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# How Biodiverse Is Minecraft?

Sophia Bennett
*Natural Sciences (Life and Physical Sciences), School of Biological Sciences, University of Leicester*
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**Abstract**
Biodiversity is crucial for ecosystem integrity. The biodiversity of the UK is decreasing rapidly, but can games such as Minecraft be useful in teaching younger generations the significance of this? This paper discusses how biodiverse Minecraft forest and plains biomes are using the Simpson's biodiversity index.

**Keywords:** *Computer Game; Biology; Ecology; Biodiversity; Sandbox Computer Game; Childhood game; Minecraft*

**What is Biodiversity?**
Biodiversity refers to the variety of life in a particular habitat or ecosystem. It is important in maintaining balance and ensuring the growth of the ecosystem [1]. Organisms affect the quality of the atmosphere and soil. Plants in particular regulate the flow of water and the extent of erosion. As part of the ecosystem ourselves, we rely on other species to help maintain our environment in these ways and many others. The UK's biodiversity contains a wide range of species and habitats, from woodlands, coastal areas and urban environments [2]. It is also depreciating dramatically where nearly 1 in 6 species are at risk of extinction. Teaching children the importance of biodiversity can be challenging. Interactive and engaging methods, such as video games, can help. Games can simulate real-world ecosystems. Simpson's Diversity Index (Equation 1) measures the mean of proportional abundance for the species in an ecosystem [3]:

$$D = \frac{N(N-1)}{\sum n(n-1)}, \quad (eq^n\ 1)$$

where '$N$' is the total number of individuals and '$n$' is the number of individuals in a species. Results vary between 1 and 0, with greater numbers meaning higher biodiversity.

**Biodiversity in Minecraft**
Minecraft is a sandbox game with a virtual environment for players to explore, create, and interact with various biomes and species [4]. In Minecraft, spawn ticks are the mechanism that determines how often entities, such as animals and monsters, can appear in the game world [5]. Spawn weight influences the likelihood of different entities appearing every tick. Players must consider the spawn weights to effectively manage and utilise the resources provided by entities. Spawn weight could be compared to birth rate in reality. Additionally, Minecraft features a variety of biomes, each with unique species. By exploring these, this paper aims to calculate the biodiversity within Minecraft.

**Method**
Farming and structures that randomly spawn with entities, such as villages, will not be considered as they are too unpredictable. The spawn weights will be based on the Bedrock Edition plains and forest biomes (Table 1) [6, 7]. These are the most similar to the UK environment. Slimes can only spawn in certain elevations, so are too unpredictable to be considered. Mobs that spawn only at night (50 % of the Minecraft day) will have their spawn weight halved. Pack sizes (the ability to spawn in a group) will also be considered and the probability of spawning altered according to the median pack size (Table 1). The Bedrock spawn cap is 200 entities in a chunk [5].

The spawn weight of each individual will be multiplied by the median group size, halved if the entity only spawns at night, and proportionally reduced to give the number of individuals per species that would spawn if the 200 spawn cap was met. For example, the zombie has a spawn weight of 95 with a

median pack size of 3. After being halved due to only spawning at night and adjusted for the spawn cap, 60 out of 200 individuals will be a zombie on average in the plains biome. After finding this number for each individual, Simpson's Diversity Index will be used to calculate biodiversity (see Appendix A for further insight).

**Results**

The biodiversity of the plains biome is 0.86 (2dp). With a result close to 1, the score indicates a good richness and evenness of species. There are many different species present in roughly equal proportions. The species in the plains biome are likely to be in balanced proportions, indicating a stable and healthy ecosystem. The forest biome has an even greater biodiversity of 0.90 (2dp). The difference between the two could be a great educational point on how urbanised farming areas (plains) in the UK will not be as biodiverse as the woodland (forest) areas.

**Conclusion**

Biodiversity is important for any ecosystem. The UK's diminishing biodiversity is proof that there is a need to educate on the importance of this. Video games like Minecraft are a great way to engage children while also learning. With a Simpson's diversity index of 0.86 and 0.90 for the plains and forest biomes, as well as various game mechanics like farming, Minecraft can be a useful tool in educating children about the importance of maintaining species evenness and richness within an ecosystem.

| Plains Mob | Spawn Weight | Group Size (median) | No. of individuals |
|---|---|---|---|
| **Monster category** | | | (whole number) |
| Creeper | 100 | 1 | 21 |
| Spider | 100 | 1 | 21 |
| Zombie | 95 | 3 | 60 |
| Skeleton | 80 | 1.5 | 25 |
| Enderman | 10 | 1.5 | 3 |
| Witch | 5 | 1 | 1 |
| Zombie Villager | 5 | 3 | 3 |
| **Creature category** | | | |
| Sheep | 12 | 2.5 | 13 |
| Chicken | 10 | 3 | 13 |
| Glow Squid | 10 | 3 | 13 |
| Pig | 10 | 2 | 8 |
| Cow | 8 | 2.5 | 8 |
| Horse | 4 | 4 | 7 |
| Donkey | 1 | 4 | 2 |
| **Ambient category** | | | |
| Bat | 1 | 2 | 1 |
| **Forest Mob** | **Spawn weight** | **Group size (median)** | **No. of Individuals** |
| **Monster category** | | | (whole number) |
| Creeper | 100 | 1 | 29 |
| Spider | 100 | 1 | 29 |
| Zombie | 95 | 3 | 27 |
| Skeleton | 80 | 1.5 | 23 |
| Enderman | 10 | 1.5 | 3 |
| Witch | 5 | 1 | 1 |
| Zombie Villager | 5 | 3 | 1 |
| **Creature category** | | | |
| Sheep | 12 | 2.5 | 17 |
| Chicken | 10 | 3 | 17 |
| Glow Squid | 10 | 3 | 17 |
| Pig | 10 | 2 | 11 |
| Cow | 8 | 2.5 | 11 |
| Wolf | 5 | 4 | 11 |
| **Ambient category** | | | |
| Bat | 1 | 2 | 1 |

Table 1 – Spawn weight and median group size for each species in the Bedrock plains and forest biome. Calculated number of individuals per species on average if the spawn cap of 200 is met for both the plains and forest biome. Simpson's diversity index is also shown.

**References**

[1] Raven, P. & Wackernagel, M. (2020). *Maintaining biodiversity will define our long-term success*. Plant Diversity, [online] 42(4), pp.211–220. DOI: 10.1016/j.pld.2020.06.002

[2] Stateofnature (2023) *State of Nature Report 2023*, https://stateofnature.org.uk/ [Accessed: 05 March 2025]

[3] Study Mind (2025) *Biodiversity Calculations*, https://studymind.co.uk/notes/biodiversity-calculations/ [Accessed: 05 March 2025]

[4] Mojang Studios (2011) *Minecraft*, [Computer Game] PC Bedrock Edition, Mojang Studios, Stockholm, Sweden.

[5] Fandom (2025) *Minecraft Wiki: Spawn*, https://minecraft.fandom.com/wiki/Spawn [Accessed: 05 march 2025]

[6] Fandom (2025) *Minecraft Wiki: Plains*, https://minecraft.fandom.com/wiki/Plains [Accessed: 05 March 2025]

[7] Fandom (2025) *Minecraft Wiki: Forest*, https://minecraft.fandom.com/wiki/Forest [Accessed: 05 March 2025]

**Appendix A:**

| Plains | Plains Mob | Spawn Weight | Group Size (median) | | group size? | night time? | 200 cap | No. of Individuals | | Using Simpsons Diversity Index | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Monster category** | | | | | | | | | n(n-1) | sum | N(N-1) | 1-sum/N(N-1) |
| | Creeper | 100 | 1 | | 100 | 50 | 21.186441 | 21 | 21 | 420 | 5616 | 39402 | 0.857469164 |
| | Spider | 100 | 1 | | 100 | 50 | 21.186441 | 21 | 21 | 420 | | | |
| | Zombie | 95 | 3 | | 285 | 142.5 | 60.381356 | 60 | 60 | 3540 | | | |
| | Skeleton | 80 | 1.5 | | 120 | 60 | 25.423729 | 25 | 25 | 600 | | | |
| | Enderman | 10 | 1.5 | | 15 | 7.5 | 3.1779661 | 3 | 3 | 6 | | | |
| | Witch | 5 | 1 | | 5 | 2.5 | 1.059322 | 1 | 1 | 0 | | | |
| | Zombie Villager | 5 | 3 | | 15 | 7.5 | 3.1779661 | 3 | 3 | 6 | | | |
| | **Creature category** | | | | | | | | | | | | |
| | Sheep | 12 | 2.5 | | 30 | 30 | 12.711864 | 13 | 13 | 156 | | | |
| | Chicken | 10 | 3 | | 30 | 30 | 12.711864 | 13 | 13 | 156 | | | |
| | GlowSquid | 10 | 3 | | 30 | 30 | 12.711864 | 13 | 13 | 156 | | | |
| | Pig | 10 | 2 | | 20 | 20 | 8.4745763 | 8 | 8 | 56 | | | |
| | Cow | 8 | 2.5 | | 20 | 20 | 8.4745763 | 8 | 8 | 56 | | | |
| | Horse | 4 | 4 | | 16 | 16 | 6.779661 | 7 | 7 | 42 | | | |
| | Donkey | 1 | 4 | | 4 | 4 | 1.6949153 | 2 | 2 | 2 | | | |
| | **Ambient category** | | | | | | | | | | | | |
| | Bat | 1 | 2 | | 2 | 2 | 0.8474576 | 1 | 1 | 0 | | | |
| | | | | total individualds | | 472 | | 199 | | | | | |
| | | | | | | 0.4237288 | | | | | | | |

| Forest | Forest Mob | Spawn weight | Group size (median) | | group size? | night time? | 200 cap | No. of Individuals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Monster category** | | | | | | | | | n(n-1) | sum | N(N-1) | 1-sum/N(N-1) |
| | Creeper | 100 | 1 | | 100 | 50 | 28.612303 | 29 | 29 | 812 | 3984 | 39006 | 0.897861867 |
| | Spider | 100 | 1 | | 100 | 50 | 28.612303 | 29 | 29 | 812 | | | |
| | Zombie | 95 | 3 | | 285 | 47.5 | 27.181688 | 27 | 27 | 702 | | | |
| | Skeleton | 80 | 1.5 | | 120 | 40 | 22.889843 | 23 | 23 | 506 | | | |
| | Enderman | 10 | 1.5 | | 15 | 5 | 2.8612303 | 3 | 3 | 6 | | | |
| | Witch | 5 | 1 | | 5 | 2.5 | 1.4306152 | 1 | 1 | 0 | | | |
| | Zombie Villager | 5 | 3 | | 15 | 2.5 | 1.4306152 | 1 | 1 | 0 | | | |
| | **Creature category** | | | | | | | | | | | | |
| | Sheep | 12 | 2.5 | | 30 | 30 | 17.167382 | 17 | 17 | 272 | | | |
| | Chicken | 10 | 3 | | 30 | 30 | 17.167382 | 17 | 17 | 272 | | | |
| | GlowSquid | 10 | 3 | | 30 | 30 | 17.167382 | 17 | 17 | 272 | | | |
| | Pig | 10 | 2 | | 20 | 20 | 11.444921 | 11 | 11 | 110 | | | |
| | Cow | 8 | 2.5 | | 20 | 20 | 11.444921 | 11 | 11 | 110 | | | |
| | Wolf | 5 | 4 | | 20 | 20 | 11.444921 | 11 | 11 | 110 | | | |
| | **Ambient category** | | | | | | | | | | | | |
| | Bat | 1 | 2 | | 2 | 2 | 1.1444921 | 1 | 1 | 0 | | | |
| | | | | | | 349.5 | | | 198 | | | | |
| | | | | | | 0.5722461 | | | | | | | |

Table showing all method steps and mathematical calculations using Simpson's diversity index and the calculated average number of individuals.