2. Nested Plot Technique (Minimal Area Determination)

The Nested Plot Technique. The minimal area can only be determined in a community that is relatively homogeneous and not fragmentary. A community can be called fragmentary if it lacks species that are usually present in the recurring plant assemblages of this kind. Such fragmentation may be caused by selective destruction of certain species, for example through grazing, or simply through fragmentation of the surface area into too small segments. The total number of species (richness) is in itself an important characteristic of a community type (McINTOSH 1967b).

The minimal area is determined by initially lining out a small area, for example 0.5×0.5 m (0.25 m²) and by recording all species that occur within this small area. Then the sample area is enlarged to twice the size, then to four and eight times the size, etc. The additionally occurring species are listed separately for each enlarged area (TABLE 5.1). The sample area is increased until the species added to the list become very few. FIGURE 5.1 shows the arrangement of the sample quadrats in the form of nested plots.

TABLE 5.1. *Example Data for Determining the Minimal Area of a Pasture* (Lolieto–Cynosuretum typicum in Northwest Germany)

SUBPLOT NUMBER	SIZE (m²)	SPECIES	CUMULATIVE TOTAL NUMBER OF SPECIES
1	0.25	*Lolium perenne*	
		Poa pratensis	
		Poa trivialis	
		Festuca pratensis	
		Trifolium repens	
		Crysanthemum leucanthemum	
		Rumex acetosella	
		Plantago lanceolata	
		Bellis perennis	
		Cirsium arvense	10
2	0.5	*Cynosurus cristatus*	
		Trifolium pratense	
		Cerastium fontanum	
		Centaurea jacea	14
3	1	*Leontodon autumnalis*	
		Achillea millefolium	16
4	2	*Holcus lanatus*	
		Vicia cracca	
		Prunella vulgaris	19
5	4	*Plantago major*	
		Festuca rubra var. genuina	21
6	8	*Anthoxanthum odoratum*	22
7	16	*Trifolium dubium*	
		Taraxacum officinale	24
8	32	*Rumex crispus*	25
9	64	*Lathyrus pratensis*	26

Applied to the two curves, the minimum relevé sizes containing at least 95 percent of the species are determined as follows:

1. Pasture; total number of species is 26. Subtract 5 percent from total number (1.3) and read off the area from the curve at 24.7 number of species. The minimum plot size is about 25 m^2.

2. Hay meadow; total number of species is 32. Read off the area from the curve at 30.4 number of species. The minimum plot size is about 20 m^2.

Unlike CAIN's criterion, the 95 percent species requirement is affected by the y/x ratio. But since the 95 percent point lies to the right of the levelling-off point, as determined through CAIN's criterion, the effect of the curve shape becomes insignificant. The plot size should always be larger than the minimal area obtained through CAIN's criterion.

In spite of the lack of an absolute criterion for the minimal area, the species/area curve remains an important practical guide to stand or plot size in studies aiming at portraying a representative species composition.

Ideally, the minimal area should be established for the community type and not only for one community member of a type. This means that minimal areas should be determined in several recurring plant assemblages of the same kind. The one that indicates the largest minimal area should be used as a guide to the minimum size of a vegetation sample or relevé. MORAVEC (1973) suggested another method for determining the minimal area, which involves enlarging separate (in contrast to nested) plots in a vegetation segment until the floristic similarity (CHAP. 10) between the plots reaches a maximum value. This method appears sound theoretically but it requires much more time in field sampling and subsequent computation, so that its practicability seems rather doubtful.

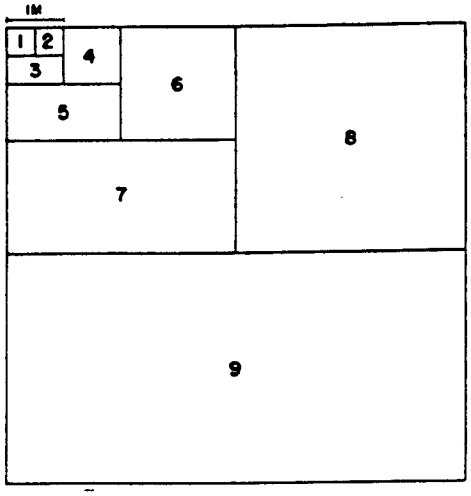


FIGURE 5.1. A system of nested plots for establishing minimal area. Each subplot numbered consecutively to 1 includes the area of the previous subplot. Thus, uneven numbered subplots are square, even numbered ones are rectangular. The plot layout relates to the data shown in TABLE 5.1.

5.22 Criteria for Size of Releve. The species number is then plotted over size of sample area. This results in a species/area curve (FIG. 5.2). The minimal area is the sample area at which the initially steeply increasing curve becomes almost horizontal.

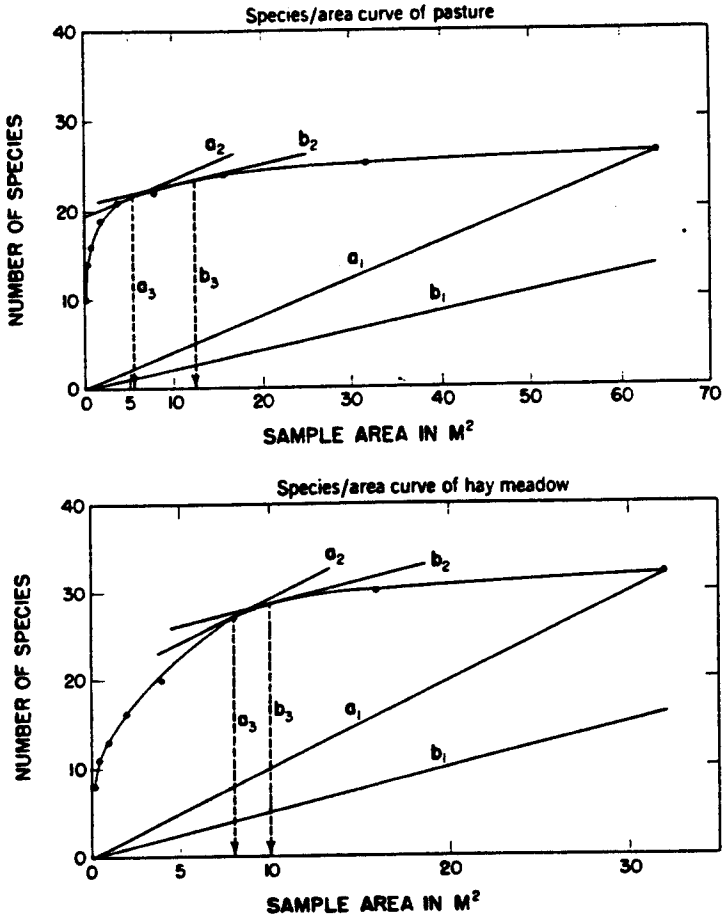
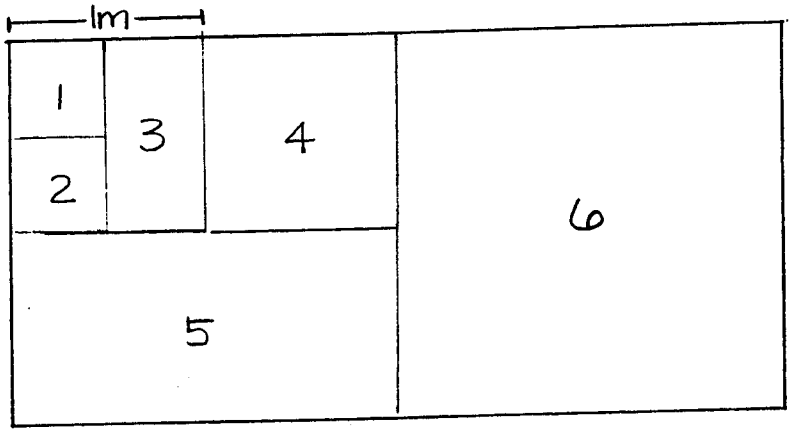


FIGURE 5.2. Species/area curves of a pasture (see TABLE 5.1) and hay meadow. Legend: a_1=10 percent line; a_2=tangent parallel to 10 percent line; a_3= protraction to minimal area based on 10 percent species increase; b_1=5 percent line; b_2=tangent parallel to 5 percent line; b_3=protraction to minimal area based on 5 percent species increase.

Sample # 1

subplot	size (m^2)	species	total species #
1	.25	A (meloematus pea) B C (sunflower?) D (lactusa) E (oaty bunch grass) F (serrated)	6
2	.5	fennel dandelion-lactusa H (fuzzy C)	8
3	1	none	8
4	2	none	8
5	4	G	9
6	8	I (mustard)	10



Nested Plot Technique (Minimal Area Determination)

In this exercise, we began by lining out a .5m x .5m area a few meters away from our first transect (at the bottom of the incline) and recording all the species present. The sample area was then enlarged to twice the size and sequentially doubled, and for each enlarged area we recorded the additionally occurring species. The sample was increased until the change in the number of species over the change in sample area (slope) became relatively small. After plotting sample area versus number of species, the ensuing species/area curve was used to calculate the minimal area (area at which slope approaches 0) , as well as the minimal area containing at least 95 percent of the species. Our entire transect consisted mostly of grasses, fennel, meloematus pea, and lactusa and the minimal area based on 10 percent species calculated was around $1m^2$, while the minimal area for 95 percent of the species was $6m^2$. The notion of minimal area is useful not only in determining the minimum size of a vegetation sample in experimental studies, but as a guide to conservationists in the design of nature reserves.

Student Sample # 2

GRAPH #5: SPECIES-AREA CURVE