Taproots in oaks play a critical role in absorbing water from deeper soil layers, ensuring tree health during drought stress. In contrast to acorn-sown seedlings, nursery management practices where seedlings are grown in containers, may alter natural taproot formation. The most common practice applied to seedlings grown in containers is the removal of their taproot by air pruning, which involves forming an air space between the bottom of a container and the surface it rests on. Oak seedlings without a taproot system are not capable of drawing water from deeper soil layers and thus have a reduced ability to overcome adverse environmental conditions resulting from periodic and sustained episodes of drought. Drought resistance in oak tree stands may be improved by planting oak seedlings growing in containers that are capable of drawing water from deeper soil layers. The effect of this improved resistance, achieved by preserving the taproot system in containerized oak seedlings, will be forest stands with increased tolerance to adverse climatic changes, such as cyclic periods of drought. Considering the fragmentary state of our current knowledge on the consequences of agrotechnical treatments (seedlings production in containers) on the long-term growth and fitness of oak stands, it is essential to obtain and evaluate biological data that can potentially be used to improve nursery practices and thereby result in the production of higher-quality oak seedlings with an increased ability to persist and grow into mature trees suitable for timber harvesting. The information generated in this project will benefit both foresters and the scientific community and will contribute to the advancement of forest science. Understanding how container oak production practices influence taproot development when seedlings are subsequently planted in a forest site, requires a perspective that takes into account the endogenous traits and ontogenetic growth patterns resulting from forest practices. An analysis of the factors conducive to the development of a taproot in containerized seedlings will be conducted through the integration of anatomical, physiological, and molecular approaches. A comprehensive approach will be utilized, including the use of state-of-the-art molecular and physiological biology techniques, to fully elucidate the biological prerequisites needed for taproot regrowth in containerized oak seedlings that are subsequently planted in forest stands. Incorporation of knowledge from the ontogenetic and physiological factors that arise during nursery cultivation will foster the development of practices that improve the quality and vigor taproot re-growth when seedlings produced in containers are planted in the field. Conducting research that includes aspects of forest and biological sciences could have a major impact on the production strategies used to generate containerized seedlings. Information on the processes involved in the formation of the root system in containers will allow for the production of oak stands that are more resistant to negative and injurious effects of the stress induced by periods of drought that impact the vitality of oak trees. Taproot systems are capable of drawing sufficient water from deeper soil depths to maintain the health of the entire tree, and thus prevent the economic losses associated with the need to remove and replant trees that cannot survive episodic periods of drought. The diverse biological analyses within the current proposal have been designed so that the impacts of producing higher quality oaks seedlings will be maximized, both in terms of biomass production and the diversity of other forestry needs, such as disease issues, regional preferences, and the planning of policy strategies for climate change adaptation.