The large wounds created by increment borers have been a particular cause for concern, but in some tree–fungus associations, smaller wounds inflicted by the IML-Resistograph caused greater damage than large wounds (Kersten and Schwarze 2005).

More research is needed to compare the long-term effects of using different kinds of drills and borers in a variety of host–fungus associations. The positioning of mapping should be

Table 2. Methods of detecting wood decay. Reproduced from Schmidt 2006.

Method	Procedure	Advantage, disadvantage	Reference
Optical	Visual	Non-destructive, subjective (VTA)	Young (1984), Mattheck and Breloer (1994), Reinartz and Schlag (1997), Roloff (2001)
	Endoscopy	Confined spaces, strongly destructive	Janotta (1995)
	Rhizoscopy	Root systems	Seufert et al. (1986)
	Light microscopy	Simple, detection of early stages of decay	Schwarze et al. (1997), Anagnost (1998)
	Electron microscopy	High resolution	Liese (1970), Daniel (2003)
	IR/NIR/FTIR spectroscopy	Laboratory method, printed record	Körner et al. (1992), Schwanninger et al. (2004)
	UV microspectrophotometry	Laboratory method, 3D wood topochemistry	Koch and Kleist (2001)
Spectrometric	GC-MS	Laboratory method, detection of moulds and indoor decay	Keller (2004)
	MALDI-TOF MS	Laboratory method, detection of moulds and indoor decay	Schmidt and Kallow (2005)
Acoustic	Rubber mallet	Non-destructive, subjective	Mattheck and Breloer (1994)
	Speed of ultrasound (stress wave timer)	Mildly destructive, readings affected by cracks, frost and wet wood. Certain types of decay are difficult to detect	Schwarze and Fink (1994), Rust (2001), Niemz et al. (2002)
	Arbotom®, Picus® acoustic tomography	Mildly invasive, software constructs 2D pictures (acoustic tomograms)	Rabe et al. (2004), Schwarze and Heuser (2006), Rinn (2003, 2004)
Electrical	Electrical resistance, conductivity (Shigometer, Vitamat, Treetronic)	Portable, readings affected by weather conditions, mildly-strongly destructive	Shigo et al. (1977), Kučera (1986)
	Nuclear magnetic resonance	Non-destructive, not mobile, expensive	Pearce et al. (1997), Müller et al. (2002), Oven et al. (2008)
	3D magnetic resonance microscopy		
	Radar	Non-destructive, ground-penetrating radar for root investigation	Barton and Montagu (2004)
Mechanical	Increment borer	Handy, inexpensive, strongly destructive	Mattheck and Breloer (1994)
	Fractometer	Detects early stages of all decay types, strongly destructive as increment cores are required	Mattheck and Bethge (1993) Schwarze and Fink (1994)
	Needle penetration (Pilodyn)	Mildly destructive, handy, inexpensive	Niemz and Kučera (1999)
	Penetration resistance (Resistograph®, IML-Resistograph)	Strongly destructive, portable, printed data plots	Rinn (1994), Rinn et al. (1990), Schwarze and Fink (1994), Isik and Li (2003)
Thermal imaging	Heat radiation	Non-destructive, portable, low resolution	Niemz et al. (1998), Catena (2003), Nicolotti (2003)
Radiographic	X-ray, γ-ray computer tomography	Non-destructive, portable, high resolution, expensive, use in the field restricted by legislation	Habermehl (1994), Habermehl and Ridder (1995), Schwarze and Gülpen (1995)
Caliometric	Isothermal microcalorimetry	Laboratory method	Xie et al. (1997)
Microbiological	Culturing of pure cultures	Laboratory method, fungal identification	Nobles (1958), Stalpers (1978), Rose (1993)
Biochemical	CO_2	Laboratory method, fungal activity	Kirk et al. (1986)
	ATP	Laboratory method, fungal activity	McCarthy (2001), Bjurman (1992)
	Chitin	Laboratory method, fungal quantification	Nilsson and Bjurman (1998)
	Ergosterol	Laboratory method, fungal quantification	Pasanen et al. (1999), Dawson-Andoh (2002)
	pH value	Fungal activity, brown/white rot differentiation	Peek et al. (1980)
	Sniffer dogs	Non-destructive, sporophore and decay detection	Koch (1991), Keller (2004)
Molecular	Protein gel electrophoresis	Laboratory method, fungal identification	Schmidt and Kebernik (1989)
	Immunology	Laboratory method, early stages of decay, fungal identification	Vigrow et al. (1991a,b), Clausen (1997)
	DNA-based methods	Laboratory method, fungal identification, objective	White et al. (2001), Schmidt (2000)

Non-destructive = tree tissues not damaged. Mildly destructive = tree tissues are damaged but boundaries (reaction- and barrier zones) are not. Strongly destructive = tree boundaries damaged (refers to measurements on the standing tree). VTA = visual tree assessment.