Science Concepts Planning Sheet

1. Choose an **activity:** Woodland Studies - Terrestrial Invertebrate Hunting

2. Break-down your activity into **learning chunks.**

Leaf litter survey in trays   Mapping Trees

Pit fall trapping   Heights / Numbers of Trees and Vegetation

Tree shaking

3. KEY QUESTIONS: Picking Biodiversity Loss to focus on.......

Cycles: From the definition of cycles I came up with the question of "How do the seasonal cycles impact on the life cycle of an invertebrate or groups of invertebrates?" From the link document "Biodiversity loss, reduces the numbers and types of species which regulates the movement of nutrients around the eco-system. If species are lost from the system, there are less alternative pathways from the nutrients to cycle, decreasing the resilience of the ecosystem as a whole." Other key question might be "What happens to the nutrient cycle if one or more invertebrates suffers losses?" Or "In which season are woodland ecosystems more resilient to change"

Changes: Which species are adapted to different places? Why? What are the places like? What would happen if the places changed? From the link document "Loss of species, means loss of relationships, networks and complexity. It means loss of a complex environment in which species can display diverse behaviours. These opportunities to display diverse behaviours and to change resources available to other species, reduces opportunities to evolve and therefore to adapt to change and survive. This makes me think of behaviour studies, what behaviours do invertebrates display when they are in a complex environment compared to the behaviours they display when they are in a simple environment?

Stability: What might happen if a tree fell down, how would that change the population numbers of a particular invertebrate? What would happen to the food web or the whole wood land ecosystem, in a storm? From the link document" Ecosystems have multiple feedback loops, bringing the system back into balance. The reduction in the numbers of a particular species maybe within the limits of the ecosystem for the population to recover; this is a balanced state of continual fluctuation which is adapting to changing conditions. However, lose too many of a particular species or some of a number of different species and the ecosystem loses its diversity and therefore its resilience to change. What percentage of the woodland would need to stay standing in a storm to ensure the woodland maintained its resilience? How would the time scales effect feedback systems bring the woodland system back into balance? What are the feedback systems operating in a woodland? What would happen if one species of tree became diseased and lost a lot of its population?

Flow: What are the food chains in a woodland? What are the food webs? What's the tropic structure like in a woodland? What would happen if the top predators were poisoned and died in large numbers?

Developed Study:

Starting with a fairly simple study, I might look at the cycling through the seasons.

How do the seasonal cycles impact on the numbers and types of invertebrates in a woodland?

Sampling invertebrate several times throughout the year, in the same places with the same methods. This would allow a comparison of the numbers and types of invertebrates throughout the seasons. Collecting data on the weather through-out the year, as well as weather on the survey day would provide some context. Learners could build up their knowledge of the types of invertebrates groups and their life-cycles by research in-between the survey days.

If you only had one day to complete the survey, I might think about doing a midday comparison, with dawn or dusk, perhaps focusing on one area of the woodland, such as the understory.

Both these studies could lead on to further work, but would certainly start to throw up discussion questions surrounding the interconnectedness of the woodland ecosystem. So for example, Is it the temperature or humidity that effects the distribution of invertebrates through-out the day? Is it the availability of the food source that affects the distribution of invertebrates through-out the day? Should learners have been collecting data on the things that their chosen invertebrate eats as well as the distribution of the invertebrate during the day? Does places to hide from predators affect where the invertebrates are found?

The design in detail goes round and round in an iterative process, getting better and refining each time around, as details are improved.

Transferring the learning:

Taking the learning and showing how it links with the learners experience in a range of contexts is important for behaviour change for sustainability. By providing transferability we start to draw out the key learning points from a simple activity and reveal how this can be useful in a wider range of contexts. Once again the key science principles help us. Look at each of the key science principles that have been developed in your learning and consider how they can be transferred into other areas of the learner's experience.

Cycles: seasonal cycles in nature play a big role in when and where we choose to travel to for a holiday, and by travelling overseas we have an impact on the global society. Another way would be to see where cycles appear in man-made environments, for example can we see cycles in the way we manufacture products? No, these are generally linear processes (take – make - dispose). Would making these processes more like a nature cycle improve their sustainability and longevity?

Change: the invertebrates change throughout the year dependent on conditions, you might explore how the learners community has changed. Do things always stay the same or is change taking place all the time? This has links with stability.

Stability: if we monitor an invertebrate species over time we will find their population fluctuates, however, if the woodland remains in a stable condition population fluctuation remain within a dynamic balance. Do we see the same stability in some man-mad environments? Think of the waste we create, is this stable or steadily increasing over time? Which would be a more sustainable state? The same could be said for greenhouse emissions on a global society level.

Energy flow: we can see that invertebrates get their energy from plant matter which in turn gets energy from the sun. Some of this energy is returned as nutrients in the soil when the invertebrate dies and decomposes. The cascading of energy in this way makes maximum use of the sun's energy. In man-made energy systems are the same principles used? Can we improve man-made energy systems based on the principles we find in the woodland? Could we take action in our own lives or our community to use energy more effectively like in natural systems?

By considering each of the key science principles with the transferability principles we can extend the science learning to show how it can be applied in a range of contexts that support sustainability; guiding students thinking, behaviour and action.