



# Alpha, Beta, and Gamma Diversity

Bởi:  
sterling

*Whittaker (1972)* described three terms for measuring biodiversity over spatial scales: alpha, beta, and gamma diversity. Alpha diversity refers to the diversity within a particular area or ecosystem, and is usually expressed by the number of species (i.e., species richness) in that ecosystem. For example, if we are monitoring the effect that British farming practices have on the diversity of native birds in a particular region of the country, then we might want to compare species diversity within different ecosystems, such as an undisturbed deciduous wood, a well-established hedgerow bordering a small pasture, and a large arable field. We can walk a transect in each of these three ecosystems and count the number of species we see; this gives us the alpha diversity for each ecosystem; see [\[link\]](#) (this example is based on the hypothetical example given by *Meffe et al., 2002; Table 6.1*).

If we examine the change in species diversity between these ecosystems then we are measuring the beta diversity. We are counting the total number of species that are unique to each of the ecosystems being compared. For example, the beta diversity between the woodland and the hedgerow habitats is 7 (representing the 5 species found in the woodland but not the hedgerow, plus the 2 species found in the hedgerow but not the woodland). Thus, beta diversity allows us to compare diversity between ecosystems.

Gamma diversity is a measure of the overall diversity for the different ecosystems within a region. *Hunter (2002: 448)* defines gamma diversity as "geographic-scale species diversity". In the example in [\[link\]](#), the total number of species for the three ecosystems is 14, which represent the gamma diversity.

## Alpha, Beta, and Gamma Diversity

Alpha, beta and gamma diversity for hypothetical species of birds in three different ecosystems

| Hypothetical species | Woodland habitat         | Hedgerow habitat           | Open field habitat          |
|----------------------|--------------------------|----------------------------|-----------------------------|
| A                    | X                        |                            |                             |
| B                    | X                        |                            |                             |
| C                    | X                        |                            |                             |
| D                    | X                        |                            |                             |
| E                    | X                        |                            |                             |
| F                    | X                        | X                          |                             |
| G                    | X                        | X                          |                             |
| H                    | X                        | X                          |                             |
| I                    | X                        | X                          |                             |
| J                    | X                        | X                          |                             |
| K                    |                          | X                          |                             |
| L                    |                          | X                          | X                           |
| M                    |                          |                            | X                           |
| N                    |                          |                            | X                           |
| Alpha diversity      | 10                       | 7                          | 3                           |
| Beta diversity       | Woodland vs. hedgerow: 7 | Hedgerow vs. open field: 8 | Woodland vs. open field: 13 |
| Gamma diversity      | 14                       |                            |                             |