

**International Cross Calibration Course
on Crown Condition for Mediterranean Countries
Forest School of National forest Service “La Marsiliana”
28-30 September 2009**



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Division 6^ (NFI, CONECOFOR and Environmental Monitoring)**



Corpo Forestale dello Stato
Ispettorato Generale



The National Forest Corps (Corpo forestale dello Stato - CFS) is a state police force operating under civil law.

It's specialised in the protection of natural and landscape heritage and in the prevention and repression of offences occurring in the environmental and agro-food field.

The CFS has a long history of forest protection covering all activities aimed at the protection of the country's agro-environmental resources and wildlife.



Corpo Forestale dello Stato
Ispettorato Generale

The Corps is in charge of supervising Parks, Wildlife Sanctuaries and State-owned Nature Reserves. It carries out anti-poaching tasks to protect game and control river fishing.

As well as these historic tasks, the CFS is now called upon to meet the citizens' needs in terms of food security as well as the control of the international trade in endangered species of wild fauna and flora, as laid down by the Washington Convention (CITES).





Corpo Forestale dello Stato
Ispettorato Generale

The Corps has law enforcement tasks and contributes to guarantee law and order, public security and emergency services mainly in the countryside. It's one of the 5 Police National Corps, with specific capacities in environmental sector. It's a member of the National and Provincial Law and Order and Public Security Committees and it is represented by its officials in the Inter-force Offices operating under the Italian Ministry of the Interior.





Corpo Forestale dello Stato
Ispettorato Generale



CFS carries out many activities in coordination with Civil Protection Authorities, Fire Brigades, Armed Forces and other police forces. It dedicates also men and means to the prevention and the repression of forest fire offences through its participation in the activities of Regional Anti Forest-Fire Operational Centres.





Structure of CFS

1 Central Administration (Headquarters), 15 Regional Coordination Offices, 76 Provincial Stations, 17 District Coordination Offices, 1.152 Municipal stations, 15 Territorial Coordination Offices for activities in protected areas, 25 CITES Certification Services and 19 Operational Units situated at the airport and harbour customs offices, 17 operational Centres and 44 Mechanised Anti Forest-fire Units. The total number of Forest Corps staff members is about to 8.000 units

Monitoring of environment and National Forest Inventory (INFC)

The 6th Division of CFS is charged to realizing the new NFI and the continuous monitoring of territory. A central office in Rome organizes and co-ordinates more than 100 field teams spread on all Italian provinces.

Every team field is provided with modern monitoring tools (e.g. GPS instruments) and it is frequently trained in specific training course on monitoring topics.

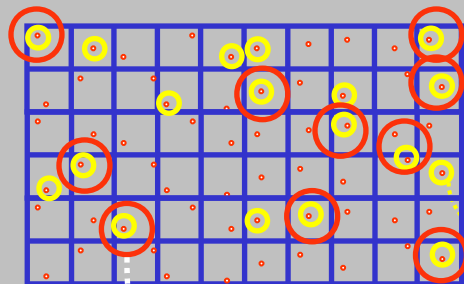
The main monitoring activities foreseen for 2009 are:

- Survey of fire affected forest areas;
- Survey of uncontrolled waste fields;
- Monitoring of rivers and lakes to assess the quality of water
- INFC (monitoring of forest soil organic carbon content)



INFC: STRATIFIED THREE-PHASE SAMPLING DESIGN

Phase 1 : Land Cover classification



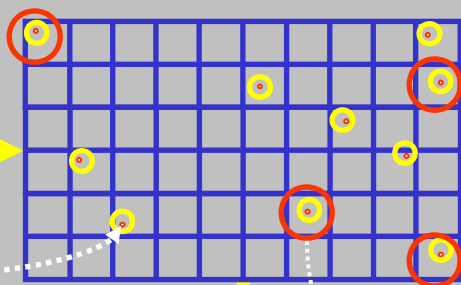
301,000 sampling points

randomly selected within each square of the grid

by photo-interpretation

Forest and other wooded land points

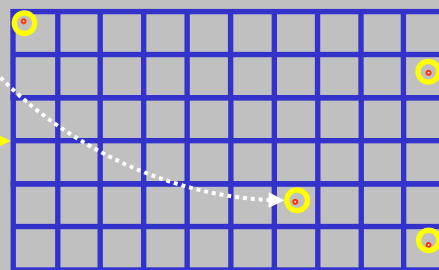
Phase 2 : Forest Classification and qualitative attributes



30,000 sampling points

randomly selected within the stratum of forest and other wooded land

Phase 3: Attributes measurement



~ 8,000 sampling points

selected within the stratum of the second phase points

by ground surveys

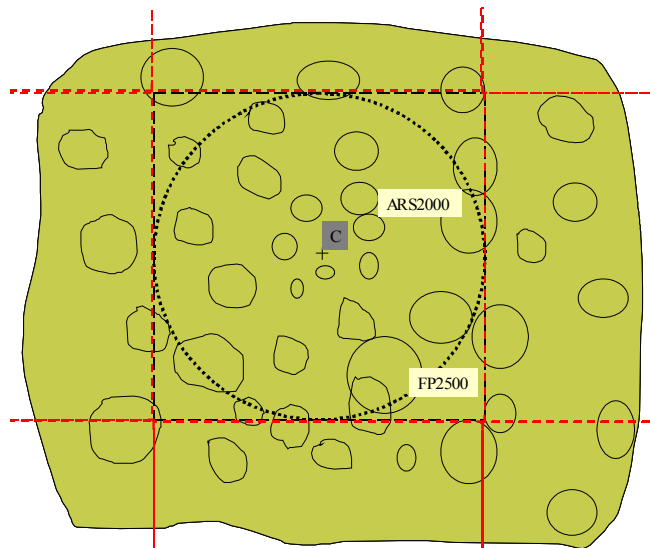




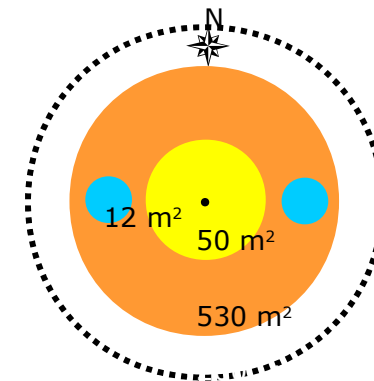
INFC: SAMPLING PLOTS



1st phase interpretation area



2nd phase sampling plot



3rd phase sampling plot

By an **ongoing integrative field survey**, samplings of soil, deadwood and young regenerating plants for laboratory analysis (carbon content) are collected.

The integrative survey is carried out in 1.499 plots randomly sampled from the second phase set, stratified by forest type and administrative region.

Their shape do not differ from the 3rd phase plots; soil is collected in three squared areas 30 by 30 cm.

Inventory phase	Sampling units		Main aim of data collection
	Number	Size (m ²)	
First	301,000 (on orthophotos)	5,000	Land cover/use classification
Second	30,000 (terrestrial plots)	2,000	Vegetation classification
Third	6,865 (terrestrial plots)	From 12.6 to 530	Quantitative parameters
Integrative survey	1,499 (terrestrial plots)	From 0.9 to 530	Carbon content (soil and deadwood)





INFC: MAIN PARAMETERS ASSESSED

Site features

aspect
elevation
ground inclination
roughness

Vegetation classification

inventory category
forest type
forest sub-type

Forest features

origin (natural regeneration/plantation)
mixture status
management system
development stage

Forest planning & restrictions

protection status
management plans
predominant functions

Second phase survey

Vegetation characteristics

canopy cover
texture
presence of forest edges

Ownership

private/public
bodies





INFC: MAIN PARAMETERS ASSESSED

Third phase survey

Standing trees

diameter at 1,30 m
vitality, snapped trees
species
cut height (snapped)
status of decay

Sub-sampling trees

height
increment
age
crown depth
damages/illness (pathogen
or environmental causes)

Deadwood

lying deadwood:

- diameters & length
- class of decay
- species group
(conifer/broadleaf)

stump:

- diameter, height
- class of decay
- species
- age-removal

Stand features

age
health (general status)

Silviculture & yield

intensity of management
main function
removals
not woody production

Young regenerations & shrubs

species
n° of plants
damages
origin





Corpo Forestale dello Stato
Ispettorato Generale

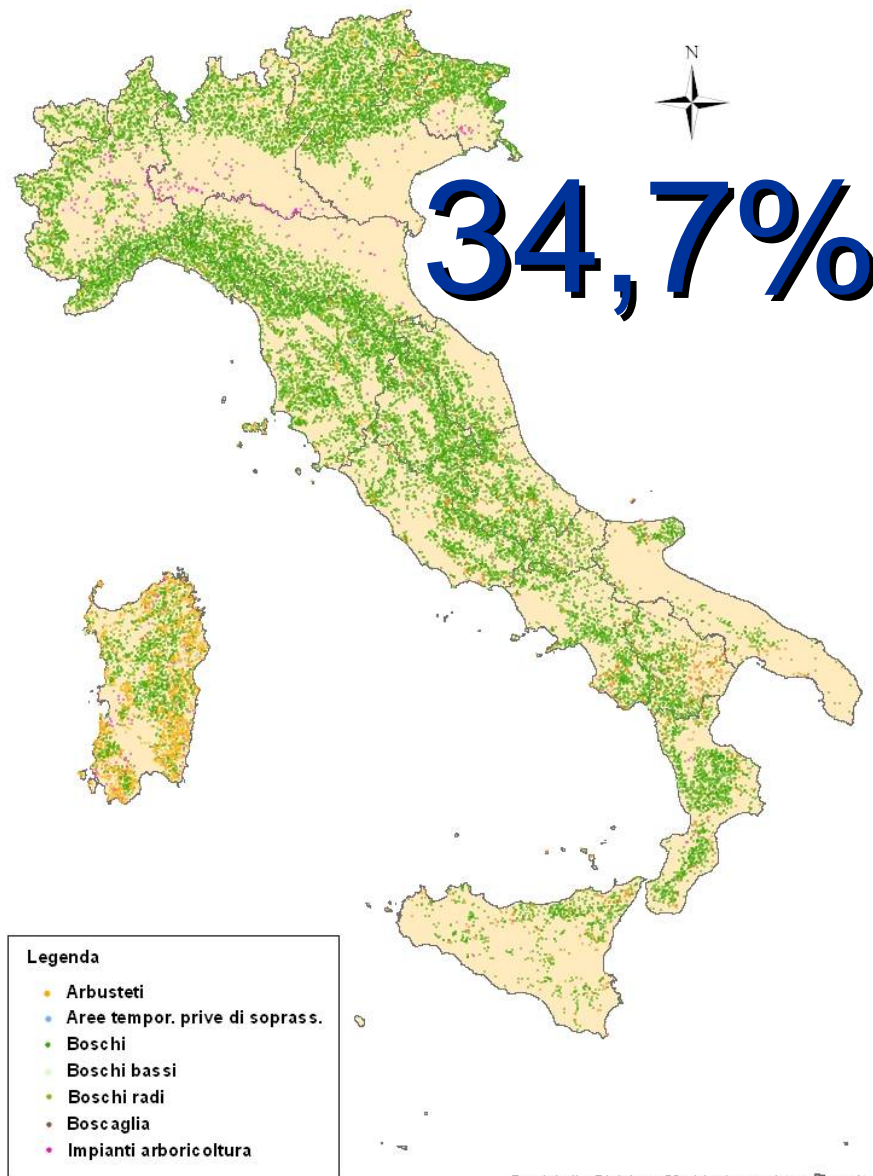
Inventario Forestale Nazionale Italiano
1985

Superficie forestale nazionale
8.675.000 ha (ES%= 0,9)

Inventario Nazionale delle Foreste e dei Serbatoi forestali di Carbonio

Superficie forestale totale Definizione FRA2000 (ettari)	Superficie territoriale Fonte ISTAT, 2002 (ettari)
10.467.533 ES (%) 0.3	30.132.845

Inventario Nazionale Forestale e dei serbatoi di Carbonio - Il fase
Ripartizione delle aree di saggio per categorie inventariali



Estensione della **superficie forestale** in Italia per distretti territoriali



Distretti territoriali	Superficie forestale (Bosco + Altre terre boscate)		Superficie territoriale (Fonte ISTAT, 2002)	Coefficiente di boscosità
	(ettari)	ES (%)	(ettari)	(%)
Sardegna	1.213.250	0,8	2.408.989	50,4
Toscana	1.151.539	0,7	2.299.018	50,1
Piemonte	940.116	1,0	2.539.983	37,0
Lombardia	665.703	1,2	2.386.285	27,9
Calabria	612.931	1,1	1.508.055	40,6
Emilia Romagna	608.818	1,2	2.212.309	27,5
Lazio	605.859	1,2	1.720.768	35,2
Veneto	446.856	1,4	1.839.122	24,3
Campania	445.274	1,5	1.359.025	32,8
Abruzzo	438.590	1,3	1.079.512	40,6
Trentino	407.531	1,1	620.690	65,7
Umbria	390.255	1,2	845.604	46,2
Liguria	375.134	1,1	542.024	69,2
Alto Adige	372.174	1,3	739.997	50,3
Friuli V.G.	357.224	1,3	785.648	45,5
Basilicata	356.426	1,5	999.461	35,7
Sicilia	338.171	1,9	2.570.282	13,2
Marche	308.076	1,6	969.406	31,8
Puglia	179.040	2,6	1.936.580	9,2
Molise	148.641	2,3	443.765	33,5
Valle d'Aosta	105.928	2,7	326.322	32,5
Italia	10.467.533	0,3	30.132.845	34,7



**Estensione
in Italia delle
17 categorie
forestali
dell'INFC
(Boschi alti)**

Categoria forestale	Boschi alti	ES (%)
Boschi a rovere, roverella e farnia	1.084.247	1,8
Faggete	1.035.103	1,8
Cerrete, boschi di farnetto, fragno, vallonea	1.010.986	1,7
Altri boschi caducifogli	994.777	1,8
Ostrieti, carpineti	852.202	2
Castagneti	788.408	2,1
Leccete	620.318	2,3
Boschi di abete rosso	586.082	2,2
Boschi di larice e cembro	382.372	3
Pinete di pino nero, laricio e loricato	236.467	3,9
Boschi igrofili	229.054	4
Pinete di pini mediterranei	226.101	4
Sugherete	168.602	4,5
Pinete di pino silvestre e montano	151.671	4,9
Altri boschi di latifoglie sempreverdi	84.712	6,6
Boschi di abete bianco	68.460	7,4
Altri boschi di conifere, pure o miste	63.407	7,7
TOTALE	8.582.968	0,4

RISULTATI

Distretto territoriale	Totale Bosco			
	Numero alberi totale	ES	Numero alberi/ha	ES
	(n)	(%)	(n ha ⁻¹)	(%)
Piemonte	1 023 073 879	3.7	1 175.1	3.5
Valle d'Aosta	69 673 512	9.6	707.8	9.1
Lombardia	718 730 878	4.5	1 185.9	4.2
Alto Adige	297 734 742	6.0	884.3	5.8
Trentino	497 647 562	5.9	1 325.6	5.8
Veneto	643 220 322	5.5	1 616.6	5.2
Friuli V.G.	437 841 591	5.5	1 351.5	5.3
Liguria	511 170 582	4.7	1 507.4	4.4
Emilia Romagna	1 022 981 275	4.0	1 816.2	3.8
Toscana	1 425 843 253	3.5	1 403.8	3.4
Umbria	674 609 115	5.4	1 815.5	5.3
Marche	518 624 393	6.6	1 779.8	6.4
Lazio	849 939 309	5.4	1 562.7	5.2
Abruzzo	564 473 860	4.9	1 441.9	4.6
Molise	217 317 173	8.6	1 639.4	8.1
Campania	583 062 284	7.2	1 516.8	7.0
Puglia	137 131 946	9.3	940.0	8.6
Basilicata	310 386 935	7.6	1 179.8	7.2
Calabria	587 679 701	7.7	1 255.3	7.5
Sicilia	196 060 512	8.7	765.0	8.3
Sardegna	662 625 972	6.8	1 135.7	6.5
Italia	11 949 630 797	1.3	1 364.2	1.2

NUMERO DI ALBERI NEI BOSCHI ITALIANI

12 miliardi circa di alberi in totale
1364 alberi ad ettaro

RISULTATI

Distretto territoriale	Totale Bosco			
	Area basimetrica (m ²)	ES (%)	Area basimetrica (m ² ha ⁻¹)	ES (%)
Piemonte	18 190 013	2.6	20.9	2.3
Valle d'Aosta	2 126 187	6.6	21.6	6.7
Lombardia	13 771 544	3.3	22.7	3.0
Alto Adige	10 880 268	3.8	32.3	3.4
Trentino	11 185 577	3.6	29.8	3.3
Veneto	10 000 070	3.3	25.1	2.9
Friuli V.G.	8 151 556	4.0	25.2	3.7
Liguria	7 601 420	3.9	22.4	3.6
Emilia Romagna	11 660 418	3.2	20.7	2.9
Toscana	19 790 992	2.6	19.5	2.4
Umbria	5 426 676	3.9	14.6	3.7
Marche	4 537 278	5.3	15.6	5.0
Lazio	9 371 386	3.9	17.2	3.6
Abruzzo	7 802 686	3.8	19.9	3.5
Molise	2 293 656	7.0	17.3	6.4
Campania	6 594 407	4.8	17.2	4.4
Puglia	1 955 498	7.7	13.4	6.9
Basilicata	4 116 684	5.1	15.7	4.5
Calabria	11 903 573	4.2	25.4	3.8
Sicilia	3 874 783	5.6	15.1	4.9
Sardegna	7 197 096	4.5	12.3	4.1
Italia	178 433 746	0.9	20.4	0.8

AREA BASIMETRICA NEI BOSCHI ITALIANI

20.4 m² ad ettaro

RISULTATI

Distretto territoriale	Totale Bosco			
	Volume totale (m ³)	ES (%)	Volume ad ettaro (m ³ ha ⁻¹)	ES (%)
Piemonte	129 776 430	3.0	149.1	2.8
Valle d'Aosta	15 334 302	7.6	155.8	6.9
Lombardia	108 036 723	4.1	178.3	3.9
Alto Adige	105 188 527	4.6	312.4	4.3
Trentino	105 776 549	4.7	281.8	4.6
Veneto	81 195 960	4.6	204.1	4.2
Friuli V.G.	67 830 001	5.3	209.5	5.0
Liguria	49 438 791	4.5	145.8	4.3
Emilia Romagna	72 338 122	3.9	128.4	3.6
Toscana	131 955 985	3.1	129.9	2.9
Umbria	29 254 669	4.8	78.7	4.6
Marche	24 293 622	6.6	83.4	6.3
Lazio	57 510 635	4.6	105.7	4.4
Abruzzo	50 492 831	4.6	129.0	4.4
Molise	14 635 984	8.9	110.4	8.4
Campania	42 502 693	6.0	110.6	5.7
Puglia	12 160 485	10.9	83.4	10.4
Basilicata	27 661 206	6.9	105.1	6.4
Calabria	87 967 454	4.7	187.9	4.3
Sicilia	23 182 797	6.7	90.5	6.1
Sardegna	32 882 733	5.6	56.4	5.2
Italia	1 269 416 499	1.1	144.9	1.0

VOLUME DI FUSTO E RAMI GROSSI NEI BOSCHI ITALIANI

1 miliardo e 270 milioni di m³
145 m³ ad ettaro

RISULTATI

Distretto territoriale	Faggete			
	Volume totale (m ³)	ES (%)	Volume ad ettaro (m ³ ha ⁻¹)	ES (%)
Piemonte	20 758 731	8.5	179.7	-
Valle d'Aosta	202 576	64.6	175.3	-
Lombardia	12 214 675	12.6	186.0	-
Alto Adige	913 971	34.0	241.7	-
Trentino	12 822 985	12.4	206.0	-
Veneto	16 174 807	11.4	240.7	-
Friuli V.G.	23 828 467	10.7	268.3	-
Liguria	8 005 797	11.9	216.4	-
Emilia Romagna	21 275 150	8.6	210.9	-
Toscana	17 545 114	9.2	242.8	-
Umbria	2 644 115	20.3	174.9	-
Marche	2 670 319	23.2	149.7	-
Lazio	17 735 774	11.1	247.3	-
Abruzzo	28 261 832	7.1	230.9	-
Molise	3 923 098	19.4	264.4	-
Campania	16 243 190	12.4	294.3	-
Puglia	1 331 508	33.8	265.7	-
Basilicata	7 179 721	16.7	271.5	-
Calabria	23 636 402	9.1	306.0	-
Sicilia	2 641 277	18.5	174.2	-
Sardegna	0	-	0	-
Italia	240 009 507	2.8	231.9	2.1

**VOLUME TOTALE DI FUSTO E RAMI GROSSI
NELLE FAGGETE (1,035,103 ha)**

**240 milioni di m³
232 m³ ad ettaro**

RISULTATI

Distretto territoriale	Pinete di pino nero, laricio e loricato			
	Volume totale (m ³)	ES (%)	Volume ad ettaro (m ³ ha ⁻¹)	ES (%)
Piemonte	360 114	48.1	127.3	-
Valle d'Aosta	32 910	100.0	85.4	-
Lombardia	790 639	41.6	163.1	-
Alto Adige	4 536	100.0	12.0	-
Trentino	1 221 414	30.2	199.4	-
Veneto	491 587	46.0	140.3	-
Friuli V.G.	5 167 091	19.0	167.5	-
Liguria	1 498 522	36.1	272.7	-
Emilia Romagna	3 634 291	25.4	219.6	-
Toscana	7 089 450	22.8	384.7	-
Umbria	638 820	30.4	108.3	-
Marche	1 545 985	24.3	148.6	-
Lazio	1 550 386	25.2	183.0	-
Abruzzo	1 999 314	28.3	104.4	-
Molise	263 354	47.3	112.4	-
Campania	1 054 793	33.6	168.5	-
Puglia	228 938	62.8	147.4	-
Basilicata	185 357	49.4	71.0	-
Calabria	24 081 917	10.2	322.7	-
Sicilia	881 775	29.6	123.0	-
Sardegna	559 268	37.0	65.2	-
Italia	53 280 460	6.5	225.3	5.3

**VOLUME TOTALE DI FUSTO E RAMI GROSSI
NELLE PINETE DI PINO NERO (236,467 ha)**

**53 milioni di m³
225 m³ ad ettaro**

RISULTATI

Distretto territoriale	Totale Bosco			
	Fitomassa totale	ES	Fitomassa unitaria	ES
	(Mg)	(%)	(Mg ha ⁻¹)	(%)
Piemonte	67 549 924	2.9	100.6	2.7
Valle d'Aosta	8 576 939	7.1	87.1	6.4
Lombardia	68 464 944	3.8	113.0	3.6
Alto Adige	55 213 115	4.4	164.0	4.1
Trentino	59 062 534	4.3	157.3	4.1
Veneto	51 049 296	4.2	128.3	3.8
Friuli V.G.	45 655 448	5.0	141.0	4.7
Liguria	34 695 419	4.3	102.3	4.1
Emilia Romagna	55 589 418	3.7	98.7	3.4
Toscana	97 118 033	2.9	95.6	2.7
Umbria	24 793 823	4.6	66.7	4.4
Marche	19 746 332	6.1	67.8	5.8
Lazio	46 010 483	4.5	84.6	4.3
Abruzzo	40 059 450	4.5	102.3	4.3
Molise	11 793 710	8.8	89.0	8.3
Campania	33 350 902	6.0	86.8	5.7
Puglia	9 370 736	10.6	64.2	10.1
Basilicata	21 788 324	6.8	82.8	6.3
Calabria	58 367 627	4.9	124.7	4.5
Sicilia	16 768 781	6.3	65.4	6.8
Sardegna	29 417 858	5.7	50.4	5.3
Italia	874 443 096	1.0	99.8	1.0

FITOMASSA EPIGEA TOTALE NEI BOSCHI ITALIANI

**870 milioni di tonnellate
(peso secco)
100 tonnellate ad ettaro**

RISULTATI

Distretto territoriale	Totale Bosco			
	Incremento corrente di volume	ES	Incremento corrente di volume unitario	ES
	(m ³)	(%)	(m ³ ha ⁻¹)	(%)
Piemonte	3 965 982	3.2	4.6	3.0
Valle d'Aosta	298 242	8.0	3.0	7.4
Lombardia	3 143 506	4.0	6.2	3.7
Alto Adige	1 856 437	4.3	5.5	4.0
Trentino	2 301 685	4.2	6.1	4.0
Veneto	2 210 914	4.1	5.6	3.7
Friuli V.G.	1 821 997	4.7	5.6	4.4
Liguria	1 576 441	4.9	4.7	4.6
Emilia Romagna	2 484 463	3.9	4.4	3.6
Toscana	4 154 946	3.4	4.1	3.3
Umbria	814 265	4.8	2.2	4.6
Marche	789 922	7.2	2.7	7.0
Lazio	1 548 091	4.8	2.9	4.6
Abruzzo	1 316 967	4.8	3.4	4.5
Molise	422 162	7.5	3.2	6.9
Campania	1 566 083	5.4	4.1	5.1
Puglia	407 879	8.8	2.8	8.2
Basilicata	738 870	6.0	2.8	5.4
Calabria	2 524 411	4.7	5.4	4.4
Sicilia	756 005	7.1	3.0	6.5
Sardegna	1 173 026	5.5	2.0	5.1
Italia	35 872 293	1.1	4.1	1.0

**INCREMENTO ANNUO
DI VOLUME
NEI BOSCHI ITALIANI**

**36 milioni circa di m³
4.1 m³ ad ettaro**

RISULTATI

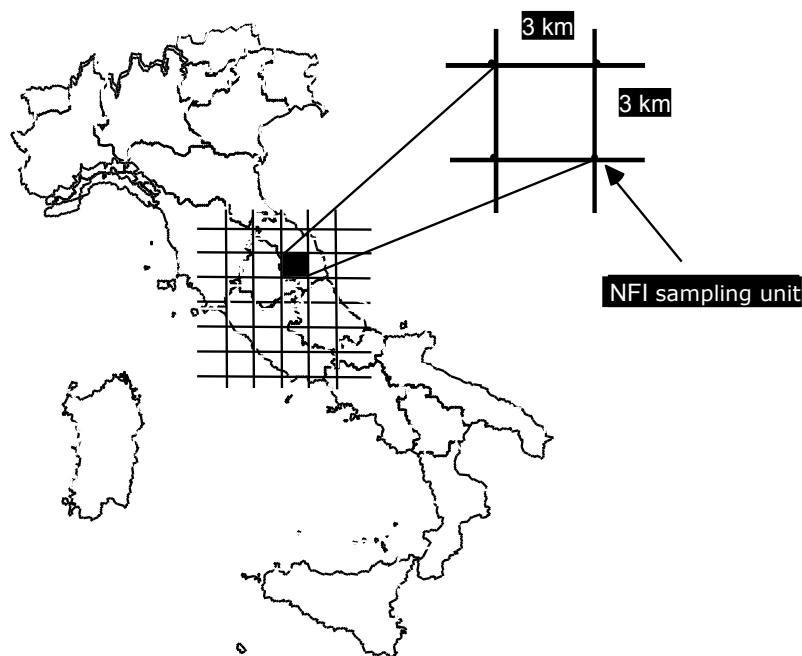
Distretto territoriale	Totale Bosco			
	Volume totale (m ³)	ES (%)	Volume ad ettaro (m ³ ha ⁻¹)	ES (%)
Piemonte	12 304 940	6.9	14.1	6.8
Valle d'Aosta	1 073 360	20.0	10.9	19.8
Lombardia	7 391 764	8.0	12.2	7.9
Alto Adige	4 177 416	8.5	12.4	6.3
Trentino	4 696 451	7.5	12.5	7.4
Veneto	4 359 792	7.5	11.0	7.3
Friuli V.G.	3 497 309	8.7	10.8	8.6
Liguria	5 546 696	7.4	16.4	7.2
Emilia Romagna	4 462 344	7.8	7.9	7.7
Toscana	10 920 612	7.3	10.8	7.2
Umbria	900 549	15.3	2.4	15.3
Marche	806 044	14.2	2.8	14.1
Lazio	1 994 819	10.7	3.7	10.6
Abruzzo	1 396 865	10.0	3.6	9.9
Molise	523 638	18.8	4.0	18.5
Campania	1 245 741	13.1	3.2	13.0
Puglia	243 600	17.7	1.7	17.4
Basilicata	491 430	14.7	1.9	14.5
Calabria	2 819 234	10.9	6.0	10.8
Sicilia	738 821	12.6	2.9	12.3
Sardegna	899 740	12.8	1.5	12.6
Italia	70 490 164	2.3	8.1	2.3

NECROMASSA TOTALE
(alberi morti in piedi, necromassa a
terra, ceppaie residue)
DEI BOSCHI ITALIANI

70 milioni di m³
8 m³ ad ettaro

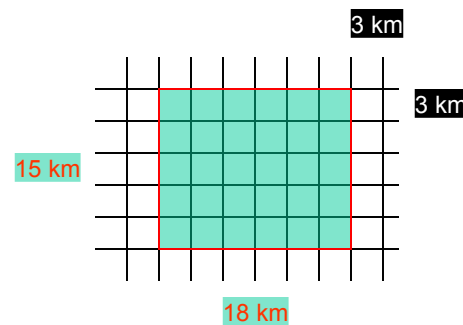


NATIONAL FOREST INVENTORY and ICP Level I plots



The ~240 ICP level I plots are systematically distributed and located on the first Italian forest inventory plots:

one ICP level I plot every 30 NFI sampling units



IFNI 85

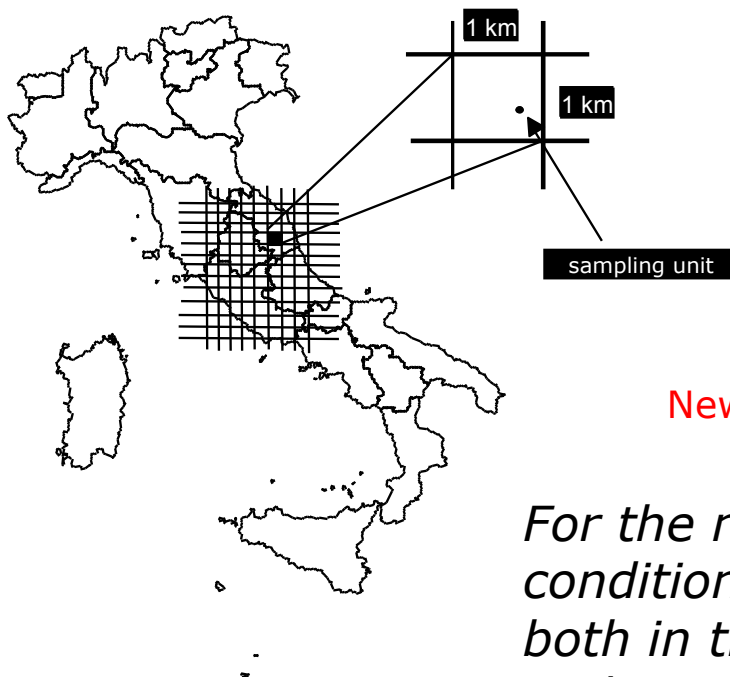


Level I plots





NATIONAL FOREST INVENTORY and FutMon plots for crown condition assessment



The ~ 350 new plots will not be distributed systematically on the first phase grid

They will be selected randomly by forest type group (3-6 groups) and administrative region (21 regions) from 2nd phase strata

New sampling design

For the next two years (2009-2010) crown condition assessment will be carried out both in the ICP Level I plots (ICP protocol and new protocol) and in the FutMon plots (new protocol)

INFC (2005)

New selection procedure: all trees in the plot satisfying measurement conditions (min DBH, social class, ...)





Thank you for your attention!