We have used pulsed laser photoionization of dry atmospheric air for the analysis of the $\text{O}_2(\text{X}^3\Sigma^+ \rightarrow \text{C}^3\Pi)$ excitation spectrum and improved characterization of the $\text{O}_2(\text{C}^3\Pi)$ Ryberg state. This $^3\Pi$ Ryberg state is generally very diffuse due to predissociation, but using this method, reasonable resolution in the rotational structure of the $v=2$ level was achieved. A simulated $\text{O}_2(\text{X}^3\Sigma^+ \rightarrow \text{C}^3\Pi)$ excitation spectrum was calculated for line position, intensity, and linewidth that agreed very well with the experiment, providing values for $\nu_0$, $B_v$, and $D_v$ for the F1, F2, and F3 subbands of $\text{O}_2(\text{C}^3\Pi, v=2)$. The photoionization technique involved a combination of resonant-enhanced multi-photon ionization (REMPI), collisional excitation, and laser-induced fluorescence. A focused, ultraviolet laser pulse was used to excite the $\text{O}_2(\text{X}^3\Sigma^+ \rightarrow \text{C}^3\Pi)$ resonant transition. The near coincident energy between the $\text{O}_2(\text{C}^3\Pi, v=2)$ state and the $\text{N}_2(\text{a}_1^1\Sigma^+, v=1)$ state resulted in rapid collisional transfer of energy to the $\text{N}_2(\text{a}_1)$ state. The $\text{N}_2(\text{a}_1)$ molecules were then photoionized by the same laser pulse to the $\text{N}_2^+(\text{B})$ state, producing an easily observable fluorescence at 391 nm. By scanning the laser wavelength while observing the 391 nm fluorescence, details of the $\text{O}_2(\text{C}^3\Pi)$ Ryberg state could be studied.