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We use a periodically forced density-dependent compensatory Leslie model to study the combined effects of environmental fluctuations and age-structure on pioneer populations. In constant environments, the models have globally attracting positive fixed points. However, with the advent of periodic forcing, the models have globally attracting cycles. We derive conditions under which the cycle is attenuant, resonant, and neither attenuant nor resonant. These results show that the response of age-structured populations to environmental fluctuations is a complex function of the compensatory mechanisms at different life-history stages, the fertile age classes and the period of the environment. (Received September 15, 2007)