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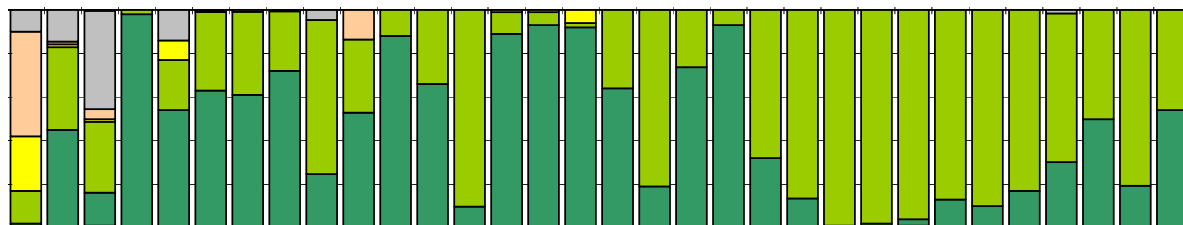
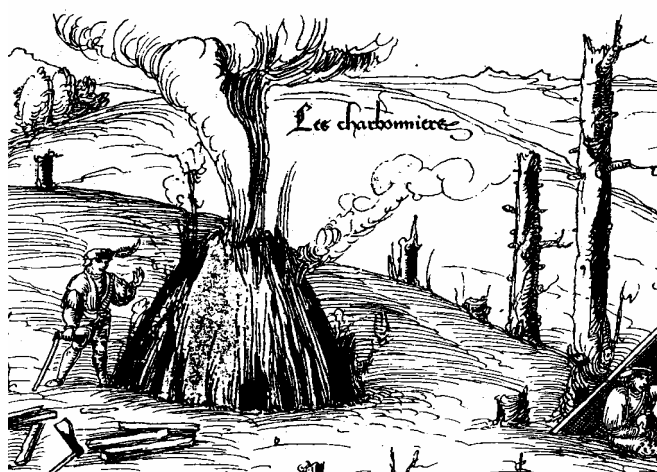


Local to global
significance of
charcoal science

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6th International Anthracology Meeting

Freiburg • Germany • 30th August to 6th September 2015



Schauinsland Excursion

- Field Guide

by Thomas Ludemann

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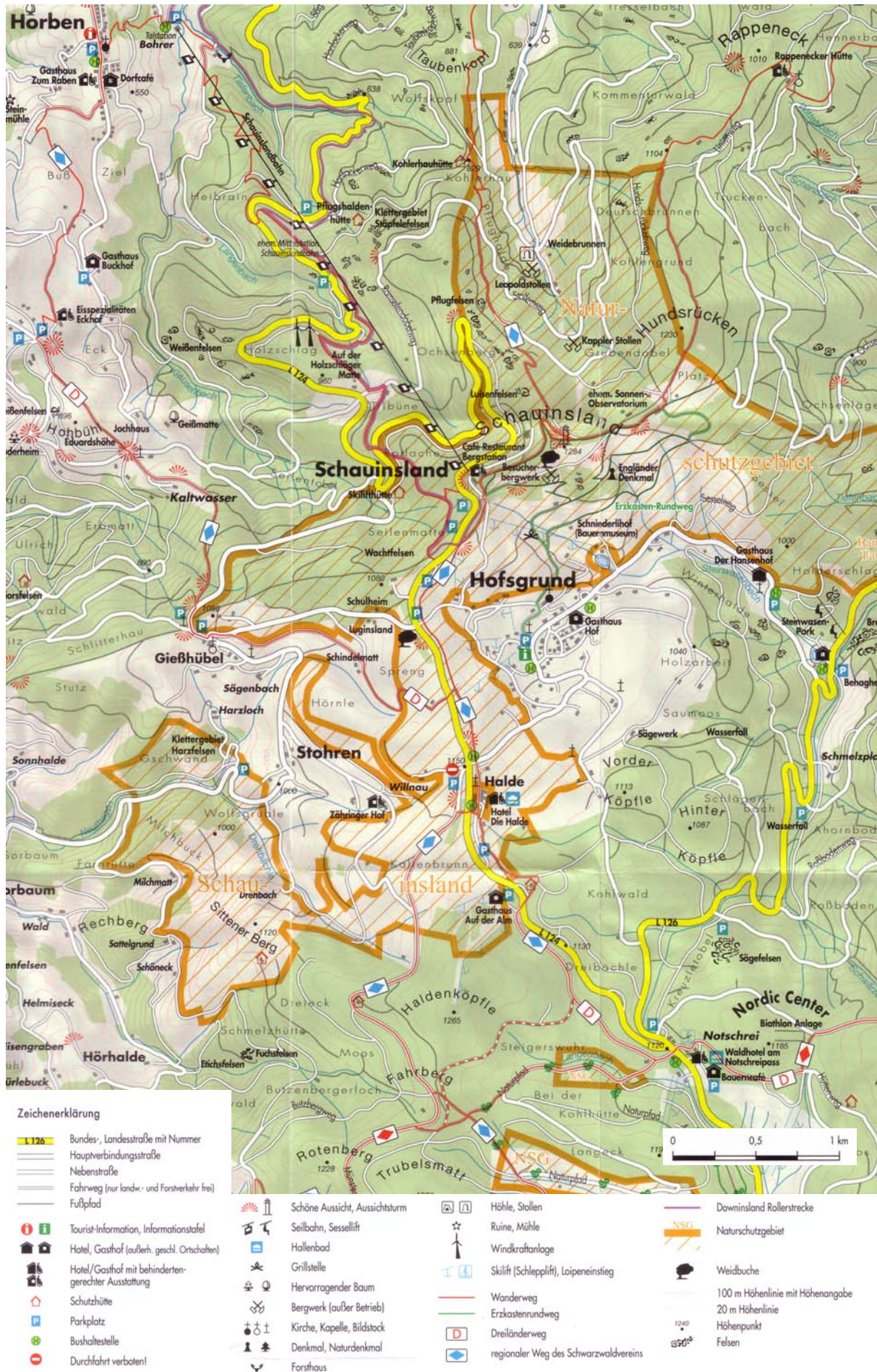
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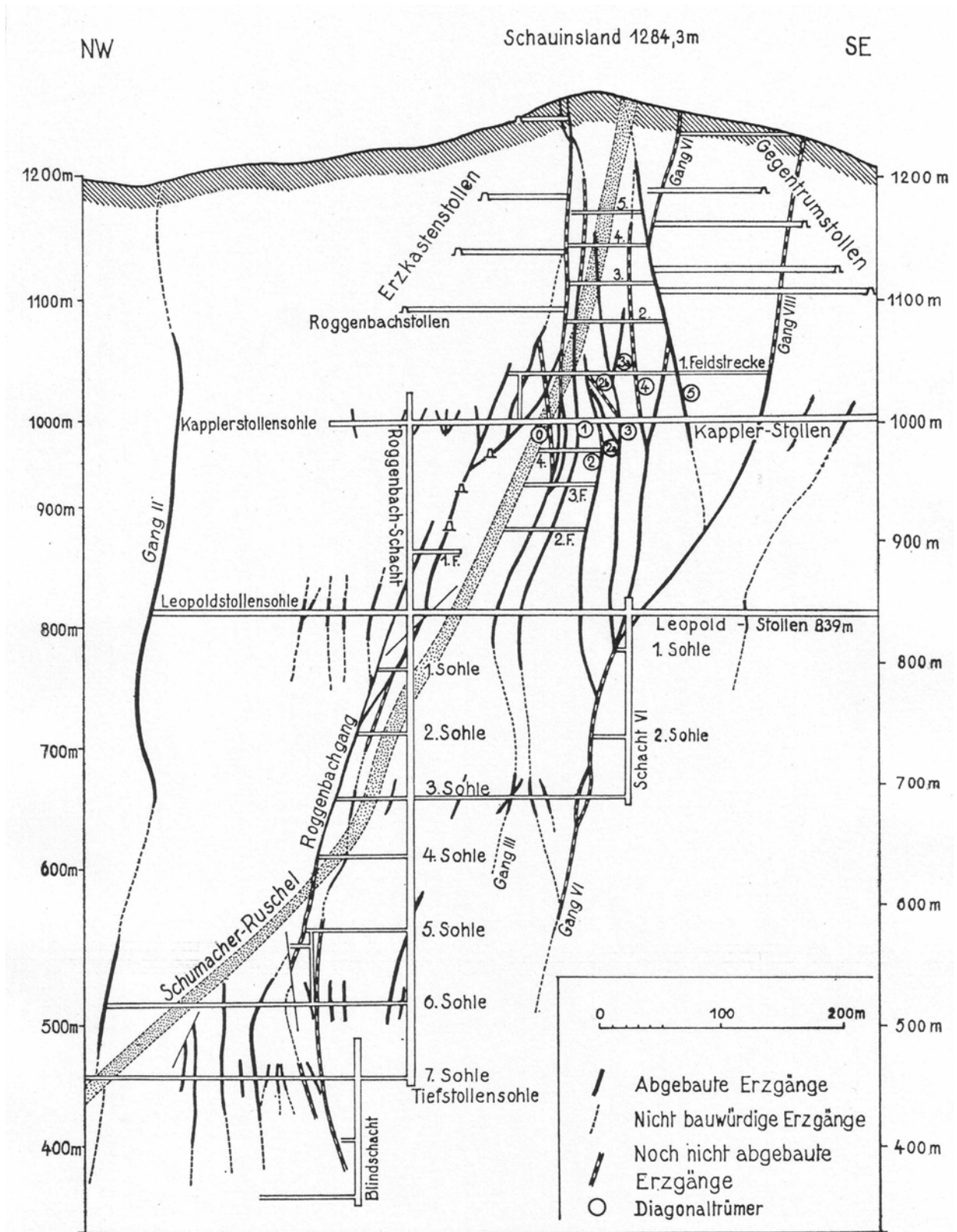
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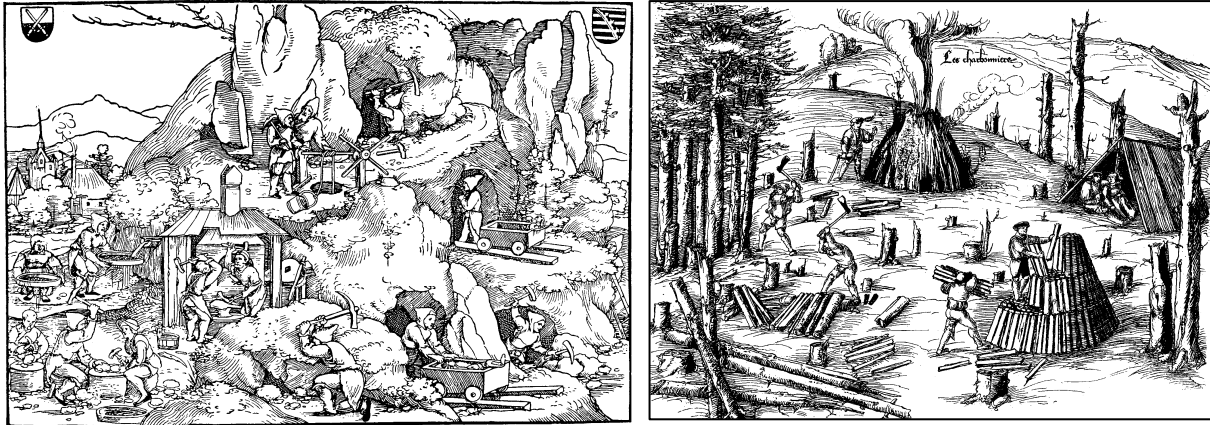
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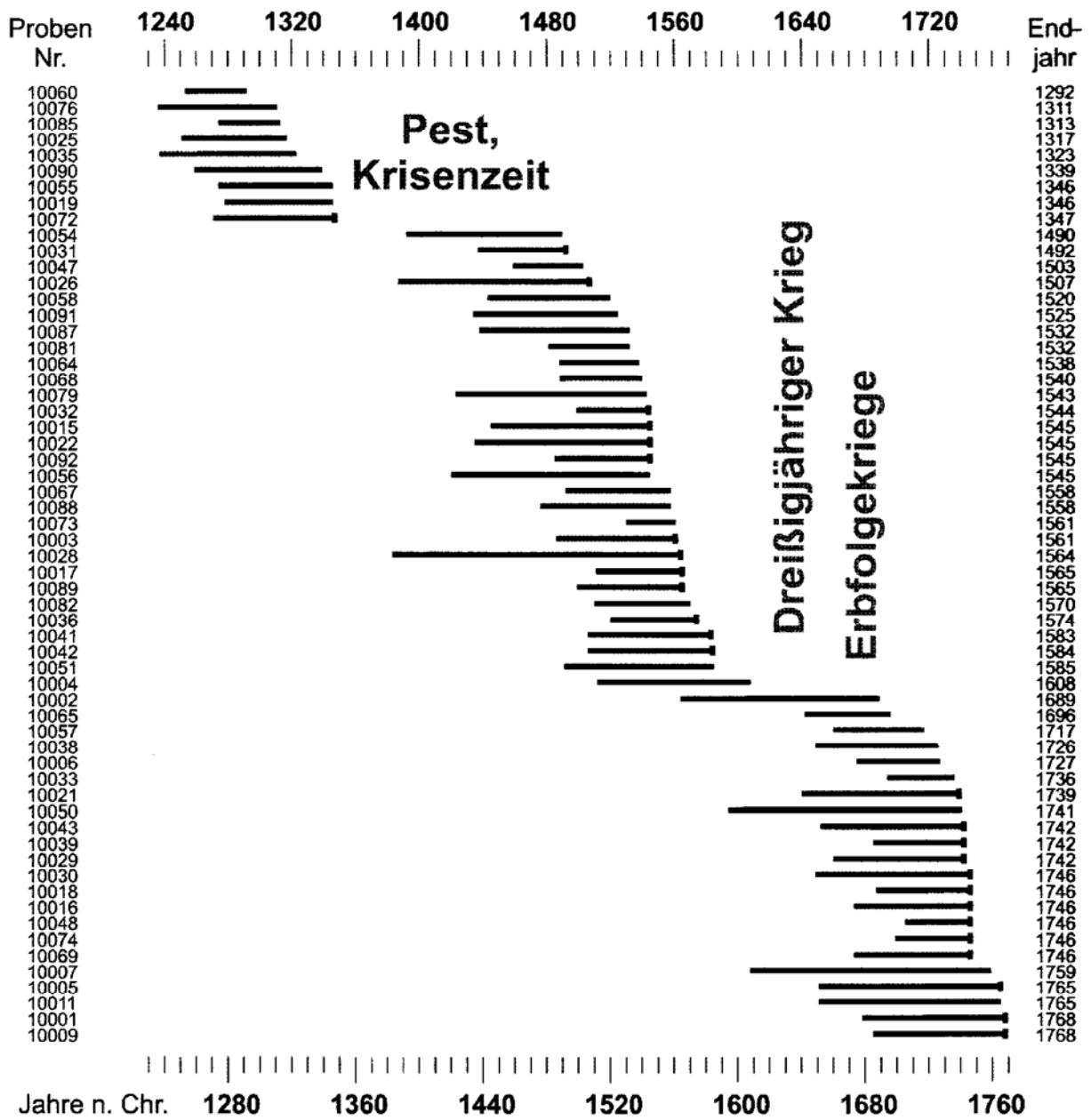




Schauinsland mine, SW Black Forest, and mineral veins (Erzgänge). Schwarzwaldverein (1966) modified from Schürenberg 1957.



Historical mining and charcoal production (from ZIMMERMANN 1990: 130 and GROSS 1550)



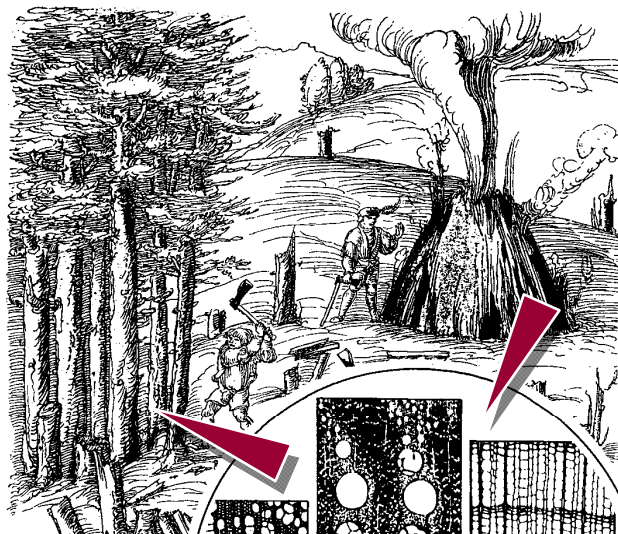
Dendrochronological results of wood from the Schauinsland mine (Straßburger & Tegel 2006: 242).



Upright circular charcoal kilns

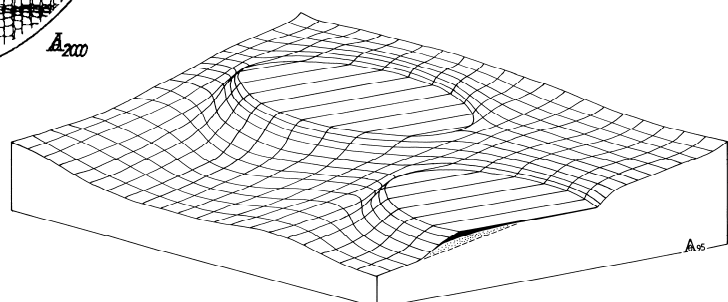
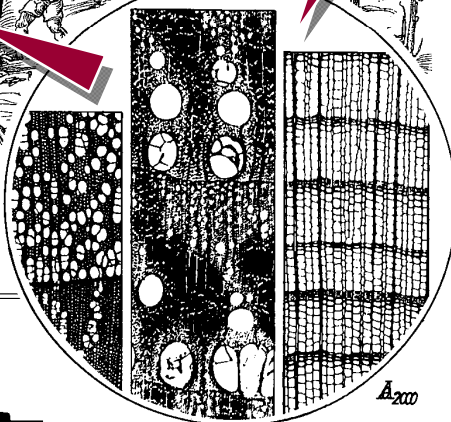
Traditional charcoal burning in the Black Forest

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Bad Wildbad

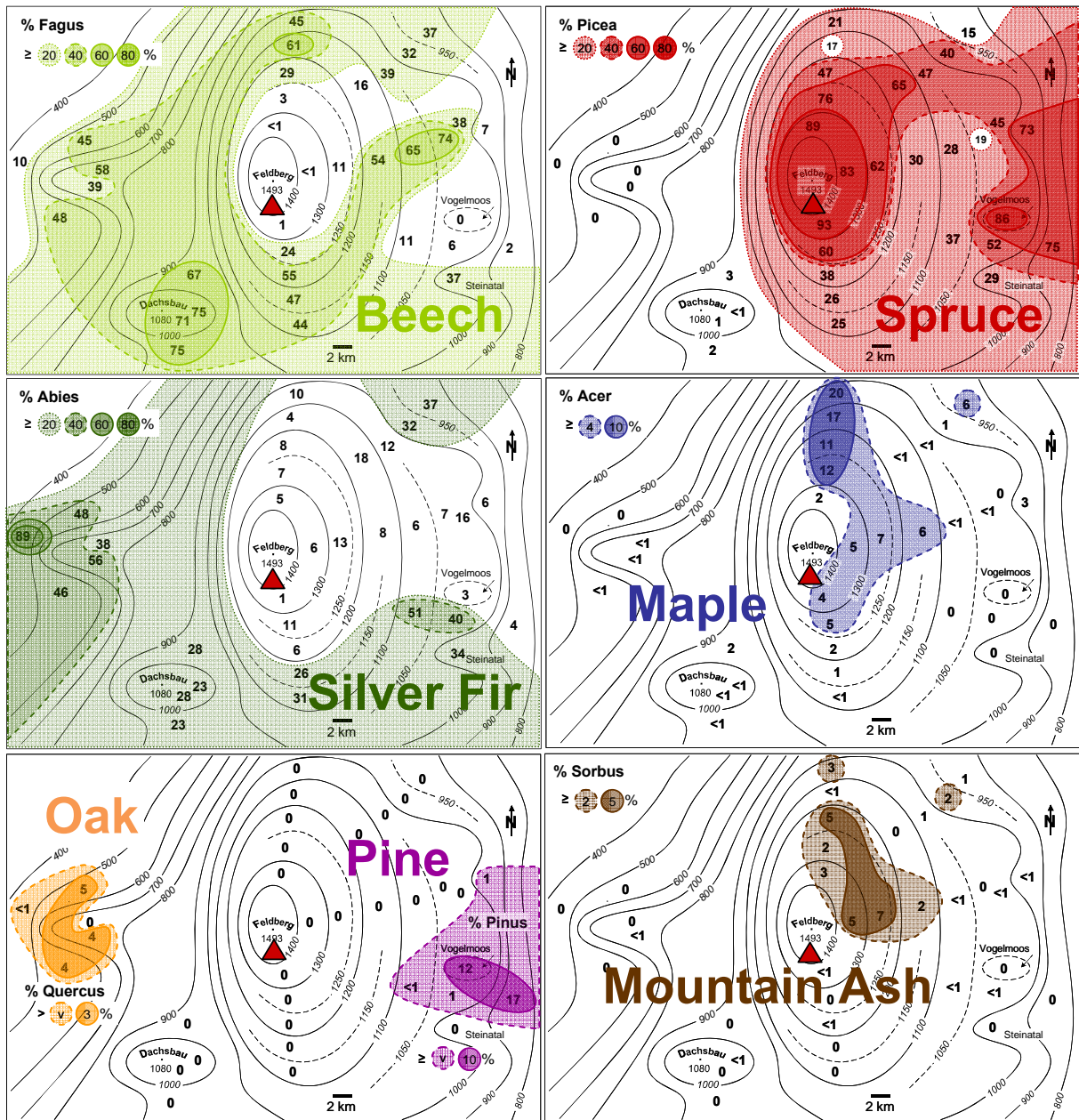


© Drawing by O. Nelle, modified
(LUDEMANN & NELLE 2002: 18))

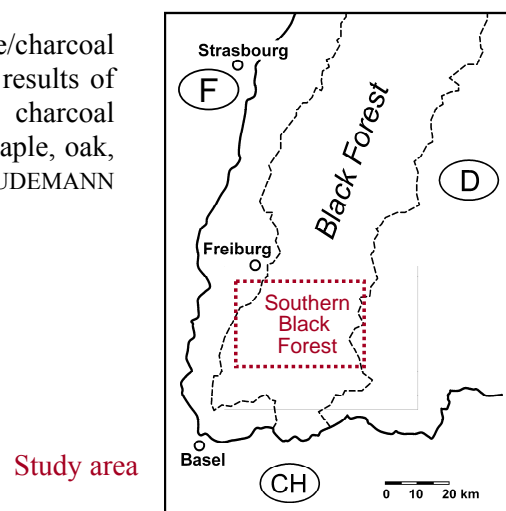
Kiln Site Anthracology



LUDEMANN 2004: 189
LUDEMANN 1996: 94

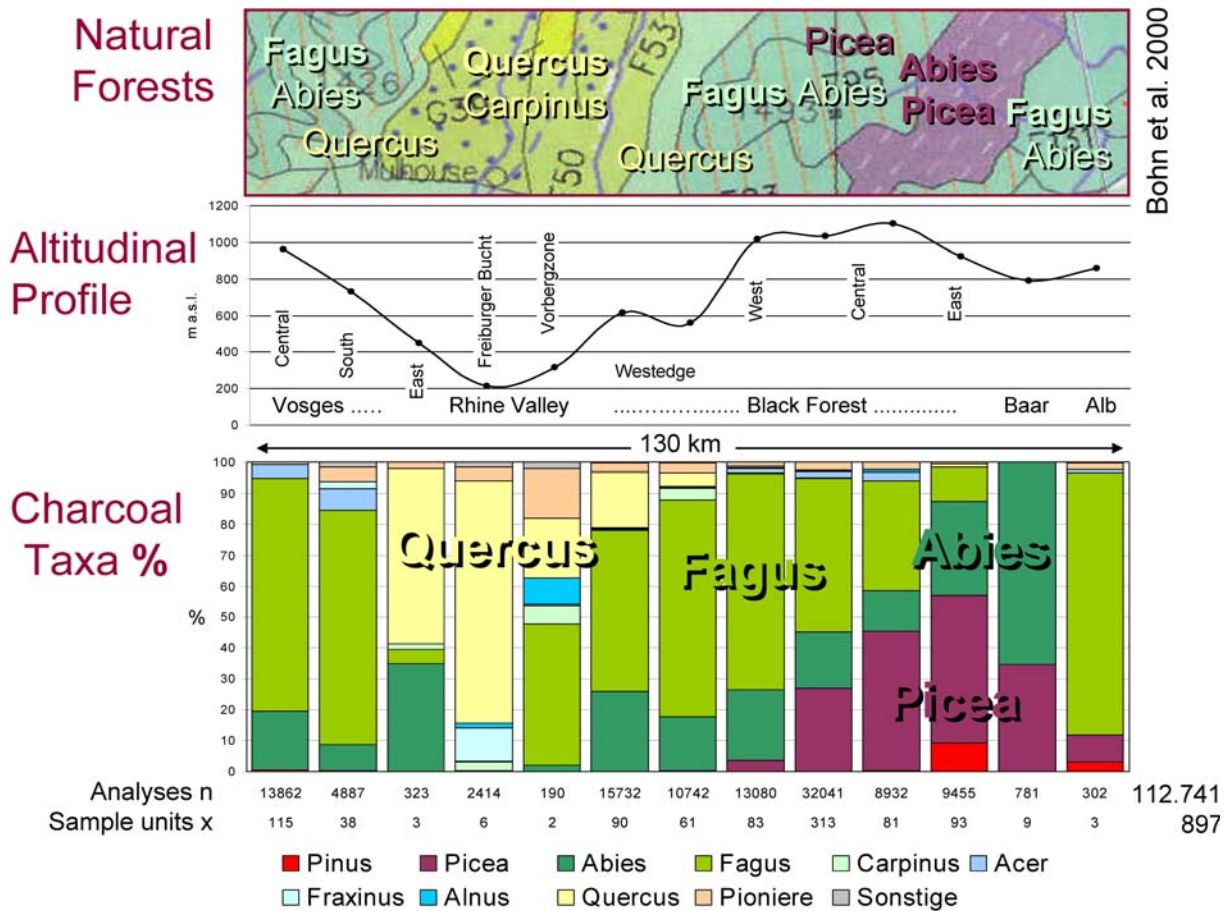


Spatial pattern of tree taxa of postmedieval fuel wood use/charcoal production in the Southern Black Forest. Anthracological results of 200 charcoal kiln sites (number of analyses n = 23,681 charcoal pieces analysed). Percentage of beech, spruce, silver fir, maple, oak, pine and maple mountain ash in the charcoal samples (LUDEMANN 2003, modified).

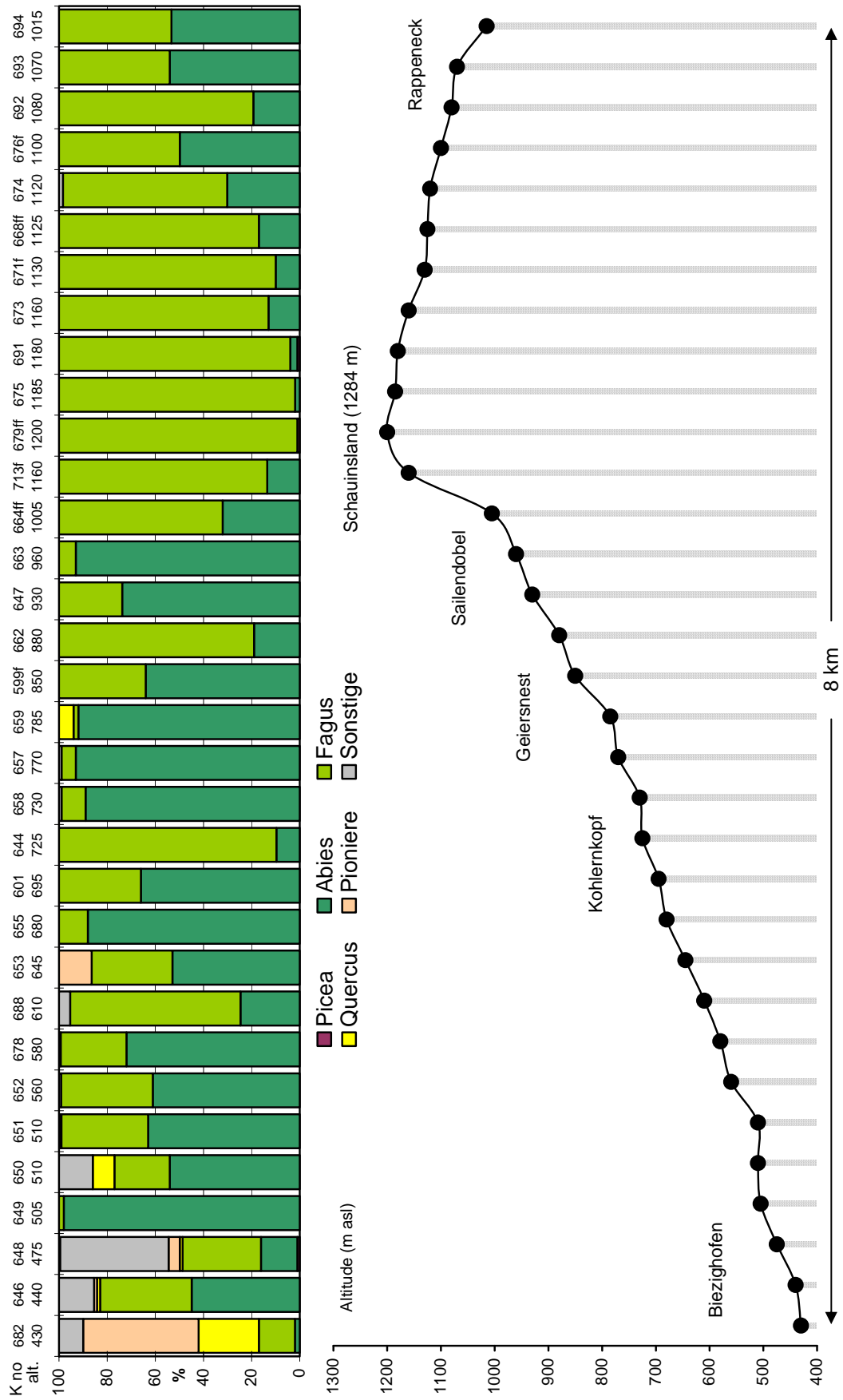




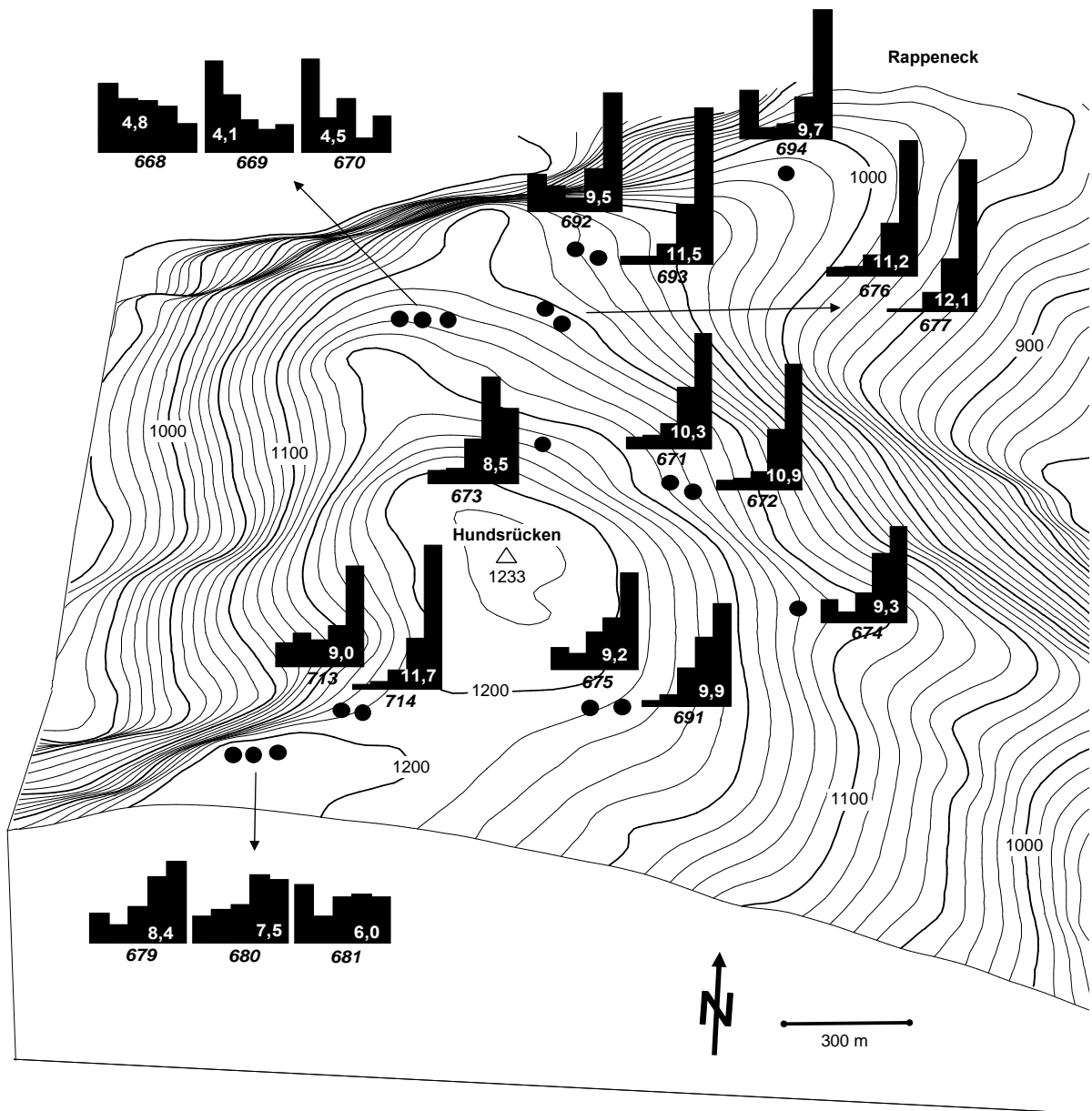
Kiln site K713 in the Schauinsland area, analysed by O. Nelle 1999, prepared for SWR-TV Sept. 2012



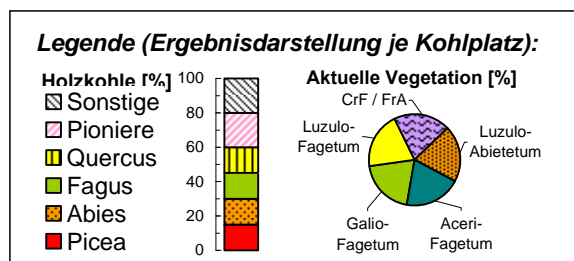
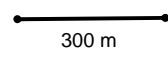
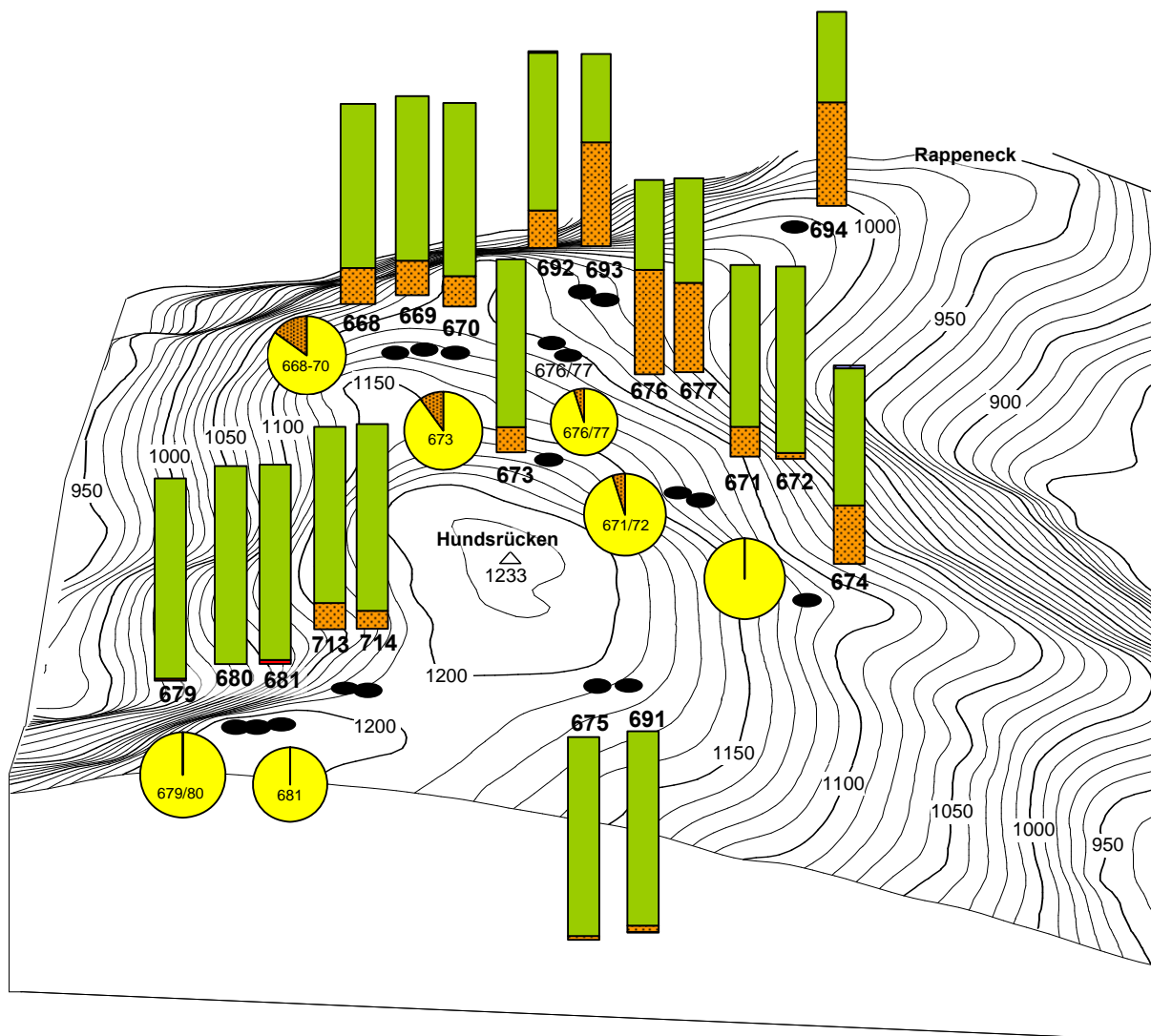
Anthracological results and natural vegetation on a 130 km landscape profile from the Vosges to the Swabian Alb in western Central Europe. At the top are the predominant tree taxa of the natural forest vegetation after BOHN et al. (2000; map modified); at the bottom the tree taxa compositions of the charcoal samples of historical mining, archaeometallurgy and charcoal burning sites, according to regions/landscape units. n, number of analyses; x, number of samples; black dots at the profile: average altitude of the sample sites of each region (LUDEMANN 2010: 160, modified).



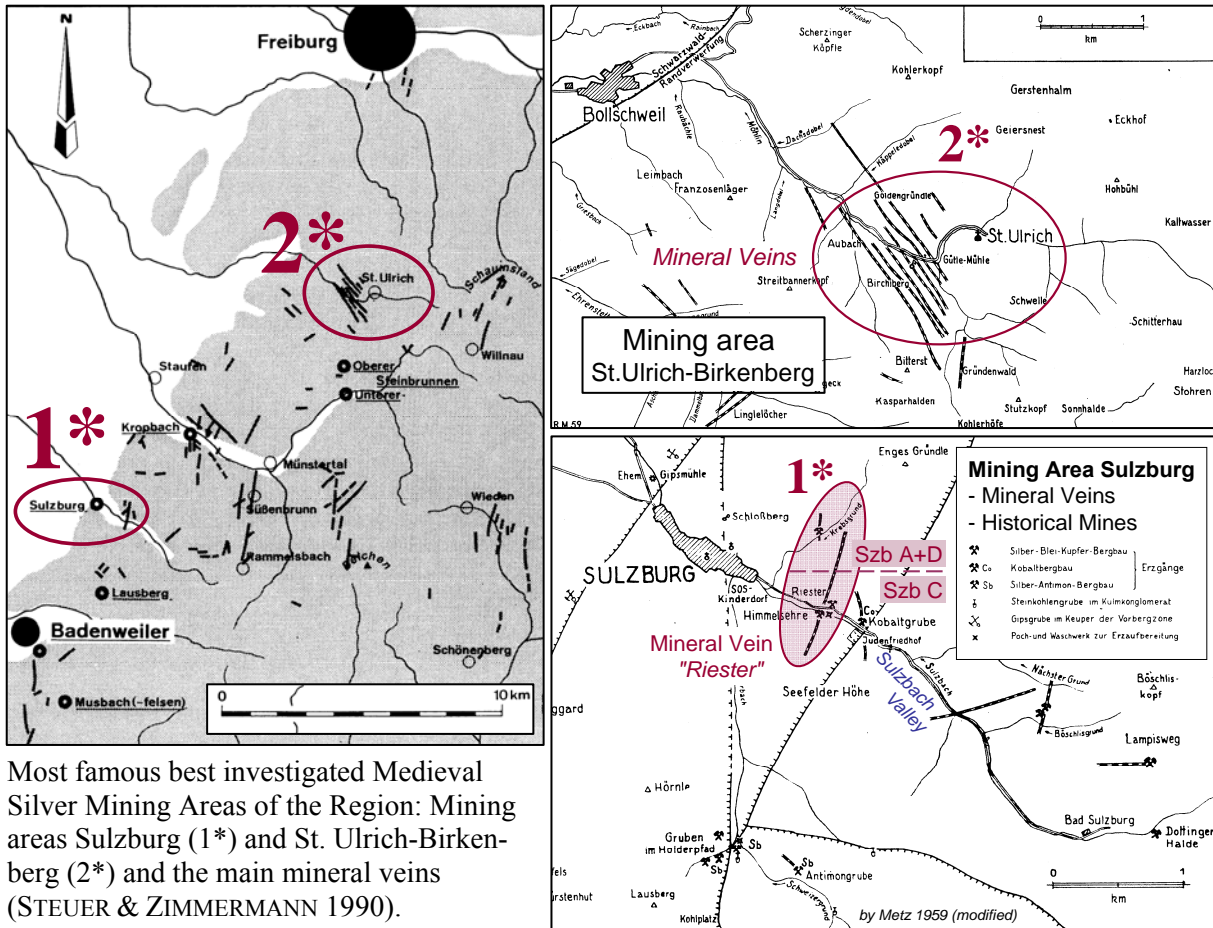
Anthracological results of 41 kiln sites from an altitudinal profile Biezychofen (400 m asl) – Geiersnest – Schauinsland (1284 m asl). LUDEMANN & NELLE 2002: 57, modified.



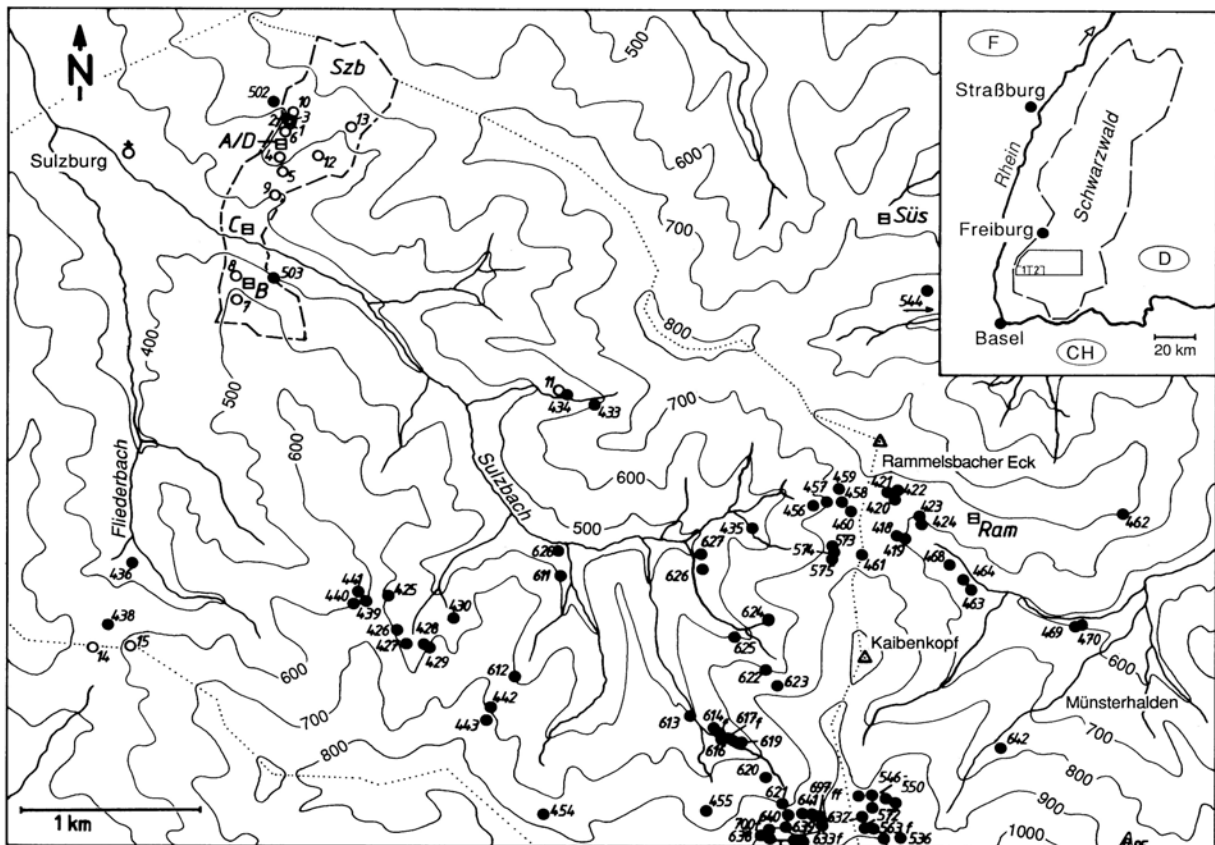
Investigation area Hundsrücken, Schauinsland, Black Forest, SW Germany. Anthracological results of 19 kiln sites. Distribution of charcoal pieces in diameter size classes. First column: percentage of pieces with a diameter up to 2 cm; second column: up to 3 cm; third column: up to 5 cm; fourth column: up to 10 cm; fifth column: more than 10 cm diameter (LUDEMANN & NELLE 2002: 97).



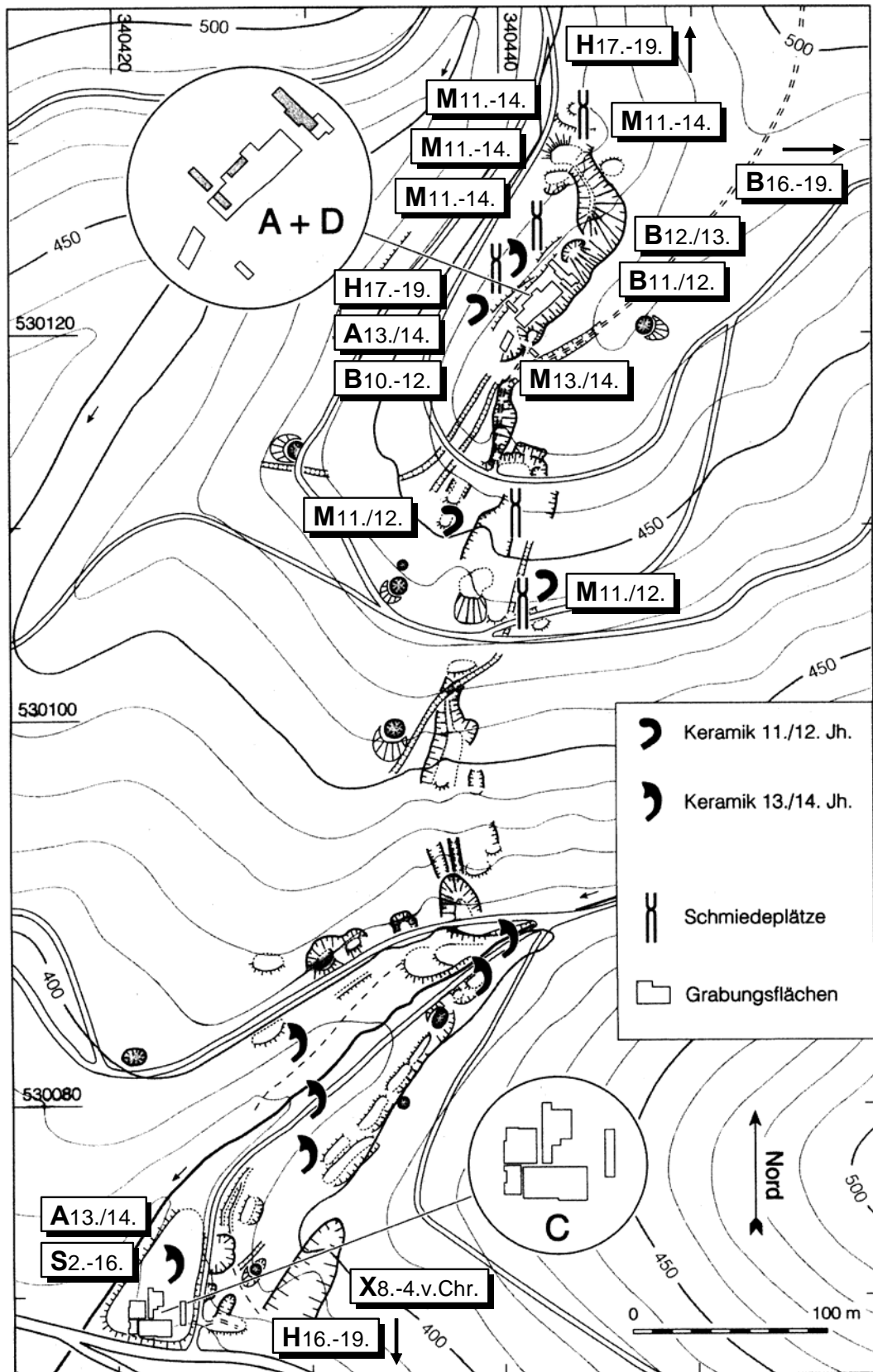
Investigation area Hunds Rücken, Schauinsland, Black Forest, SW Germany. Results of charcoal analysis (columns) of 19 kiln sites and of vegetation mapping (circles) of 7 sample areas in the surroundings of the kiln sites investigated. The sites are situated in the forest area between the top of Mont Schauinsland and the Rappeneck, called Hunds Rücken. Luzulo-Fagetum is most frequent in the surroundings of the kiln sites, Fagus in the historical charcoal. (LUDEMANN & NELLE 2002: 88).



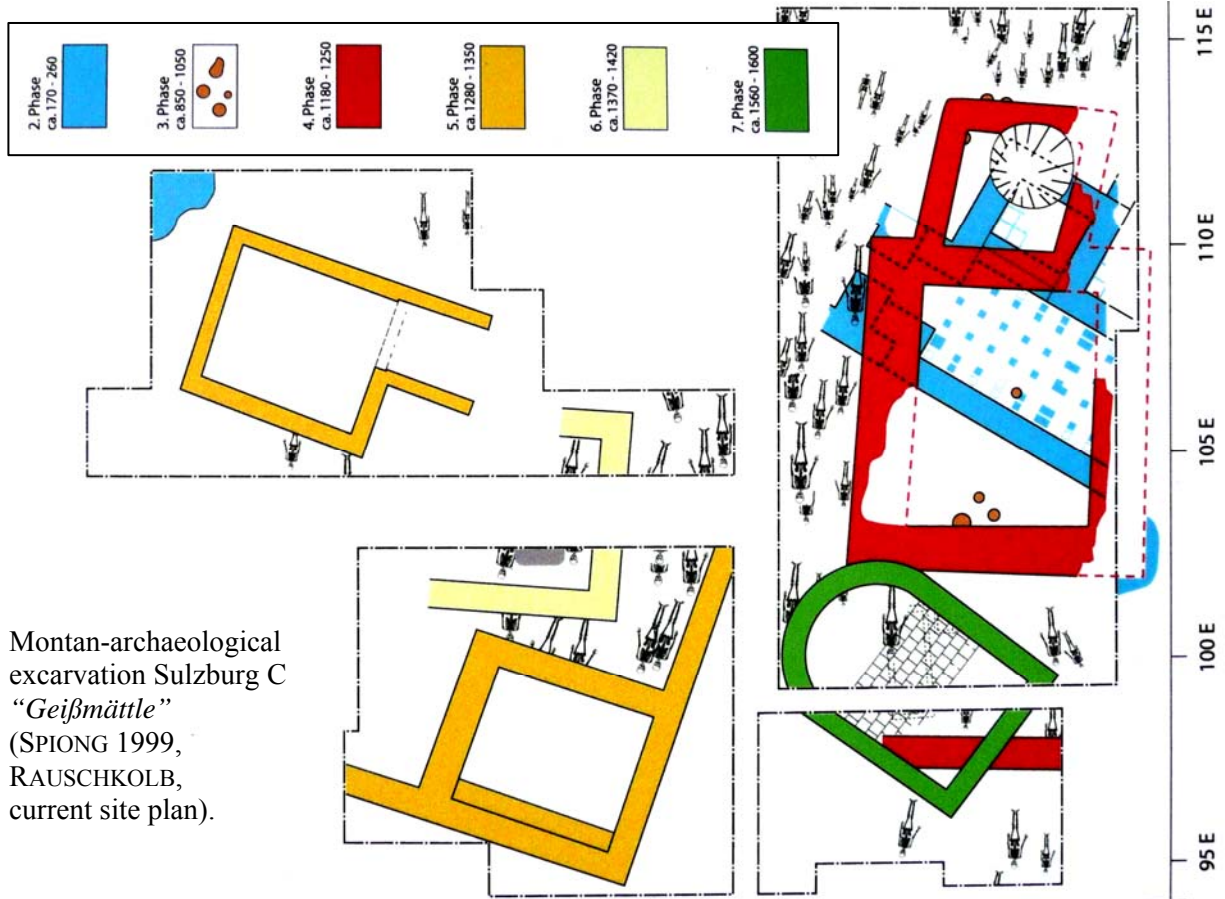
Most famous best investigated Medieval Silver Mining Areas of the Region: Mining areas Sulzburg (1*) and St. Ulrich-Birkenberg (2*) and the main mineral veins (STEUER & ZIMMERMANN 1990).



Mining area Sulzburg. Charcoal sample sites (LUDEMANN 1996: 88; modified).

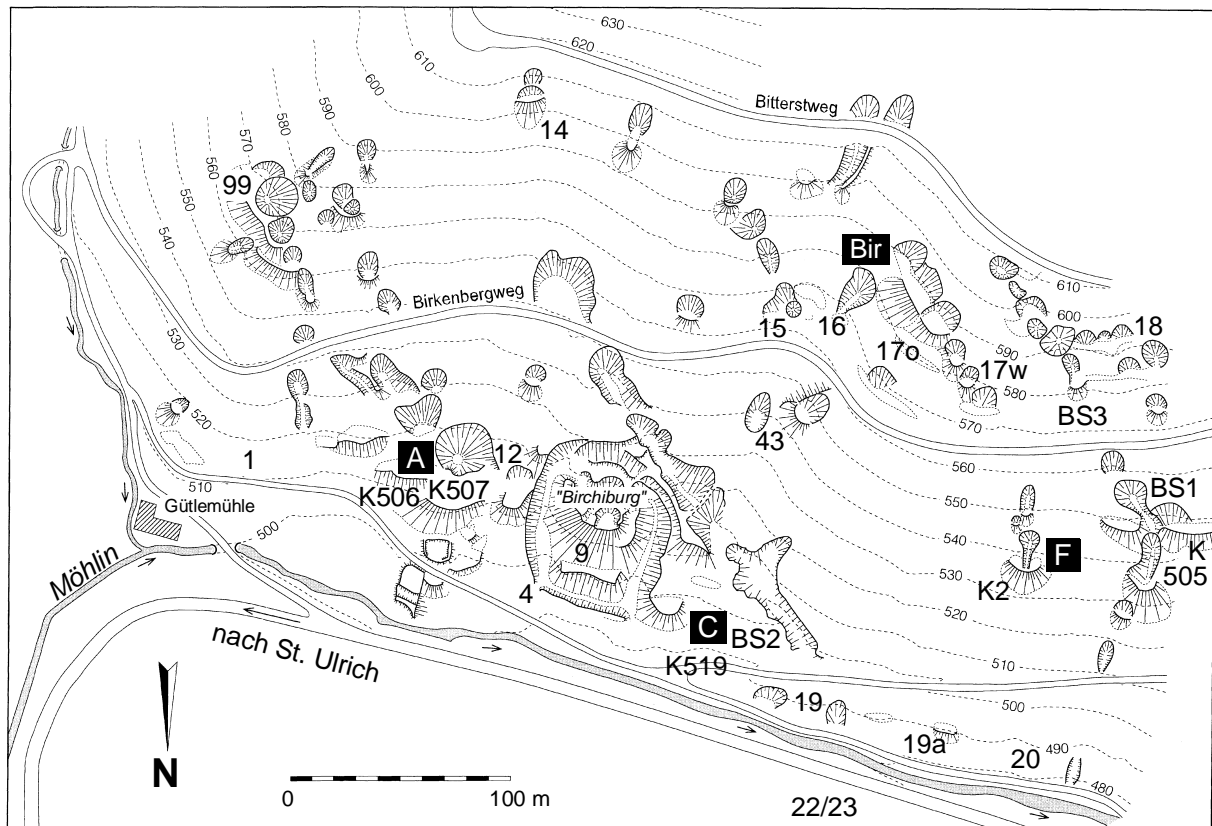


Mining area Sulzburg, Southern Black Forest, SW Germany. Mineral vein *Riestergang* with many anthropogenic relief features at the sw-facing slope. Sample sites of wood charcoal macro-remains and periods (centuries) investigated anthracologically: A working terraces, B mines, H kiln sites, M smithies, S settlement, X colluvial deposit. A+D, C: archaeological excavations (Map based on GOLDENBERG 1999, modified.; LUDEMANN 2008: 45).

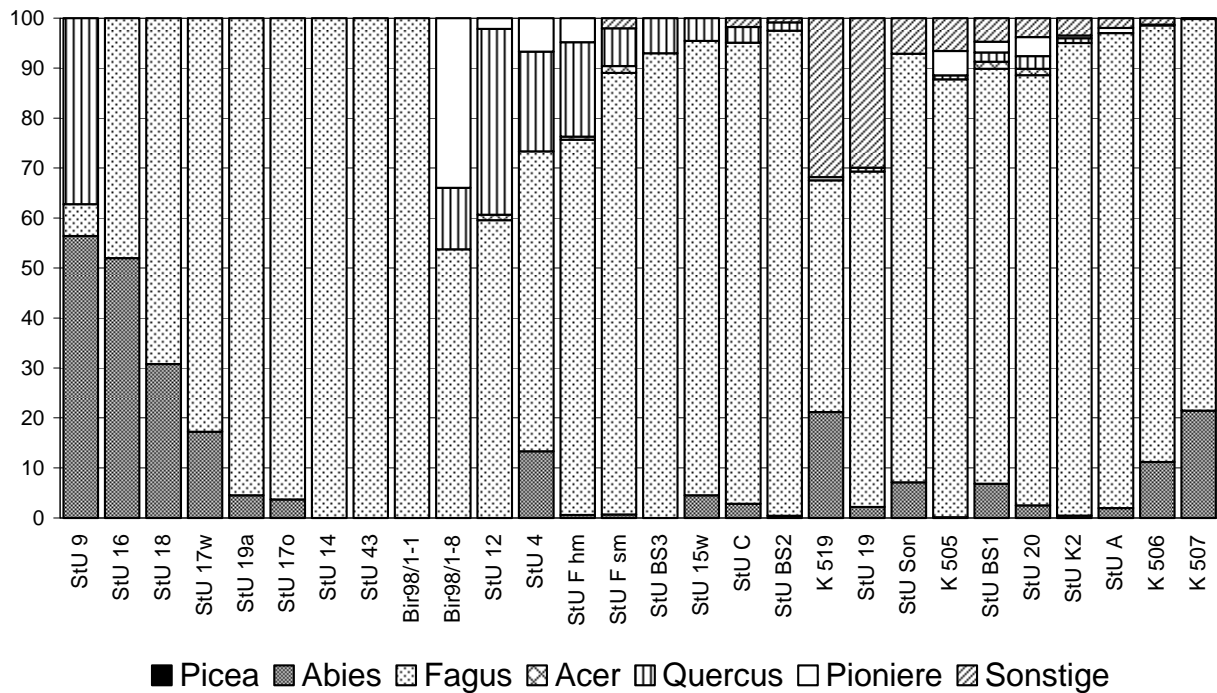


Montan-archaeological excavation Sulzburg C "Geißmättle" (SPIONG 1999, RAUSCHKOLB, current site plan).





Mining area St. Ulrich-Birkenberg, Black Forest, SW Germany. Central part of the medieval mining area on the north-facing slope of the Birkenberg with the mining archaeological excavations, A, C, F and Bir, and the other sites investigated (No., BS No., K No.). Map based on GOLDENBERG 1999, modified (LUDEMANN & NELLE 2002: 29).



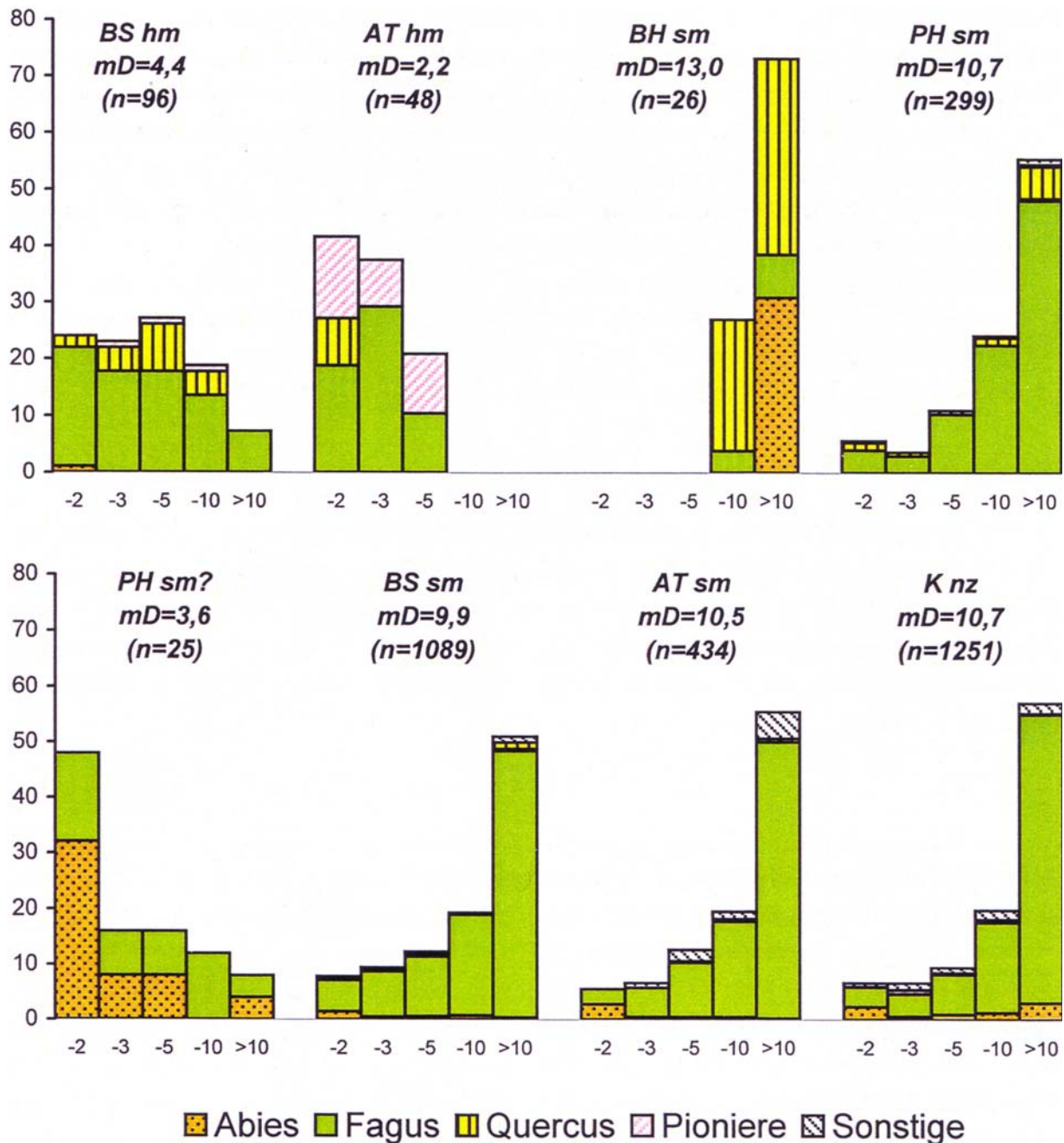
Anthracological results from 29 sample sites in the medieval mining area St. Ulrich-Birkenberg, Black Forest, SW Germany, classified by the different tree species compositions in the charcoal samples. Sonstige: remaining taxa, especially *Carpinus* (LUDEMANN & NELLE 2002: 51).

Medieval mining area St. Ulrich Birkenberg, Black Forest, SW Germany. Anthracological results (taxa %) of 4 mining archaeological excavations (StU A, C, F, Bir98/1) and 25 other historical sites from the Middle Ages and from Modern Times. Left and right columns give period: Hoch-MA: Central Middle Ages, Spät-MA: Late Middle Ages, Neuzeit: Modern Times. Jh.: centuries AD. Nutzungsart: Kind of wood use: Arbeitsterrasse, working platforms; Burghalde: castle area; Bergschmieden: mine-smithies' forges; Meilerplätze: charcoal kiln sites; Pingenhalden: pit and shaft areas. N number of charcoal pieces determined per sample and all together. G/N average weight per piece. mD: diameter average (LUDEMANN & NELLE 2002: 69).

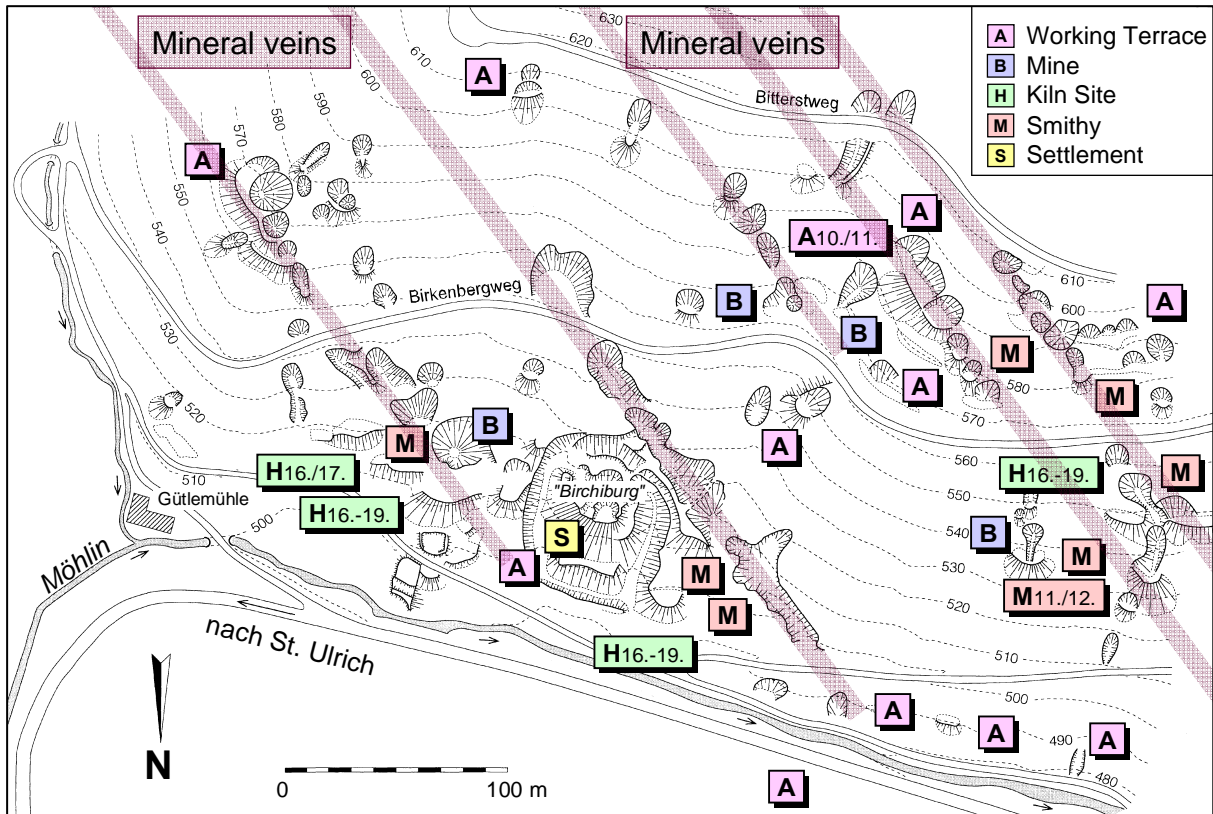
Nutzungsphase	Nutzungsart	Fundplatz	Baumartenanteile in der Holzkohle [%]											N	G/N [g]	mD [cm]	Alter Jh.		
			Salix	Corylus	Quercus	Fagus	Abies	Carpinus	Acer	Populus	Betula	Ulmus	Prunus					Alnus	Pomoideae
Hoch-MA	Bergschmiede	StU F*	3	2	19	75	1	.	1	<1	.	.	.	.	.	498	0,2	4,4	11.-12.
	Arbeitsterrasse	Bir98/1-8*	8	26	12	54	.	.	.	.	.	.	.	.	.	106	0,0	2,2	10.-11.
Spät-MA	Burghalde	StU 9	.	.	37	6	56	.	.	.	.	.	.	.	.	78	0,4	13,0	13.-14.
		Pingenhalden	StU K2	.	1	1	95	1	4	200	0,7	10,7	(13.-14.)
	StU 12		1	.	37	60	.	.	1	1	.	.	.	.	.	94	0,3	11,3	(13.-14.)
	StU 15w		.	.	5	91	5	.	.	.	.	.	.	.	.	44	0,3	9,7	(13.-14.)
	StU 16		.	.	.	48	52	.	.	.	.	.	.	.	.	25	0,3	3,6	13.-14.?
	Bergschmieden	StU BS1	<1	1	2	83	7	4	1	.	<1	<1	.	.	.	424	0,5	8,5	13.-14.
		StU A	.	1	.	95	2	2	.	.	.	.	.	.	.	100	3,4	10,0	13.-14.
		StU F*	.	.	8	88	1	2	1	.	.	.	.	.	.	146	0,1	4,3	13.-14.
		StU C	.	.	3	92	3	2	.	.	.	.	.	.	.	283	0,7	11,2	13.-14.
		StU BS2	.	.	2	97	.	1	.	.	.	.	.	.	.	236	0,4	10,9	13.-14.
		StU 17w	.	.	.	83	17	.	.	.	.	.	.	.	.	58	0,3	8,5	13.-14.
		StU BS3	.	.	7	93	.	.	.	.	.	.	.	.	.	114	0,8	11,0	13.-14.
	sonstige Arbeitsterrassen	StU 20	3	1	3	86	3	4	1	.	.	.	.	.	.	79	0,3	7,9	13.-14.
		StU 19	.	.	1	67	2	30	.	.	.	.	.	.	.	137	0,5	11,2	13.-14.
		StU 4	.	7	20	60	13	.	.	.	.	.	.	.	.	15	0,2	9,4	(13.-14.)
		StU 18	.	.	.	69	31	.	.	.	.	.	.	.	.	26	0,5	7,8	13.-14.
		StU Son**	.	.	.	86	7	.	.	.	.	.	.	.	.	28	0,2	8,0	13.-14.
StU 19a		.	.	.	95	5	.	.	.	.	.	.	.	.	22	0,2	12,0	13.-14.	
StU 17o		.	.	.	96	4	.	.	.	.	.	.	.	.	81	0,2	10,3	13.-14.	
Bir98/1-1*		.	.	.	100	.	.	.	.	.	.	.	.	.	29	2,4	12,8	13.-14.	
StU 14		.	.	.	100	.	.	.	.	.	.	.	.	.	18	0,2	8,0	(13.-14.)	
StU 43	.	.	.	100	.	.	.	.	.	.	.	.	.	85	0,3	12,3	(13.-14.)		
Neuzeit	Meilerplätze	K 506	.	.	.	87	11	1	<1	.	.	.	.	.	626	0,5	12,2	16.-17.	
		K 507	.	.	.	78	21	<1	.	.	.	.	.	.	605	0,3	12,9	16.-19.	
		K 519	.	.	.	46	21	30	.	.	.	1	.	1	1	151	0,9	8,5	16.-19.?
		K 505	<1	.	1	88	<1	7	.	4	.	.	.	.	.	1381	0,3	9,2	16.-19.?
Summe		n=29***	1	1	4	83	7	4	<1	1	<1	<1	<1	<1	5689	0,6	9,4	10.-19.	

*2 Fundplätze aufgeschlüsselt (Bir98/1, StU F)

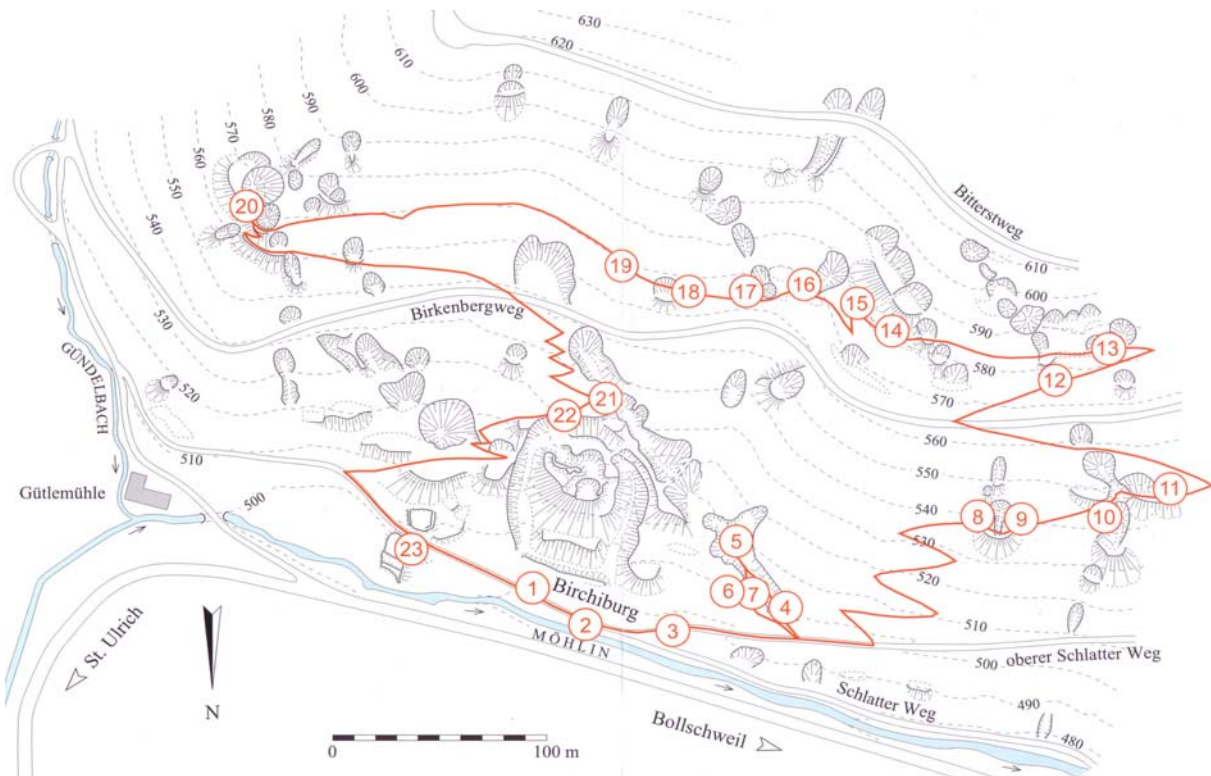
**4 Fundplätze zusammengefasst, StU Son (StU 1, StU 22, StU 23, StU 99)



Medieval mining area St. Ulrich Birkenberg, Black Forest, SW Germany. Anthracological result of 29 sample sites, summarized by age and kind of site/kind of wood exploitation into 8 groups. Distribution of charcoal pieces in diameter classes and by wood species. First column: percentage of pieces with a diameter up to 2 cm; second column: up to 3 cm; third column: up to 5 cm; fourth column: up to 10 cm; fifth column: more than 10 cm diameter. **AT** working platforms, **BH** castle area, **BS** mine-smithies' forges, **K** kiln sites, **PH** pit and shaft areas. **hm** Central Middle Ages, **sm** Late Middle Ages, **nz** Modern Times. **mD** average diameter. **n** sample size (LUDEMANN & NELLE 2002: 71).



Medieval mining area St. Ulrich-Birkenberg, Southern Black Forest, SW Germany with many anthropogenic relief features at the north-facing slope. Sample sites of wood charcoal macro-remains: A working terraces, B mines, H kiln sites, M smithies, S settlement. Map based on GOLDENBERG 1999, modified (LUDEMANN 2010b:184, modified).

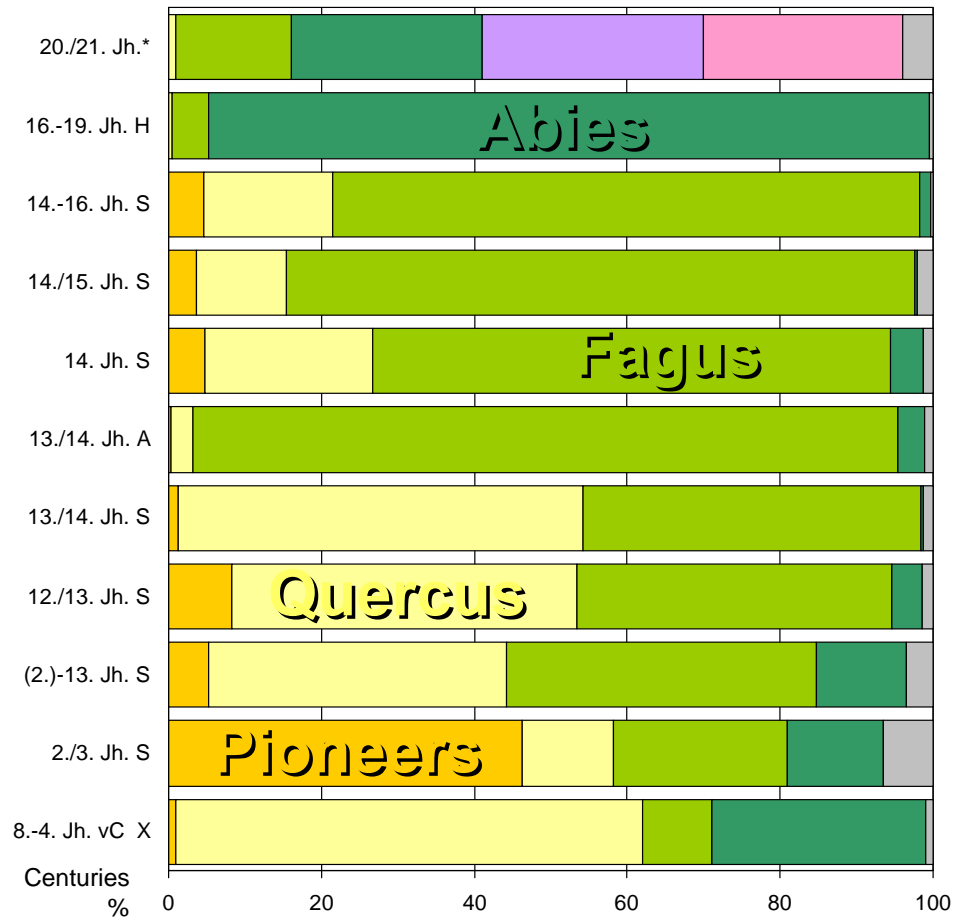


Mining archaeological pilot area "Birkenberg", Black Forest, Germany. 1-23 Illustrated sites of historical mining activities (Reference: Birkenberg flyer 2004; GOLDENBERG & FRÖHLICH 2006).

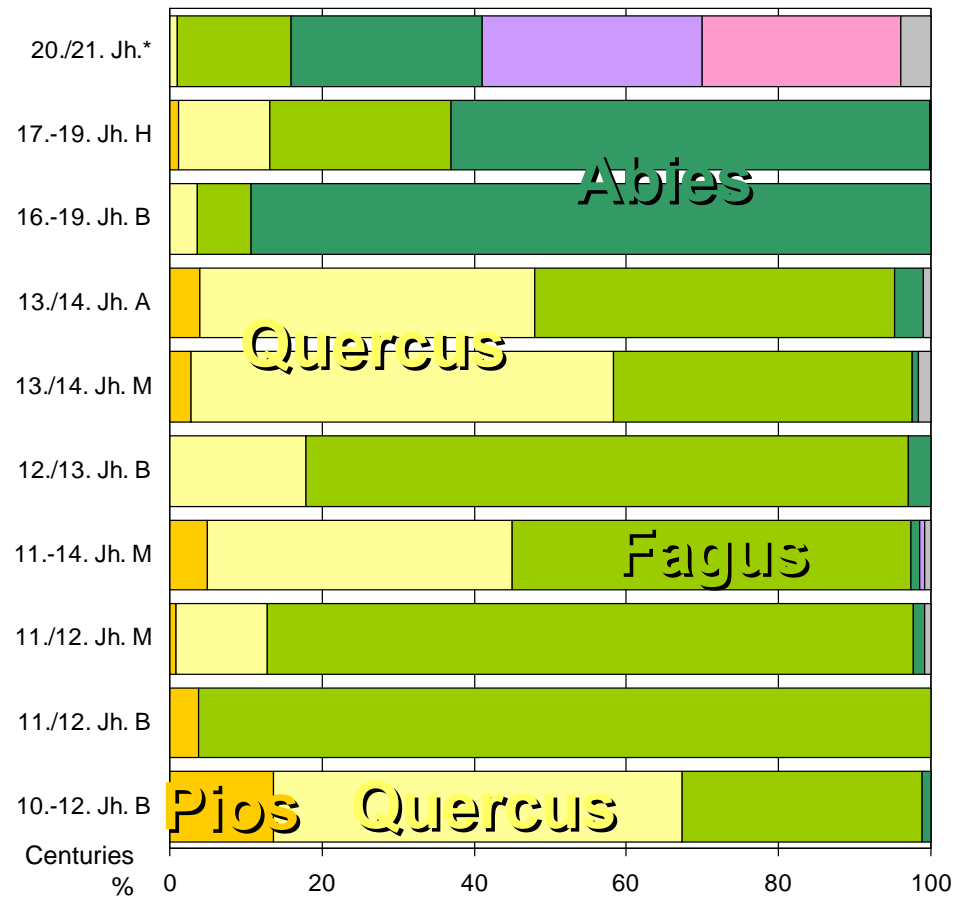
Anthracological results of two historical mining areas of the western part of the Southern Black Forest, SW Germany, based on analyses of 14,046 wood charcoal macro-remains. Kind of use: A working terraces, B mines, H kiln sites, M smithies, S settlements, X ditch sediment (LUDEMANN 2008, 2010b).

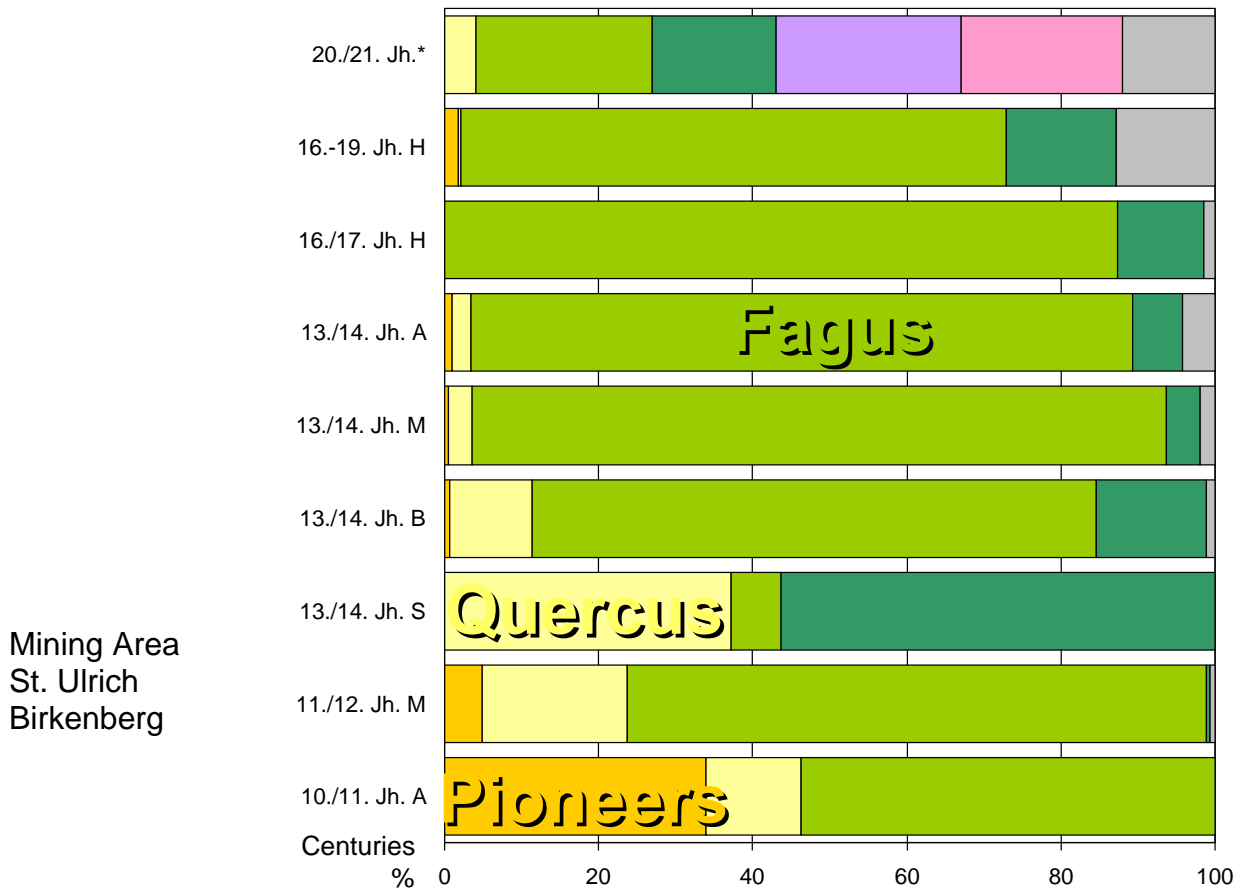
Period [centuries]	Kind of Use	Number of Analyses	Average Weight/ Charcoal Frag. [g]	Number of Taxa	Proportion of Taxa in Charcoal Samples [%]														Average Diameter mD [cm]					
					Fagus	Quercus	Abies	Corylus	Salix	Carpinus	Alnus	Populus	Acer	Prunus	Ulmus	Tilia	Betula	Pomoideae		Picea	root wood	Fraxinus		
Total		14046		17	55	22	16	3	2	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
Mining Area Sulzburg, Southern Riestergang, Sulzbach Valley Floor																								
16.-19.	H	212	0.5	4	5	<1	94															<1	8.0	
14.-16.	S	280	0.9	6	77	17	1	4	1	<1														7.7
14./15.	S	1137	1.0	13	82	12	<1	2	1	<1	<1	1	1	<1			<1	<1				<1	8.4	
14.	S	419	1.4	10	68	22	4	2	1	<1		1	<1			1	<1						<1	7.9
13./14.	A	348	2.2	5	92	3	3		<1				1											11.6
13./14.	S	310	0.7	8	44	53	<1	1			1	<1	<1	<1									<1	5.0
12./13.	S	73	0.4	6	41	45	4	1	7		1													7.3
(2.)-13.	S	507	0.5	10	41	39	12	3	2		3	<1	<1			1		<1						7.3
2./3.	S	184	0.4	7	23	12	13	22	19		7	5												7.1
8.-4.BC	X	100	0.1	5	9	61	28	1								1								12.9
		3570		16	48	26	16	4	3	<1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Mining Area Sulzburg, Northern Riestergang, Krebsgrund/Riestergrund																								
17.-19.	H	1207	2.2	8	24	12	63	1	<1	<1	<1	<1												8.0
16.-19.	B	28	0.2	3	7	4	89																	3.0
13./14.	A	622	1.8	9	47	44	4	2	1	<1					<1	<1	1							5.9
13./14.	M	883	1.8	7	39	55	1	1		1	2		1											4.9
12./13.	B	67	0.8	3	79	18	3																	7.7
11.-14.	M	911	0.3	10	52	40	1	3	1		1	<1				<1	<1	1						2.5
11./12.	M	711	0.4	8	85	12	2	1		<1	<1	<1			<1									4.1
11./12.	B	80	0.4	2	96			4																3.2
10.-12.	B	278	0.9	6	32	54	1	1	12		<1													6.3
		4787		15	51	27	18	2	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Mining Area St. Ulrich, Birkenberg																								
16.-19.	H	2137	0.5	9	71	<1	14		<1	12	<1	1			<1			<1						10.2
16./17.	H	626	0.5	4	87		11			1		<1												12.2
13./14.	A	520	0.5	8	86	2	6	1	<1	3		<1	1											10.0
13./14.	M	1361	0.9	9	90	3	4	<1	<1	2		<1		<1		<1								9.2
13./14.	B	363	0.4	8	73	11	14	<1	<1	1		<1	<1											8.8
13./14.	S	78	0.4	3	6	37	56																	13.0
11./12.	M	498	0.2	7	75	19	1	2	3		<1	1												4.4
10./11.	A	106	<0.1	4	54	12		26	8															2.2
		5689		13	68	11	13	4	1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	

Mining Area
Sulzburg
Riestergang
South




Mining Area
Sulzburg
Riestergang
North





Anthracological results (taxa %) of two historical mining areas (Sulzburg, St. Ulrich-Birkenberg) of the western part of the Southern Black Forest, SW Germany, by period and kind of wood use, based on analyses of 14,046 wood charcoal macro-remains. Kind of use: A working terraces, B mines, H kiln sites, M smithies, S settlements, X ditch sediment. Upper most columns: current tree species composition (LUDEMANN 2008, modified; cf. last table).

-  pioneers
-  Quercus
-  Fagus
-  Abies
-  Picea
-  Pseudotsuga
-  others

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Public and Experimental Kilns No.1-6 - Traditional Charcoal Production Projects

by Schauinsland forester & charcoal burner
Philipp Schell



scientific cooperation
Faculty of Biology
Dept. of Geobotany



No.1 - 2002
10 m³



No.2 - 2003
33 m³



No.3 - 2006
35 m³



No.4 - 2008
52 m³



No.5 - 2012
49 m³



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Thomas Ludemann, Freiburg

No.6 - 2015



Public and Experimental Kiln No.5 - 2012 - Charcoal Production Project No.5



23.01.2012
Fuel wood



25.01.2012
Preparation
of fuel wood
(experimental
kiln No.5)



08.02.2012
50 m³ fuel wood
2/3 beech
(*Fagus sylv.*)
1/3 maple
(*Acer pseudop.*)





03.05.2012
Charcoal Kiln
Construction
(experimental
kiln No.5)

Kiln centre
"Quandel"
6:55



Kiln base
"Rost"
7:55



Kiln base
"Rost"
8:03

03.05.2012
Charcoal Kiln
Construction
(experimental
kiln No.5)



Kiln base
"Rost"
8:19



Fuel wood
layer 1
8:48



Fuel wood
layer 1
8:48



Fuel wood
layer 2
10:30



03.05.2012
Charcoal Kiln
Construction
(experimental
kiln No.5)

Fuel wood
layer 2
11:20



Anthracology
students
←

Fuel wood
layer 3
12:34



Green cover
12:59

03.05.2012
Charcoal Kiln
Construction
(experimental
kiln No.5)

14:05



Green cover
14:39



15:55



Black cover
Soil cover
16:05





03.05.2012
Charcoal
Burning
(experimental
kiln No.5)

Charcoal kiln
"ready for
take-off"
16:22



16:28



Starting
the burning
process
16:32



16:42



17:48

03.05.2012
Top of the Kiln centre,
Quandel "under fire"



Burning kiln &
charcoal burner
18:40

Charcoal
Burning
(experimental
kiln No.5)



after 5 days
08.05.2012



Charcoal Burning (experimental kiln No.5)



after 10 days
13.05.2012



after 12 days
15.05.2012





Volume
Reduction
(experimental
kiln No.5)

within
12 days

03.05.2012



15.05.2012



12.06.2003



27.06.2003

Experimental kiln No.2: Volume reduction (about 50 %) within two weeks (pictures taken exactly from the same field position; cf. red lines)

24.05.2012
Charcoal
Harvest Day
(experimental
kiln No.5)

ready for
"Charcoal
harvest"
7:56



7:59



8:03



24.05.2012
Charcoal
Harvest Day
(experimental
kiln No.5)

8:11



Base
construction
"Rost"
(partly not
charred)

8:17



8:21



8:22

24.05.2012
Charcoal
Harvest Day
(experimental
kiln No.5)



Charcoal
harvesting
non-traditional
8:24





24.05.2012
Charcoal
Harvest Day
(experimental
kiln No.5)

8:28



8:30

24.05.2012
Charcoal
Harvest Day
(experimental
kiln No.5)



Base
construction
"Rost"
(partly not
charred)
8:34



Live coals
after 9 days!
8:38



Fire fighting
quenching
after 9 days
8:50



24.05.2012
Charcoal
Harvest Day
(experimental
kiln No.5)

10:30



10:32



11:17



11:53

24.05.2012
Charcoal
Harvest Day
(experimental
kiln No.5)



12:00

Eco-
charcoal
from
Freiburg's
forests
- Touch
history!





Charcoal from Freiburg's forests -
Touch history & Kiln site anthracology!

Freiburg 
IM BREISGAU

