Origin and Use of the Coefficients of Conservatism

The following is a brief explanation of the origin and use of the Coefficient of Conservatism. For a more detailed explanation see Allain and others (2006)

Personnel who set conservation priorities and design and monitor restoration projects generally rely on botanists to provide subjective, nonquantitative opinions of habitat quality based on the presence of rare plants, exotic plants, and indicator species. Using the presence of native plant species as indicators in a community, Swink and Wilhelm (1979, 1994) devised a quantitative measure of naturalness called Floristic Quality Assessment (FQA) for the Chicago area. Based on the assumption that vegetation in a community responds predictably to disturbance history, species composition is used as an indicator of naturalness (Taft and others, 1997). Floristic quality analysis systems have since been developed for Missouri (Heumann and others, 1993), Ohio (Andreas and Lichvar, 1995), Ontario (Oldham and others, 1995), Michigan (Herman and others, 1997), The Dakotas (Northern Great Plains Floristic Quality Assessment Panel, 2001) and Wisconsin (Bernthal, 2003). A similar system was developed for Louisiana's coastal prairie flora (Allain and others, in press) and will be discussed briefly in this article. Coefficients of conservatism for each of the species found in Louisiana's coastal prairie are provided in Coastal Prairie Restoration Information System database.

Coefficients of Conservatism

This system of plant classification concentrates on the coastal prairie community and is restricted to the historic range of coastal prairie in Louisiana. A list of plant species occurring in coastal prairie remnants was created that includes disturbance associated species and introduced species occurring in prairie restorations and degraded prairie remnants.

Native species were assigned a coefficient of conservatism (*C*) on a scale of 0-10 based upon their degree of fidelity to remnant coastal prairies and their tolerance of disturbance. Species with high community fidelity are limited in the number of communities in which they occur and are considered indicator species. The *C* value represents an expert's confidence that a plant will occur in a prairie remnant. A species with a $C = 10$ (conservative species) indicates that a botanist would be 100% certain that, if it was growing wild in southwest Louisiana, it was growing on a remnant coastal prairie. A species with a *C* of 0 (early succession species) indicates no confidence that a plant came from a prairie remnant.

In addition to community fidelity, plant species assigned high *C* values are also considered to be intolerant of disturbance. A *C* value of 0-1 indicates an early succession species that requires a high level of disturbance, whereas a *C* value of 5 indicates a species that is only tolerant of disturbance. A species with a C value of 8-10 indicates a species that is intolerant of disturbance.

Introduced plant species are also included in this classification system but with negetive coefficients. Some introduced plants have the potential to alter their habitat, thus displacing native species. Other nonnatives, while not visibly altering their habitat, are indicators of disturbance. Still other nonnatives, representing a small and apparently benign portion of the flora of a site, lower the

relative conservation value of that site when compared to a similar site not yet invaded. Consequently, nonnative plant species are assigned coefficient values from –1 to –3. A coefficient of –1 indicates a species that does not occur on prairie remnants of significant natural quality. A *C* value of –2 was assigned to species that can become established in prairie but are not invasive and do not exclude other species. Those species that both invade prairie and displace native species were given a value of –3.

Floristic Quality Index

Two measurements are commonly used to assess floristic quality employing the *C* values: (1) the average coefficient of conservatism ($\overline{C}$), and (2) floristic quality index (FQI). The FQI is a weighted index of species richness and is calculated by using the following formula:

$$FQI = \overline{C}\sqrt{n_1}$$

where $\overline{C}$ (average coefficient of conservatism) is multiplied by $\sqrt{n_1}$ (the square root of the number of native species at the site). This formula is thought to correct for the differences in size, heterogeneity, or inventory effort among compared sites.

A variant of this method, called the Adjusted Floristic Quality Index (AFQI), includes nonnatives and a quantitative value of their invasive potential. It is calculated using the formula:

$$AFQI = \overline{C}\sqrt{n_2}$$

where $\sqrt{n_2}$ is the total number of species at a site, including nonnatives.

Floristic quality analysis is a versatile, relatively easy to use and repeatable system for quantifying habitat quality and is of value in assessing the integrity of prairie remnants and restorations. Further, it is useful in developing management strategies based on these criteria. The AFQI provides an additional dimension for comparison of natural plant communities across habitats and time, making it useful as a tool in monitoring restoration and enhancement projects.

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