 Glyphosate (Roundup) is the most widely used herbicide in the world, and is a key component of direct-seed (no-till) systems throughout the world, especially in the Pacific Northwest (PNW). It is relatively safe, tightly bound to soil particles, is broken down by microbes, and does not have a long residual in the soil. However, there has been concern about non-target effects, especially on other beneficial bacteria and fungi in the soil. Until 10 years ago, technology did not exist to look in detail at the entire microbial community and all its complexity. With high-throughput or next-generation sequencing, we can generate tens of thousands of DNA sequences from a single soil sample and identify all the microbes that could never be cultured. We conducted a series of studies to answer the question: how does glyphosate affect soil microbes in the PNW? We sampled the fields of 4 long-time direct seeders across the precipitation zones of WA and ID, over two years. At each farm, we sampled wheat fields with a long history of glyphosate use, and adjacent CRP land with no history of use. We brought the soils into the greenhouse, split the samples, and planted with wheat. One half were terminated after one month with glyphosate at field rates, and in the other half, plants were mechanically clipped. We sampled the soil and rhizosphere and extracted DNA. We continued this for 4 cycles of planting, killing and replanting. DNA was sequenced with Illumina MiSeq and bacterial and fungal sequences were identified and communities were analyzed. For bacteria, the location of the field and the cropping system was the primary driver of community composition. Glyphosate had a very minor role, often only explaining 1-2% of the variation. Only a small percentage of the bacteria showed a differential response to glyphosate (<1%) More were stimulated by glyphosate use than were reduced. This is due to a greenbridge effect, selecting for communities favored by dying roots. Similar results were seen with fungi. We also examined the succession of fungi and oomycetes over time in roots that were killed with glyphosate. We identified a previously unknown Pythium (P. volutum) that increased in the dying root, while another obligate parasite (Lagenra radicicola) decreased. The richness of species increased in dying roots at 3 days, but then declined to lower levels than non-treated roots, indicating that dead roots were dominated by fewer taxa. Network analysis showed that glyphosate treatments also changed the relationships of taxa, with more negative associations in glyphosate treated roots, indicating completion for the dying root. These studies are the first to examine glyphosate effects on microbes at this level of complexity. Glyphosate has two risks that are greater than effects on microbes- the greenbridge effect and the risk of developing resistant weeds with widespread glyphosate use.