



Coastal Forest Monitoring

Background

Cape Cod National Seashore (CACO) is best known for its shoreline scenery, the interior forests and woodlands have become the most prominent feature of this coastal landscape. Forest communities within CACO are found over a broad range of topographic, hydrologic, and geologic conditions and provide an expansive habitat for a large number of flora and fauna. As such, forests may serve as an important indicator of the ecological health of not only CACO, but Cape Cod itself. Both natural and anthropogenic factors influence the health of forests. Chronic and episodic climatological factors, fire, fire suppression, disease, invasive species, insects, succession, fragmentation by development, acid deposition, ultraviolet radiation, climate change, and air pollution have been identified as having the potential to significantly alter this diverse habitat. The independent and interactive effects of human history and the coastal environment have resulted in a unique mosaic of forest types, each with the potential to follow a different trajectory of change. Monitoring and understanding this change has become an important priority for CACO.

Long-Term Monitoring

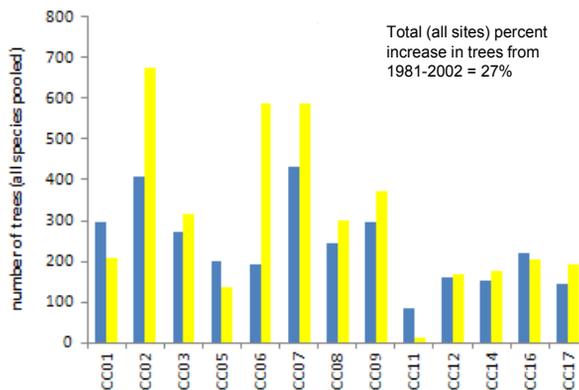
Forest monitoring has been conducted once per decade beginning in 1981. Currently there are 39 sites within CACO's monitoring network, encompassing pine, pine-oak, oak, black locust, red maple, and Atlantic white cedar, and beech tree ecotypes. Data is collected on tree basal areas, densities, seedling recruitment, canopy cover, maximum heights. Understory and forest floor vegetation is assessed through visual estimates of cover.



Map showing forest monitoring locations (yellow dots) (left) and a fish-eye photo of forest canopy cover, which is quantified using digital image analysis (right)

Status and Trends

CACO forests are influenced by a variety of environmental factors, some of which accelerate (e.g., atmospheric nitrogen deposition) the process of succession and others which suppress this process (e.g., salt spray). Nonetheless, it has become clear that the open grassland and heathland vistas that were integrally linked with CACO's past landscape have increasingly become dominated by woodlands and forests. Data from 1981 through 2002 (Figure below) reflects this trend in the majority of forest monitoring plots.



Number of trees (> 2-inch diameter) at each forest monitoring site in 1981 vs. 2002. The total number of trees in each year (all sites pooled) is given in the top right corner of the graph.



Severe salt-spray damage, as evidenced by the brown needles, to a pitch pine near the coastal bluff. Note the small stature of the tree, which develops as a result of wind and salt stress. Salt spray slows the rate of forest succession.

Forest vegetation monitoring will be repeated every 10 years in an effort to build an extensive dataset for this ecosystem. Forests cover the largest proportion of CACO's landscape and in this way are perhaps its most important natural resource. Long term monitoring is essential for providing high quality data and statistically-rigorous analyses of change. In the face of climate change, this kind of scientific endeavor is of critical value.

More Information

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