This paper presents the results of a long-term project at the UWM Center for By-Products Utilization to investigate the effect of wood fly ash on the strength and durability aspects of concrete. Four series of concrete mixtures were proportioned to achieve a 28-day compressive strength of approximately 5000 psi. All mixtures contained between nine to 33 percent of fly ash (ratio of wood fly ash and Class C fly was varied (0, 0.3, 0.4, and 0.6). Tests were performed for density, compressive strength, splitting tensile strength, flexural strength, shrinkage, and freezing and thawing resistance. Based on the results obtained, it was concluded that durable structural-grade concrete could be manufactured using 50% blend of wood and coal fly ash as a replacement of cement.