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13.4.1. Considerations of Community Characteristics for Sampling Vegetation

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Wetland managers often monitor marsh vegetation to determine if management goals have been met and expenditures justified. Vegetation can be monitored using indices that identify plant composition, trends in vegetative changes, or rough estimates of food production. Development of vegetation sampling protocol requires careful assessment of management goals in relation to benefits received from sampling efforts. Assessing the results of manipulations has direct management implications, whereas detailed studies that emphasize plant life histories or basic ecological investigations have less direct value. Information on plant community characteristics that will enable managers to match sampling techniques with refuge needs and the constraints imposed by time, expertise, number of personnel, and program funds is provided.

Identification of Goals

The initial consideration in any collection of management data is: "How will this information assist in meeting refuge objectives?" Information on variables other than plants are important. Records on the hydrological regime, timing and type of manipulations, and the wildlife response to management must be maintained. Only then can the results of management be assessed.

The next step is to identify the type of vegetative information required (Table 1). Detailed changes in composition or densities and exact measurements of biomass usually have limited value for refuge needs, whereas more general changes in composition or densities and gross measurements of foods produced are essential in monitoring the effectiveness of management investments. Qualitative approaches or general quantitative approaches often are adequate. Thorough comparisons of techniques on different sites, as well as seasonal or long-term variation in vegetation, require refined quantitative methodologies and time-consuming collection methods. Little is gained from long-term sampling if data are not summarized regularly and subjected to analysis.

Costs of data collection, analysis, time, and personnel are generally greater for quantitative approaches. When time, personnel, and funds are limited, costly sampling systems that provide information with little value in meeting refuge objectives should not be implemented.

Expertise

Effective sampling requires some knowledge of plant taxonomy. Recognition of plants during all life phases (e.g., germination, flowering, seeding) is essential. Use of scientific names is required because common names are not used consistently across the country. In addition, differences between life histories of plants within a genus or between plants with the same common name may have important implications for management.

Table 1. *Use of information from vegetation sampling.*

Type of sample		Use of Information
Aboveground	Vegetative composition	
	Qualitative	
	Cover maps	Monitor general changes
	Photos	
	Ground stations	Monitor general changes
	Aerial	Monitor general changes
	Quantitative	
	Line intercept	Comparisons among years, sites, techniques, etc.
	Point count	Comparisons among years, sites, techniques, etc.
	Aerial photos	Potential to identify certain plant communities, monitor changes among seasons or years
	Vegetative density	Precise comparisons/unit area
	Vegetative structure	
	Qualitative	
	Photos	Monitor general condition or changes
	Visual estimates	Monitor general condition or changes
	Quantitative	
	Cover boards	General description, comparisons among years, sites, techniques, etc.
	Sampling devices	Quantify structure, comparisons among years, sites, management techniques, etc.
	Canopy photos	Quantify degree of closure
Biomass	Seeds	Estimate foods produced
	Vegetative parts	Estimate litter production—browse, etc.
	Percent cover	Estimate cover available on openings for wildlife
Belowground	Composition	Monitor changes among years, sites, techniques, etc.
	Density	Precise comparisons/unit area
	Biomass	Precise comparisons/unit area

Plant Community Characteristics

Plant distribution. Plant communities often have characteristics that make sampling difficult. Typically, a few plant species are common and occur regularly in whatever sampling scheme is used (Fig. 1). In contrast, a large number of plant species will be represented by only a few scattered individuals in most communities. This distribution results in high variability regardless of sampling technique, and dictates that large sample sizes are required if statistical testing and predictive sampling are desired.

Plant structure. The structure of different plants is an important consideration in sampling vegetation. Certain techniques will identify tall, robust vegetation but will overlook smaller or prostrate vegetation.

Growth form. The growth form of plants must be considered before data collection is undertaken. For example, some plants grow in clumps or have

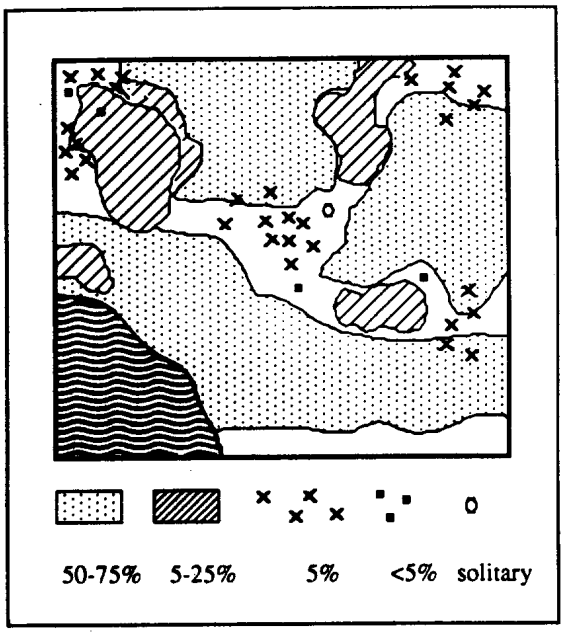

Figure 1. Plant distribution map showing dominance of a few species.

multiple leaves that are all attached to a single rhizome or root system. The distinction between a leaf and a stem becomes critical when data are compared between sites or among years. The chronology of plant growth requires that sampling be properly timed. Otherwise, some species will be overlooked or sampling will not be representative. Animal response to vegetation structure also affects the timing of data collection. Rapid growth of some plants dictates that sampling for structure cannot be delayed for the convenience of the investigator. For example, vegetative structure at the time of nest initiation cannot be identified after nesting is completed. Finally, the maturation pattern of seeds or production of underground parts is a critical consideration in scheduling collection of samples.

Sampling Techniques

The effectiveness of sampling techniques must be considered in relation to their costs in time and personnel (Table 2). Detailed approaches to sampling will be provided in specific techniques chapters in this handbook.

Plant composition. For general long-term trends, aerial or ground photos provide good records. When different vegetation can be distin-

Table 2. *Techniques commonly used to monitor vegetation.*

Information needed/ Technique used	Disadvantages	Advantages
Plant composition		
Line intercept	Time-consuming, requires large sample	Minimal equipment, can monitor size of openings in vegetation
Point count	Time-consuming, requires large sample	Minimal equipment, can monitor size of openings in vegetation
Quadrats	Time-consuming, require large sample	Minimal equipment
Cover maps	Only identify general plant communities	Quick, especially if aerial photos or other base maps are available
Aerial photos (LANDSAT)	Only identify general plant communities Expensive unless photos can be borrowed May require special equipment	Accurate potential for establishing a continuous record of changes
Photo stations	Only identify gross changes	Permanent record of major changes, economical
Plant density–herbaceous		
Quadrat	Time-consuming, needs large sample	Minimal equipment
Ocular	Visual estimates vary among individuals	Quick, minimal equipment
Plant density–woody		
Prism	Only an estimate, not effective for seedings or saplings	Quick, minimal equipment
Seeds		
Catch pans	Time-consuming, animals eat samples, costly to make pans, estimate only of fallen seeds because gradually maturing species drop seeds over an extended period	Can monitor gradual seed production
Quadrat	Time-consuming	
Vertical cover		
Cover board	Burdensome device in some habitats	Quick estimate of vertical cover
Horizontal cover		
Sampling device	Burdensome device in some habitats	Accurate estimate
Belowground biomass		
Quadrat	Time-consuming, difficult to obtain in deep habitats	Accurate estimate

guished from photographs, the potential to document changes exists. Cover maps developed from field inspections (e.g., pacing on ice) and aerial photos are often adequate and more economical than sampling with intercepts or quadrats. Color 35-mm slides are often available from Agricultural Stabilization and Conservation Service (ASCS) offices. Many of these low-level photographs clearly delineate wetland vegetation, and digitized planimeter analysis can yield estimates of the area of different vegetation zones. Comparisons among years must be made with photographs of the same similar season. Since slides can normally be borrowed from ASCS offices, the construction of composite photographs of a wetland from 35-mm slides is economical. Thus, the cost of color reproductions and time to construct maps can be far less than the expenses of aerial photography and large-format photographs. ASCS offices generally do not retain slides of a particular year for more than 2–3 years; therefore, data must be obtained within 2–3 years after the photograph was taken. Long-term photographs may be available within certain periods, but not specific years.

Plant densities. Visual estimates of the percent cover of important species on management units usually provide an adequate index to changes among years. Stem counts within quadrats are very time consuming. Monitoring all plants species within quadrats often has little importance in management and is both costly and time consuming.

Seeds, tubers, etc. No quick method has been developed to monitor seed or tuber production. General estimates of production usually meet management needs and require only information on plant composition and the relative estimates of production for each species. Estimates of belowground biomass are particularly expensive because plant samples must be separated from a large volume of soil. Such activities are generally beyond the capabilities of refuge staff or budgets. Sampling techniques that have low resolution, yet clearly document changes related to management, changes among years, and differences related to habitat use by wildlife, often meet the needs of refuge managers. Consistent record keeping among years using data sheets, photography stations, or ASCS photography provides long-term perspectives as refuge staffs change, modifications in hydrology occur, or as land-use practices influence plant composition on refuges.

Suggested Reading

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