This project consists of a series of geophysical investigations of the Mw 5.8 Virginia earthquake of August 23, 2011, based on the rapid post-seismic deployment of novel high density seismic arrays using instruments from the Earthscope Flexible Array provided to us by IRIS/PASSCAL. This event had a NE-striking reverse faulting focal mechanism, hypocentral depth of 6 km (USGS), and occurred in a previously recognized seismic zone known as the “Central Virginia Seismic Zone”. This event passes with ca. 15 km of a NW-SE oriented deep seismic reflection profile contracted in 1981 by the USGS, providing a rare opportunity to link seismicity to deep structure in the eastern U.S. The preliminary hypocentral estimate suggests that the earthquake occurred within a complex zone of east-dipping reflections that define an imbricated Paleozoic thrust sheet of the central Appalachian Piedmont that is underlain by Grenville basement at a depth of ca. 9 km. On August 27, 2011, four days after the main shock, we deployed 103 portable “Texan” one component dataloggers recording GS-11 geophones along two linear profiles over the hypocentral zone in order a) to demonstrate the viability of rapidly deploying high density arrays, b) to evaluate the value of such arrays in providing more accurate hypocentral locations derived from c) higher resolution velocity models, and d) to test the feasibility of imaging hypocentral structure with reflection methods using aftershocks and ambient noise as virtual sources by applying interferometric techniques. An additional 105 “Texan” instruments and GS-11 geophones were added six days later to extend the array more directly over the aftershock zone and along a regional NE-SW profile. The latter employed three component sensors to quantify regional attenuation characteristics. The seismic stations were deployed at 100m and 200m spacing in the aftershock zone, and 2 km along the regional profile. The aftershocks we recorded have also been located by independent temporary arrays of three-component seismographs. This combination of our very high-resolution array and the "conventional" three-component arrays represents a clear demonstration of the value and feasibility of deploying high density seismic arrays for aftershock investigations and provides guidance for even more ambitious future “High Definition” aftershock deployments (e.g. 1000+ channels)