Abstract: The identification of the dominant cellulose degradation chemistry is of central importance to the design of effective paper preservation strategies. In order to discriminate different cellulose reaction paths, chemical analyses were chosen to monitor selectively and quantitatively both the scissions and functional groups produced in cellulose during paper aging. The results for acid-treated paper are consistent with hydrolytic scission, and humid oven aging also seems to degrade the cellulose by hydrolysis reaction. Dry oven aging shows the participation of other chemistries, although the dominant cellulose scission again appears to be hydrolytic. Oxidative treatments produced a variety of degradation behavior, ranging from the "specific" oxidation with periodate (carbonyl production with little chain scission) to the "random" oxidation of acidic hypochlorite and peroxide (3-4 carbonyls per scission). Compared with these "random" oxidations, exposure to near-ultraviolet light seems to be slightly more directed toward chain scission, with relatively little production of oxidation along the chains. These results suggest bounds on the post-oxidation strength loss that will occur due to subsequent "weak link" scission.