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Philip Wesolek and **Jay Williams*** (jaywill@caltech.edu), Department of Mathematics,
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and descriptive set theory.*

We first consider three well-known chain conditions on countable groups and characterize them in terms of well-founded descriptive-set-theoretic trees. Using these characterizations, we demonstrate that the sets of groups defined by these conditions are co-analytic and not Borel. We then adapt our techniques to show elementary amenable groups may be characterized by well-founded descriptive-set-theoretic trees and, therefore, elementary amenability is equivalent to a chain condition. Our characterization again implies the set of elementary amenable groups is co-analytic and non-Borel. As corollary, we obtain a new proof of the existence of finitely generated amenable groups that are not elementary amenable. (Received September 12, 2014)