



Round table: Results and
potential of solid biomass in
Kyrgyzstan

National forest inventory in
Kyrgyzstan

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National forest inventory in Kyrgyzstan



The National Forest Inventory and monitoring is a system for monitoring, evaluating and forecasting the state and dynamics of changes in the state forest fund, specially protected natural territories, forests located on lands of other categories of the land fund, in order to effectively protect, reproduce and rational using forest resources (Forest Code of the Kyrgyz Republic)

The First National Forest Inventory

Years of the event: 2008-2010

Contractor: Department of Forestry Management of the State Forest Agency

Technical and financial support: FAO, SAEPP, Kumtor Gold Company

The Second National Forest Inventory

Years of the event: 2020-2023

Contractor: UNIQUE land use + CAREC branch in Kyrgyzstan

Technical and financial support: World bank



National forest inventory in Kyrgyzstan



The purpose of the 2nd National Forest Inventory is to ensure the sustainable development of the forest sector, the conservation of biological diversity through the creation of a reliable, reliable and up-to-date information base on the state of forests, their quantitative and qualitative characteristics, the introduction of principles of ecosystem services and adaptation to climate change.

- The NFI provides accurate and up-to-date information that should inform national and regional/local government authorities to improve environmental protection policies, as well as to monitor the effectiveness of forest policy measures.
- The NFI raises awareness not only among stakeholders and the forest and environment sector, but also among concerned citizens and the general public.
- National forest inventories follow a data collection methodology based on the statistical method of forest inventory using remote sensing and GIS to provision national and international forest information needs.



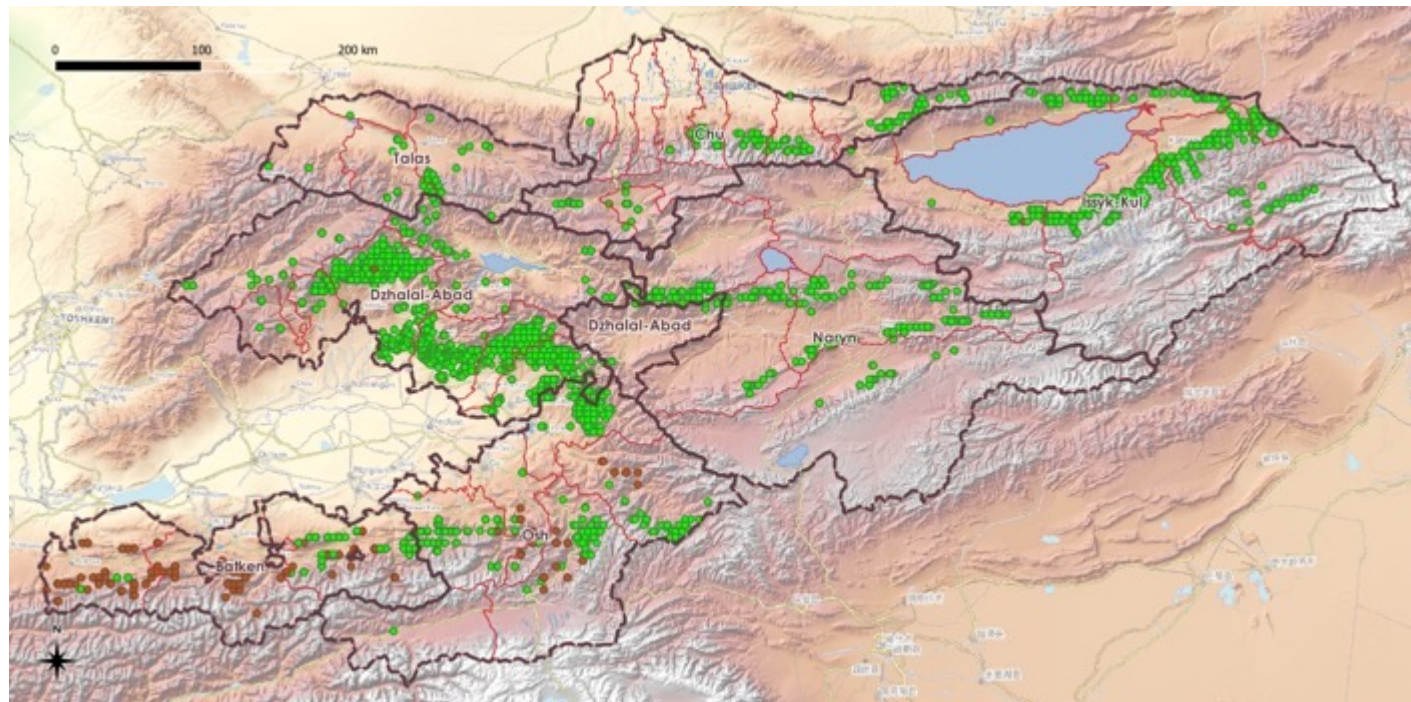
Overview on assessed sampling elements



Item	Amount
Number of NFI #2 tracts established in the grid	9,990
There of NFI#1 tracts	776
Number of NFI #2 plots established	30,694
Thereof NFI#1 plots	3,081
Number of NFI #2 tracts pre-clarified as forest	1,309
Number of NFI #2 plots pre-clarified as forest	2,653
Number of NFI #2 plots pre-clarified as forest and accessible	2,489
Number of NFI #2 tracts assessed in the field	1,244
Number of NFI #2 plots assessed in the field	2,289
Thereof NFI#1 plots	210
Number of NFI #2 plots accessible & measured in the field	2,235
Number of trees measured	13,757
Number of unique tree species	36
Number of stumps measured	1,346
Number of standing deadwoods measured	493
Number of lying deadwoods measured	686
Number of unique shrub species measured	26
Number of unique species found in the regeneration	34



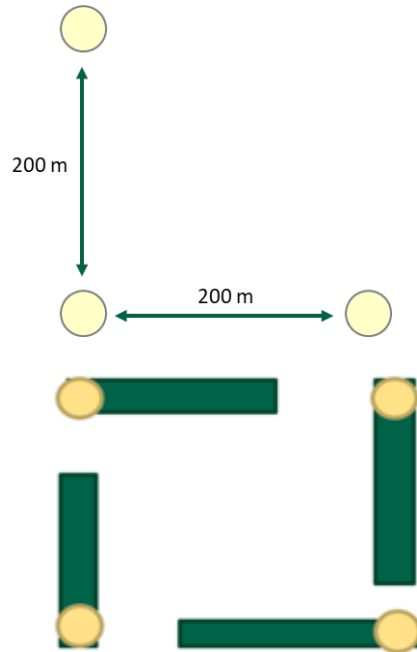
A map of all forest tracts estimated in 2020 and 2021



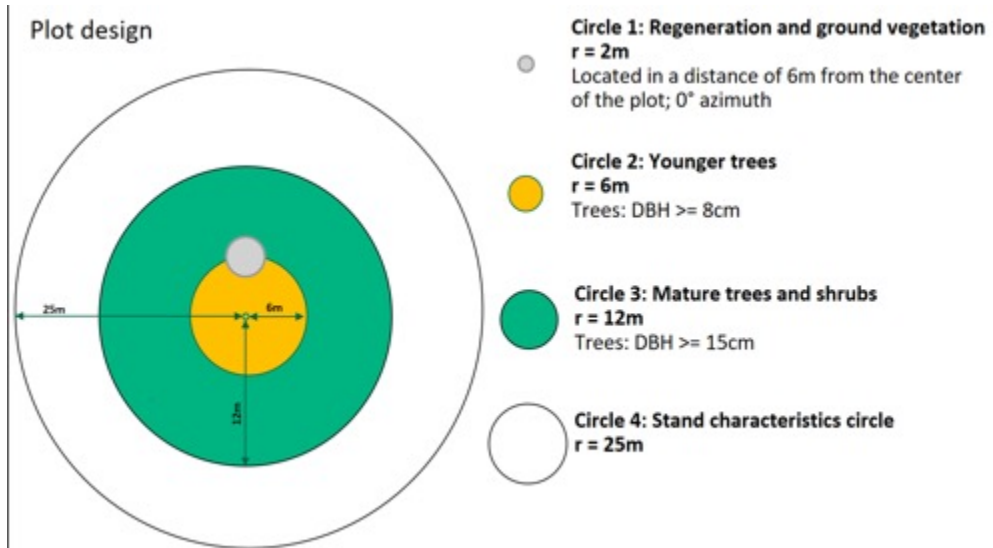
- Forest and accessible tracts
- Forest and inaccessible tracts



NFI #2: Design of standard tract and three trial plots



Combining the trial plots of the **NFI #2** and **NFI #1**





The results of processing satellite images



Land classification results

- The land cover and Main Forest Formation classification (LCC) based on satellite images (ESA Sentinel-2) allowed to improve the pre-stratification and improved the estimation of forest area and the area of the six Main Forest Formations.
- Finally, these area values are used for a post-stratification of the field data resulting in a reduction of the sampling error.

Value	Pixel count	% Class	Area (ha)
110 - Spruce-Fir Forest	31,159,733	1.56	311,407
120 - Juniper forests	44,018,670	2.20	439,898
130 - Walnut forests	5,765,546	0.29	57,659
140 - Pistachio forests	11,323,644	0.57	113,196
150 - Other mixed broadleaved forests	27,136,908	1.36	271,205
200 - Other wooded land / Shrub forests	68,906,653	3.45	688,585
Tree cover and Forest	188,311,154	9.42	1,881,949
Total country	1,999,674,463	100.00	19,981,630



Results – From forest cover to woodland



	Area (ha)	Area country (%)
Land cover classification = tree cover and forest map	1,881,949	9.4%
<i>minus</i> Trees out side forest (< 0.2 ha)	164,382	0.8%
Forest area (FAO + national > 0.2 ha)	1,717,567	8.6%
<i>minus</i> Orchards + other plantations (national land balance)*	76,680	0.4%
Forest area (national land balance)	1,640,887	8.2%

*) amount unclear and not mappable via LCC

*) document # 253-p dated 2022 "On the land balance of Kyrgyzstan"



Results - Forest Area by Main Forest Formations



- Following the FAO and national forest definition forests and shrub forests cover 1.72 Mio ha or 8.60% of the country's area on NFI #2.
- Considering ca. 76,680 ha* orchards + fruit plantations the resulting forest area can be estimated to 1.64 Mio ha or 8.2%.

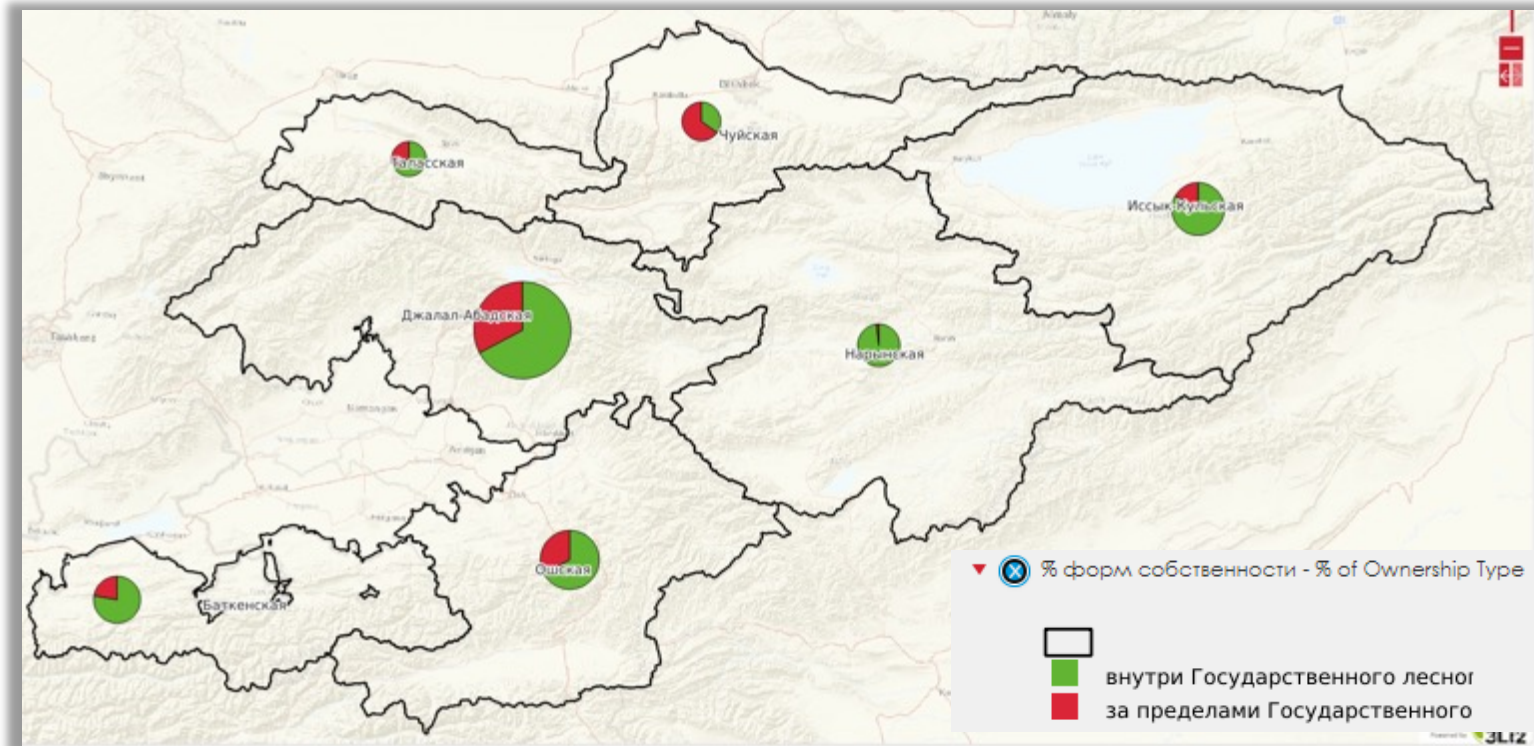
Main Forest Formations	Forest area (FAO + national) (>= 0.2 ha)		
	ha	in %	% of country
Spruce & Fir Forest	284,453.1	16.6	1.4
Juniper Forest	420,299.6	24.5	2.1
Walnut Forest	69,438.9	4.0	0.3
Pistachio Forest	62,763.5	3.7	0.3
Other broadleaved and mixed Forest	235,458.5	13.7	1.2
Shrub Forest	645,153.3	37.6	3.2
Total forest area (FAO+national)	1,717,566.9	100.0	8.6
- orchards, fruit plantations*	76,680.0	4.5	0.4
Forest area (national statistic)	1,640,886.9	95.5	8.2



Results of the NFI#2 – Forest Area



- Absolute [1000 ha] area of forest and shrub-forest per ownership type by oblast





Aboveground carbon by “ownership type”



Result type and unit	SFF	Outside SFF	Total
CO2-equiv. trees [t/ha]	58.83	36.74	52.35
CO2-equiv. trees [1000 t]	71,411.5	18,502.8	89,914.3
MOE95±[%] trees	4.3	13.8	4.0
CO2-equiv. shrubs [t/ha]	4.49	5.90	4.90
CO2-equiv. shrubs [1000 t]	5,445.2	2,971.4	8,416.6
MOE95±[%] shrubs	8.1	15.9	5.6
CO2-equiv. trees & shrubs [t/ha]	63.31	42.64	57.25
CO2-equiv. trees & shrubs [1000 t]	76,856.7	21,474.3	98,331.0

In Kyrgyzstan the total aboveground carbon in trees and shrubs is 98,331.0 thousand tons CO₂-equivalents, or, expressed per area, 57.25 t/ha CO₂-equivalents.

The majority with 76,856.7 thousand tons occurs in State Forest Fund, in forests outside State Forest Fund 21,474.3 thousand tons are stored.

The oblast with the highest storage is Dzhahalal-Abad with 36,380.8 thousand tons, followed by Issyk-Kul with 27,987.2 thousand tons.



Aboveground carbon by main forest formation



Result type and unit	Spruce-Fir Forests	Juniper Forests	Walnut Forests	Pistachio & Almond Forests	Other mixed broadleaved Forests	Shrub Forests	Total
CO2-equiv. trees [t/ha]	190.77	25.63	158.59	4.57	46.97	0.47	52.35
CO2-equiv. trees [1000 t]	49,035.8	12,412.4	14,475.1	189.8	13,537.7	263.5	89,914.3
MOE95[%] trees	4.3	11.1	8.2	13.0	16.6	38.1	4.0
CO2-equiv. shrubs [t/ha]	2.46	4.39	1.48	1.02	3.88	7.86	4.90
CO2-equiv. shrubs [1000 t]	631.3	2,124.0	135.1	42.3	1,119.3	4,364.7	8,416.7
MOE95[%] shrubs	1.4	12.5	5.3	11.6	23.9	10.0	5.6
CO2-equiv. trees & shrubs [t/ha]	193.23	30.02	160.07	5.59	50.85	8.33	57.25
CO2-equiv. trees & shrubs [1000 t]	49,667.1	14,536.4	14,610.2	232.1	14,657.0	4,628.2	98,331.0

In Kyrgyzstan the total aboveground carbon in trees and shrubs is 98,331.0 thousand tons CO₂-equivalents. Most carbon in trees and shrubs occurs in the Main Forest Formation Spruce-Fir Forests with 49,667.1 thousand tons CO₂-equivalents.

The oblast with the highest total aboveground carbon in trees and shrubs is Dzhalal-Abad with 36,380.8 thousand tons.

The Main Forest Formation in an oblast with the highest aboveground carbon in trees and shrubs is Issyk-Kul with 10,313.4 thousand tons. 12



Results of NFI #2: Volume + volume increment by Main Forest Formation



Result type and unit	Spruce-Fir forests	Juniper forests	Walnut forests	Pistachio forests	Other mixed broadleaved forests	Shrub forests	Total forests
Tree volume [1000 m³]	46,547.6	10,199.8	9,712.5	94.7	9,548.4	186.6	76,289.6
<i>in % of total forest</i>	61.0	13.4	12.7	0.1	12.5	0.2	100
Tree volume [m³/ha]	181.1	21.1	106.4	2.3	33.1	0.3	57.4
<i>in % of total forest</i>	316	37	185	4	58	1	100
Volume increment [1000 m³/a]	897.8	263.8	255.5	4.2	325.3	10.1	1,756.90
<i>in % of total forest</i>	51.1	15.0	14.5	0.2	18.5	0.6	100
Volume increment [m³/ha/a]	3.5	0.5	2.8	0.1	1.1	0.0	1.0
<i>in % of total forest</i>	350	50	280	10	110	2	100
CO2-equivalent increment [1000 t/a]	952.0	320.7	375.5	8.2	475.2	14.5	2146.1
<i>in % of total forest</i>	44	15	17	0.1	22	1	100
CO2-equivalent increment [t/ ha/a]	3.7	0.7	4.1	0.2	1.6	0.03	1.3
<i>in % of total forest</i>	285	54	315	15	123	2	100

- Standing tree volume is 76,289,000 m³, 61% are in Spruce-Fir forests.
- Volume increment is 1,756.900 m³ and the Co2-equivalent increment is 2,146.100 t dry; Volume increment is 1.0 m³/ha.
- Highest in Spruce-Fir forests (3.5 m³/ha) and high in Walnut forests (2.8 m³/ha)
- In the Pistachio forests and in Shrub forests the volume increment is extremely low.



Results of NFI #2: – Indicators of biodiversity



A dead tree as an indicator of biodiversity In the whole of Kyrgyzstan

- the total volume of dead wood is 4.22 m³/ha:
- 3.12 m³/ha falls on recumbent deadwood and 1.10 m³/ha on standing deadwood.

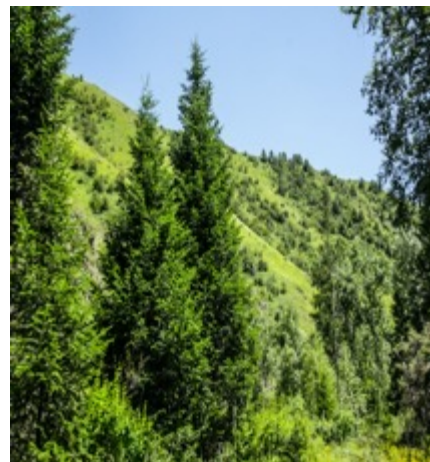
Forest formations	Dead wood	Volume (m ³ /ha)	Volume (m ³)
Spruce-Fir Forests	Lying deadwood	14.43	3,708,649
	Standing deadwood	3.18	816,549
Juniper Forests	Lying deadwood	1.40	679,792
	Standing deadwood	1.00	484,430
Walnut Forests	Lying deadwood	4.54	414,220
	Standing deadwood	3.13	285,315
Pistachio & Almond Forests	Lying deadwood	0.0	0
	Standing deadwood	0.0	0
Other mixed broadleaved Forests	Lying deadwood	1.69	486,497
	Standing deadwood	0.96	276,807
Shrub Forests	Lying deadwood	0.12	68,705
	Standing deadwood	0.05	27,309
Total	Lying deadwood	3.12	5,357,863
	Standing deadwood	1.10	1,890,409



Results of NFI #2: Comparison with NFI #1



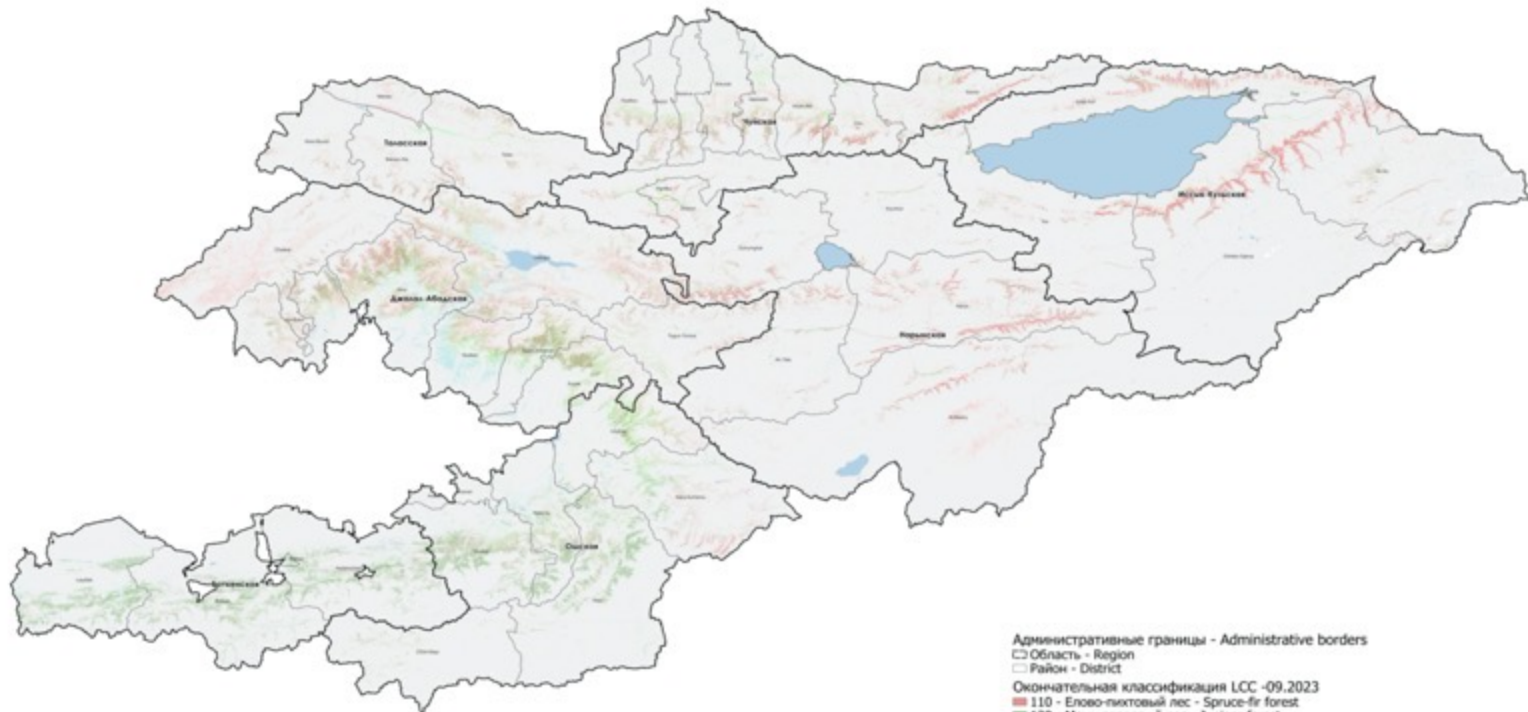
	NFI#1 2009	NFI#2 2023
Forest Area [1000 ha]	1,298.1	1,717.57
Forest Area [in % of country]	6.5	8.6
Standing tree volume [1000 m ³]	49,000.0	76,289.6
Standing tree volume MOE95%	----	3.97
Standing tree volume /ha	37.7	44.4
Shrub biomass [1000 t]	1,736.7	4,883.9
N trees	225,976,364	325,755,474
N trees / ha	168	190
Regeneration [N trees]	488,117,000	525,724,906
Regeneration [N trees / ha]	376	306





NFI#2 Кыргызстан - окончательная классификация растительного покрова

NFI#2 Kyrgyzstan - Final Land Cover Classification



Административные границы - Administrative borders

▣ Область - Region

▣ Район - District

Окончательная классификация LCC -09.2023

- 110 - Елово-пихтовый лес - Spruce-fir forest
- 120 - Можжевеловый лес - Juniper forest
- 130 - Ореховый лес - Walnut Forest
- 140 - Фисташковый лес - Pistachio Forest
- 150 - Другие Смешанные широколиственные леса - Other Mixed broadleaved forests
- 200 - Кустарниковые леса - Shrub Forests
- 300 - Ледники и снег - Glaciers and Snow
- 301 - Скалы и голая почва - Rocks and Bare Soil
- 400 - Пахотные земли - Arable Land
- 401 - Пастбища/Пастбища - Pasture/Grassland
- 510 - Расчеты - Settlement
- 600 - Водоемы - Waterbodies





Thank you for your
attention!

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