemale</i> L.	2
<i>Peucedanum praeruptorum</i> Dunn	2
<i>Phryma leptostachya</i> subsp. <i>asiatica</i> (Koidz.) Honda	2
<i>Artemisia stolonifera</i> Maxim.	1
<i>Chrysosplenium sinicum</i> Maxim.	1
<i>Fragaria orientalis</i> Losinsk.	1
<i>Miscanthus sacchariflorus</i> (Maxim.) Hack.	1
<i>Pseudolysimachion spurium</i> L.	1

Table 10.

The characteristics of tree community of five forest types in Liangshui National Natural Reserve, where: UPF = *Ulmus davidiana* var. *japonica*—*Pinus koraiensis* forest; BPF = *Betula costata*—*Pinus koraiensis* forest; QPF = *Quercus mongolica*—*Pinus koraiensis* forest; FPF = *Fraxinus mandshurica*—*Pinus koraiensis* forest; TPF = *Tilia*—*Pinus koraiensis* forest; DBH = diameter at breast height; N = number.

Families/Species	UPF		BPF		QPF		FPF		TPF	
	N	DBH (cm)	N	DBH (cm)	N	DBH (cm)	N	DBH (cm)	N	DBH (cm)
Betulaceae										
<i>Alnus cremastogyne</i> Burkill	-	-	-	-	-	-	1	10.5	-	-
<i>Alnus hirsuta</i> (Spach) Rupr.	-	-	-	-	-	-	3	16.87	-	-
<i>Betula dahurica</i> Pall.	-	-	-	-	9	22.55	-	-	-	-
<i>Betula lenta</i> Ehrh.	-	-	112	18.56	28	22.96	4	13.8	18	10.14
<i>Betula platyphylla</i> Sukaczew	-	-	44	19.69	2	28	3	18.33	2	19.75

<i>Tilia amurensis</i> Rupr.	10	17.85	17	11.86	21	12.18	7	17.06	48	16.59
<i>Tilia mandshurica</i> Rupr. & Maxim.	-	-	-	-	2	14.5	1	3	13	10.23
Ulmaceae										
<i>Ulmus davidiana</i> var. <i>japonica</i> (Rehder) Nakai	45	19.35	1	25	13	37.52	12	6.86	9	4.38
<i>Ulmus laciniata</i> (Trautv.) Mayr	7	23.48	2	3.5	2	26	1	3	4	2.33

Table 11.

The characteristics of shrub community of five forest types in Liangshui National Natural Reserve, where: UPF = *Ulmus davidiana* var. *japonica*—*Pinus koraiensis* forest; BPF = *Betula costata*—*Pinus koraiensis* forest; QPF = *Quercus mongolica*—*Pinus koraiensis* forest; FPF = *Fraxinus mandshurica*—*Pinus koraiensis* forest; TPF = *Tilia*—*Pinus koraiensis* forest; N = number; H = high.

Families/Species	UPF		BPF		QPF		FPF		TPF	
	N	H (m)	N	H (m)	N	H (m)	N	H (m)	N	H (m)
Actinidiaceae										
<i>Actinidia kolomikta</i> (Rupr. & Maxim.) Maxim.	-	-	-	-	1	1.5	-	-	-	-
Adoxaceae										
<i>Sambucus williamsii</i> Hance	24	0.99	12	1.33	6	1.23	36	1.19	46	0.91
Araliaceae										
<i>Aralia elata</i> var. <i>glabrescens</i> (Miq.) Seem.	-	-	-	-	10	0.93	-	-	2	2
<i>Eleutherococcus senticosus</i> (Rupr. & Maxim.) Maxim.	51	1.1	14	0.65	15	0.41	60	0.82	25	0.75
Berberidaceae										
<i>Berberis ferdinandi-coburgii</i> C.K.Schneid.	-	-	-	-	-	-	10	0.47	-	-
Betulaceae										
<i>Corylus mandshurica</i> (Maxim.) C.K.Schneid.	23	1.87	23	1.8	45	1.47	16	0.95	29	2.04
Caprifoliaceae										
<i>Lonicera japonica</i> Thunb.	24	0.9	18	0.83	40	1.38	20	0.93	5	1
Celastraceae										
<i>Euonymus alatus</i> (Thunb.) Siebold	-	-	2	1.5	-	-	-	-	1	3.5

Hydrangeaceae										
<i>Deutzia glabrata</i> Kom.	-	-	-	-	4	0.4	-	-	-	-
Oleaceae										
<i>Syringa reticulata</i> subsp. <i>amurensis</i> (Rupr.) P.S.Green & M.C.Chang	4	5	15	2.54	11	1	-	-	-	-
Rhamnaceae										
<i>Rhamnus davurica</i> Pall.	2	1.8	-	-	-	-	-	-	-	-
Rosaceae										
<i>Cerasus verecunda</i> Koehne	9	0.7	-	-	-	-	12	0.55	-	-
<i>Rosa davurica</i> Pall.	-	-	-	-	1	0.8	-	-	-	-
<i>Sorbaria sorbifolia</i> (L.) A.Braun	7	1.45	37	1.15	-	-	7	1.2	-	-
<i>Spiraea thunbergii</i> Siebold ex Blume	-	-	-	-	-	-	4	0.8	-	-
Sapindaceae										
<i>Acer pictum</i> subsp. <i>mono</i> Thunb.	-	-	4	1.75	-	-	-	-	-	-
<i>Acer tataricum</i> subsp. <i>ginnala</i> (Maxim.) Wesm.	-	-	-	-	5	1.2	-	-	-	-

Table 12.

The characteristics of herb community of five forest types in Liangshui National Natural Reserve, where: UPF = *Ulmus davidiana* var. *japonica*—*Pinus koraiensis* forest; BPF = *Betula costata*—*Pinus koraiensis* forest; QPF = *Quercus mongolica*—*Pinus koraiensis* forest; FPF = *Fraxinus mandshurica*—*Pinus koraiensis* forest; TPF = *Tilia*—*Pinus koraiensis* forest; N = number=N; H = high.

Families/Species	UPF		BPF		QPF		FPF		TPF	
	N	H(m)	N	H(m)	N	H(m)	N	H(m)	N	H(m)
Adoxaceae										
<i>Adoxa moschatellina</i> L.	13	0.06	9	0.03	38	0.07	1	0.15	12	0.14
<i>Sambucus javanica</i> Blume	25	0.3	1	0.3	-	-	2	0.3	-	-
Amaranthaceae										
<i>Chenopodium album</i> L.	18	0.28	-	-	-	-	24	0.22	11	0.17

<i>Aconitum volubile</i> Pall. ex Koelle	-	-	-	-	-	-	-	-	2	0.5
<i>Enemion raddeanum</i> Regel	5	0.15	11	0.23	3	0.1	33	0.26	-	-
Rosaceae										
<i>Agrimonia pilosa</i> Ledeb.	5	0.25	-	-	-	-	-	-	-	-
<i>Filipendula palmata</i> (Pall.) Maxim.	33	0.41	36	0.27	37	0.22	97	0.22	10	0.33
<i>Fragaria orientalis</i> Losinsk.	-	-	-	-	1	0.15	-	-	-	-
<i>Geum aleppicum</i> Jacq.	12	0.43	-	-	-	-	-	-	-	-
Rubiaceae										
<i>Galium spurium</i> L.	-	-	-	-	33	0.15	-	-	4	0.02
Ruscaceae										
<i>Maianthemum bifolium</i> (L.) F.W.Schmidt	5	0.07	89	0.05	-	-	4	0.04	11	0.05
<i>Convallaria majalis</i> L.	-	-	-	-	3	0.2	2	0.15	-	-
Saxifragaceae										
<i>Chrysosplenium lectus-cochleae</i> Kitag.	127	0.13	4	0.2	-	-	15	0.19	90	0.12
<i>Chrysosplenium sinicum</i> Maxim.	1	0.18	-	-	-	-	-	-	-	-
Scrophulariaceae										
<i>Pseudolysimachion spurium</i> L.	-	-	-	-	-	-	-	-	1	0.6
Umbelliferae										
<i>Carum buriaticum</i> Turcz.	-	-	2	0.45	-	-	-	-	-	-
<i>Heracleum hemsleyanum</i> Diels	-	-	-	-	-	-	3	0.3	-	-
<i>Ostericum grosseserratum</i> Maxim.	-	-	-	-	3	0.06	-	-	-	-
<i>Ostericum sieboldii</i> (Miq.) Nakai	38	0.09	63	0.09	30	0.08	35	0.08	112	0.07
<i>Peucedanum praeurptorum</i> Dunn	-	-	-	-	2	0.2	-	-	-	-
<i>Sanicula rubriflora</i> F. Schmidt ex Maxim.	7	0.18	-	-	1	1.2	36	0.18	-	-
Urticaceae										
<i>Urtica angustifolia</i> Fisch. ex Hornem.	20	0.4	-	-	17	0.25	24	0.3	43	0.39

<i>Urtica laetevirens</i> Maxim.	5	0.65	-	-	-	-	1	0.04	3	0.4
Violaceae										
<i>Viola chaerophylloides</i> (Regel) W. Becker	4	0.1	6	0.25	22	0.2	-	-	-	-

Coordinates: and Latitude; and Longitude.

Taxonomic coverage

Description: The dataset contains a total of 5007 tagged individuals representing 95 total taxa identified to species level belonging to 48 families and 78 genera (see Suppl. material 1).

Temporal coverage

Notes: Data range: 1 August 2016 - 1 August 2017.

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Data resources

Data package title: List of all individuals established in all 5 forest types in Liangshui National Natural Reserve.

Number of data sets: 1

Data set name: raw_data_Lsnnr.xls - Download file

Column label	Column description
Forest type	Forest community types
Family_name	Plant family for the species following APG IV
Genus_name	Full scientific name of the genera in which the taxon is classified
Species_name	Name of the identified species
Plot number	Transect number
Quadrat size	Quadrat size in metres
Diameter at breast height (cm)	Diameter at breast height in centimetres

High (m)	Height of vegetations in metres
Canopy diameter (m)	Canopy diameter in metres
Number	The number of the plant
Total coverage	Coverage of all species in each quadrat
Coverage	Coverage of each species

References

- Chen BB, Zhao XH, Ni RQ, Huang Z (2012) Composition and spatial pattern of tree seedlings in Korean Pine broadleaved forest in Changbai Mountains. *Journal of Northeast Forestry University* 40 (10): 39-42.
- Editorial Committee of Flora of China of Chinese Academy Science (2004) *Flora Republicae Popularis Sinicae*. Science Press, Beijing.
- Fu PY (1995) *Key of Plants of Northeastern China*. Science Press, Beijing.
- Liou T (1959) *Flora Plantarum Herbacearum Chinae Boreali-Orientalis*. 1. Science Press
- Liu JC, Zhang BW, Zhang P (1993) Scientific values and advantages of Liangshui Nature Reserve. *Chinese Journal of Wildlife* 1: 4-5.
- Liu M, Mao ZJ, Li Y, Li XH, Liu RP (2014) Climatic effects on radial growth of Korean pines with different bark forms in Liangshui Natural Reserve, northeast China. *Chinese Journal of Applied Ecology* 25 (9): 2511-2520.
- Liu ZQ (2015) The structure dynamic and niche of insect community among different vegetation restoration practices in Liangshui Natural Reserve[PhD]. *Northeast Forestry University* 9-12.
- Ma JZ (1993) *The Researches of Liangshui Natural*. Northeast Forestry University Press, Harbin, China.
- Ma YX, Cai TJ, Tan XJ, Song LP, Yu XL (2007) A research on spermatophyte flora of primary broad-leaved and Korean pine forest in Liangshui Natural Reserve. *Journal of Northeast Normal University* 39 (1): 84-90.
- Rong K, Ma JZ, Cheng Z (2009) Nest-site selection by the Eurasian red squirrels (*Sciurus vulgaris*) in Liangshui Nature Reserve. *Acta Theriologica Sinica* 29: 32-39.
- Su HJ, Ma JZ, Zou HF, Wei QL (2006) A field study on retrieved-caches of squirrel (*Sciurus vulgaris*) and their survival strategy in winter in Liangshui National Nature Reserve, North-eastern China. *Acta Theriologica Sinica* 26 (3): 262-266.
- The Angiosperm Phylogeny Group (2016) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181: 1-20.
- The Compilation Group Physical Geography of China (1986) *Physical Geography of China*. The second edition. Higher Education Press, Beijing, 161-182 pp.
- Wang YQ (1981) Brief introduction of present situation and planning in Liangshui Nature Reserve. *Chinese Journal of Wildlife* 2: 8-9.
- Wu Z, Raven PH, Hong DY (2013) *Flora of China*. Science Press, Beijing.

- Zhang HQ, An LJ, Zu YG (2000) RAPD analysis on genetic variation of *Pinus koraiensis* in Liangshui National Natural Reserve. Bulletin of Botanical Research 20 (2): 201-206.
- Zhou YL (1985) Arbor flora of Heilongjiang Province. Heilongjiang Science & Technology Press, Harbin.
- Zhou YL (1986) Silva of Heilongjiang. Heilongjiang Science & Technology Press, Harbin.

Supplementary material

Suppl. material 1: List of all plants recorded in all 5 forest types in Liangshui National Natural Reserve. [doi](#)

Authors: Wang Hongfeng & Dong Xueyun

Data type: Excel file of List of all plants recorded in all 5 forest types in Liangshui National Natural Reserve

Brief description: This is the raw dataset of each plant individual recorded with their diameter at breast height, high, canopy diameter, as well as all shrubs and herbs recorded with their coverage, total coverage, number, height.

Filename: Suppl. material.xls - [Download file](#) (297.50 kb)