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Pore characteristics measured by high-resolution x-ray computed tomography for agroforestry and grass buffers

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Riparian buffers which include agroforestry and grass buffers can improve infiltration and reduce runoff from landscapes under row crop agriculture. The study objective was to examine the influence of buffer effects on soil pore characteristics using high-resolution x-ray computed tomography (CT). Treatments studied were agroforestry buffer, grass buffer, and row crop (RC), on a Putnam silt loam (fine, smectitic, mesic Vertic Albaqualf). A no-till corn (*Zea mays* L.)-soybean [*Glycine max* (L.) Merr.] rotation was established in 1991 with buffers implemented in 1997. Agroforestry buffers, 4.5 m wide and 36.5 m apart, consisted of pin oak (*Quercus palustris* Münchh.) trees planted among redtop (*Agrostis gigantea* Roth) and brome (*Bromus* spp.) grasses and birdsfoot trefoil (*Lotus corniculatus* L.). Two replicates of intact soil cores (76-mm diam. by 76-mm long) were collected from the 0- to 100-mm depth. Cores were scanned at a voxel size of 73 by 73 by 84 μm. Images were analyzed with Three-Dimensional Medial Axis (3DMA) software. The average pore paths for grass and agroforestry buffer samples were three and five times greater, respectively, than for RC. On average, buffers had a 33% higher characteristic coordination number than RC. Buffers had a higher characteristic path length constant (2.18 times the RC treatment) and a lower path tortuosity (89% of the RC treatment) relative to values for RC. Average nodal pore volume and throat radii of buffers were 1.8 to 2.9 times larger than for RC. Results show three-dimensional structural differences caused by variations in root growth or organic matter accumulation discriminated between buffer and

row crop soil, allowing better quantification of management effects on soil porosity.