"The soil could emphatically declare, 'I am the protective filter and the mediator of energy, I am responsible for the transformation of inorganic and organic compounds, I am the sustainer of productive life, and I am the cradle of man's life and culture. At the same time, I am the medium for deposing the dust remaining after the death of man. I am the myth." (Kutílek and Nielson, 2015)

Contents

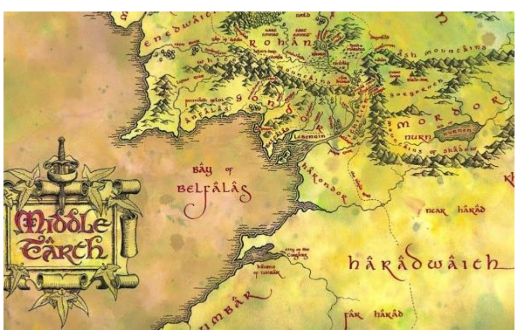
Terra Firma: An Investigation of Pedologic Accuracy in Popular Media

Introduction

Worldbuilding in Modern Media

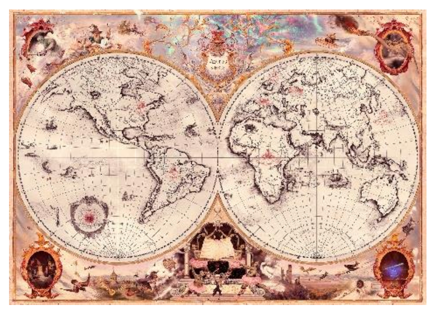
Our ability to increase immersion in movies and video games has increased dramatically. Technology, set design, and budgets have all seen humongous advancements, and the ramifications of these new opportunities can be seen on both a microscopic and macroscopic level. The ability of producers and creators to create new exciting worlds is available at a never-before-seen scale and is only becoming increasingly true to life.

Worldbuilding, the process of constructing an imaginary world, is becoming more immersive than ever before, and the public has responded in spades. Blockbuster titles featuring alternate worlds are growing more popular than ever before. Four of the five highest grossing movies of 2018 feature elements of science fiction/fantasy, and three of them take place in universes created through worldbuilding. Worldbuilding is an art of itself, as so many different elements come together to create an escapist world to immerse oneself in. It's the



reason so many people find themselves obsessed in their favourite worlds – be it Harry Potter, Lord of the Rings, or a video game like World of Warcraft. These fictional places all have their own history, politics, and mysteries to entertain while maintaining just enough realism to be entirely captivating. I personally absolutely love worldbuilding, and love to immerse myself in the lore of a well-crafted universe. Sometimes the background world creation is more interesting than the actual narrative of the story, such as the Lord of the Rings trilogy, or Destiny. Not all worldbuilding is good, however, as a poorly crafted world can be jarring and distracting to the reader, like everything that happens after the maze in the disgusting abomination of “The Maze Runner” book series.

One of the most important factors in worldbuilding is that aside from the fantasy, the world must be rooted in realism. It is important for the world and the characters within it to be similar enough to our own world that we can develop empathy for the characters and immersion for the fate of the imaginary place. As humans, we are exceptional at recognizing patterns, and even better at noticing when something isn’t the way it should be. Because of this, discrepancies in realism can completely take the viewer out of the story, and break their immersion. Because of this, realism is a huge part of worldbuilding and post-production, to ensure everything on screen is as close to what it would be like in real life as possible. Most of the time this is done to ensure the physics, geography, etc. is understandable. However, one of the most overlooked aspects of this realistic fine-tuning is the environment and setting of the scenes. For worldbuilding, the setting and general background environment is crucial to the viewer’s captivation. Having an endearing setting can make or break the world created and having an interesting but homely environment can play a big role in that appeal.



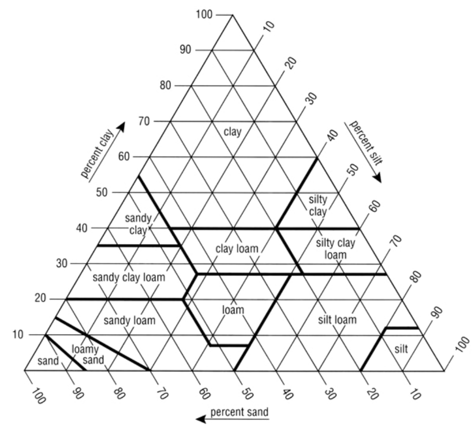
Pedology in Media

I've tried looking for a movie where soil science directly influences the plot, but I can't think of or search for any. Unfortunately, in soil science, a 'media' is a semi-homogenous mixture of mostly biotic components to grow plant s in, often containing little to no dirt. Pedology, as a science, truly only exists in the background of most recognizable movies, TV shows, and video games. When sciences take centre stage in popular media, its usually to amaze, such as the theoretical physics of 'interstellar', or be cause its necessary to the plot like in 'Ant-Man'. However, it is incredible that some worldbuilders and creators of beloved movies still took the side of accuracy when creating the many settings for their worlds. Some movies and video games have been able to follow real soil science so accurately that I refuse to believe it is coincidence.

Obviously, movies have gotten better at following real science as budgets have increased, especially in the fantasy and sci-fi genres where worldbuilding is so important. After all, outdoor movie backdrops started off as simple background paintings. As budgets expanded, studios began flying out their cast to shoot at outdoor locations, and now we see many backdrops being digitally produced. Although I initially believed the transition to digital renderings would bring about errors in ecological accuracy, a great number of modern, mostly-digital pieces have proved that the modern push towards realism and worldbuilding will only increase the accuracy to which we can expect from depictions of the pedosphere in media.

Soil Science 101

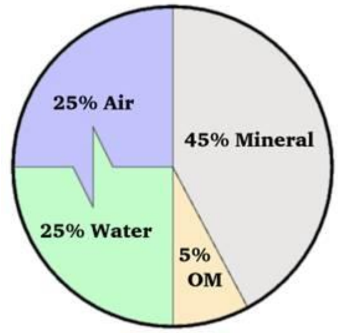
Soil Texture Theory



The percentages of clay, silt, and sand in the basic textural classes

Although soil consists of lots of different types of rock, composed of a wide variety of materials and chemical components, we can split all molecules of soil into one of three categories based on their size. The size of the soil molecules, called the '*soil texture*', can tell us many properties and behaviours of the soil. There are three primary groups of soil textures – from smallest to largest, they are *clay, silt,* and *sand.* Most soil exists as a homogenous mixture of these different soil textures. When the soil textures are combined, they can not be truly identified as any of the three main textures, as their behaviour does not reflect any one of them. We call this mixture *loam* – and it makes up most soil. Loam is generally considered to be composed of 40% sand, 40% silt, and 20% clay – an excess of any of these materials is considered a loam hybrid. If a loam has 50-60% silt, we call it silty loam. If a loam contains more than 80% silt, then it really isn't loam at all – although it isn't silt, either – we would call a mixture such as this loamy sand. The first identifying word indicates the unique concentration, and the second identifies the primary texture of the material.

In addition to the tiny grains of rock, there are a few other key components that are absolutely vital to a soil's fertility and behaviour. Soil is significantly more porous than most people believe, though the porosity varies greatly. In most cases, less than half of the volume of most soils is the actual rock that we consider ‘dirt’. In addition, about a quarter of the volume of the soil is taken up by pockets of air within the pores, and another quarter is taken up by water, both within the pores and dissolved into the material. The remaining volume of the soil is taken up by humus – the organic component of soil, formed by the decomposition of pla nt material by soil microorganisms. Without any one of these vital components, the soil will certainly be rendered unfertile due to the interconnectivity of soil behaviour.

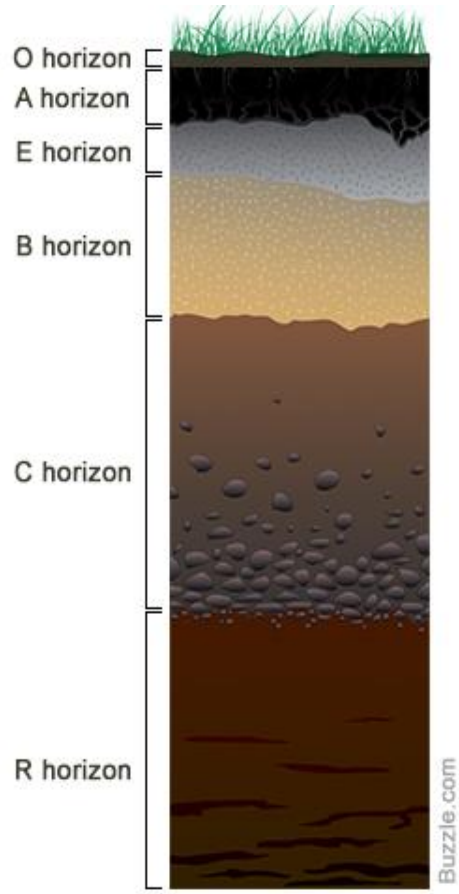


Soil Horizons

Soil horizons are the names we give to the distinct layers found within the soil profile. A soil profile can be thought of as a vertical cross-section of the soil, going down. Each soil horizon plays a vital role in the production, fertility, and behaviour of the soil. They are each unique from one another in their structure, density, reactivity, fertility, makeup, and other factors, though small transitional states from one horizon to another do exist. I will now highlight each of the soil horizons and their primary role in soil function.

Starting from the top, the first soil horizon is called the *organic layer*, and is identified by the letter ‘O’. The organic layer is the layer of organic life such as grasses, shrubs, and roots that make up the surface of our soil. It also extends to a very thin layer of the topmost soil, where humus concentration is greatest. Although a large part of the organic layer is not technically soil, it serves as more than just being the plants growing on top of everything else. The organic layer is the primary source for organic material and microorganisms vital to the rest of the soil. In addition, it serves as a mineral sink for the carbon and nitrogen at the end of their cycles, ready to be reintroduced to the soil or atmosphere.

The next soil horizon is the *topsoil*, identified by the letter 'A'. It is the first of the three mineral layers of soil, which go in alphabetical order. The topsoil is the layer of the soil beneath the organic material and is where most biological reactions occur in the soil. It is the most nutrient rich horizon, and contains a very high concentration of microorganisms, making it very reactive. The topsoil contains more mineral particles than the other horizons, making it more dense and thus more durable – protecting the rest of the soil from erosion and wind.



Following the topsoil is a non-mineral soil that is only considered to be present some of the time – the *eluviated layer,* represented by the letter 'E'. The elluviated layer is sometimes called the *elluvium*. If the elluvium is not thick enough to be considered its own soil horizon, it is considered to be the bottom part of the topsoil. This soil horizon is commonly present when in direct proximity to a body of water, ranging anywhere from a small creek to the coast of an ocean. Have you ever wondered why any hole you dig relatively deep at the beach starts to fill with water? It's because you make your way into the eluviated layer, which is water-rich and depleted of clay.

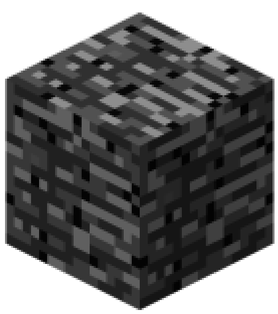
Eluviation is the process of moving biological materials from the upper layers of soil down to the lower layers. Essentially, gravity siphons water and organic materials vital to soil formation down to lower layers as water seeps further down into the soils. In some instances, the opposite is possible, called illuviation. The elluviated layer is where the process of elluviation is most intense, due to the changing density from topsoil to subsoil. In addition, it is often lighter in colour due to being mostly devoid of humus.

The second mineral layer of soil, called the *subsoil*, is vitally important to the physical of the soil. It is identified by the letter 'B'. It contains less organic material than topsoil, considering that most plant roots reside in the topsoil layer of the profile. Only very deep

rooting plants such as trees reach the subsoil. The subsoil is important because it is the layer of soil that contains most soil peds – soil aggregates that take recognizable shapes, separated by points of structural weakness. Soil peds have a strong influence on the physical behaviour of the soil, especially the infiltration. The infiltration of a soil is the ability of water to make its way into the lower inorganic soil horizons, and some soil peds are considerably more infiltrative than others. This means that in soils with low porosity, infiltrative soil peds in the subsoil can be the only hope for organic life.

The final mineral layer is the *substratum*, sometimes called the *parent material,* represented by the letter 'C'. The substratum is the relatively unchanged material that the soil horizons develop from. They often have little changes from pedologic processes, and are thus very similar to the bedrock underneath. They are often unweathered and in the earliest stages of pedogenesis, and are only separated from the bedrock by evidence of pedogenic processes. The substratum is a vital part of soil composition because it is the substance from which all other soil layers eventually form, and thus has a huge effect on the behaviour of the soil depending on its chemical and physical makeup. The substratum is under heavy environmental influence during its creation, making it very reflective of the ecosystem it is within, which carries over to the other soil horizons.

Some people consider the final soil horizon to be the bedrock – identified by the letter 'R'. The 'R' stands for regolith, the name of the surface of the bedrock that separates it from the substratum. The bedrock is important because it is the material from which all soil is formed

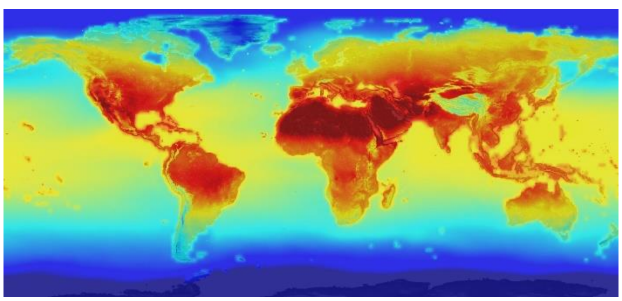


from. For example, bedrock containing lots of calcite will likely produce clay-rich soil. Calcite is highly reactive compared to other rock, causing it to break down into clay much more rapidly than other materials. This is just one of many ways the chemical material of the bedrock can influence the growth of the rest of the soil horizons.

Soil Formation – CROPT

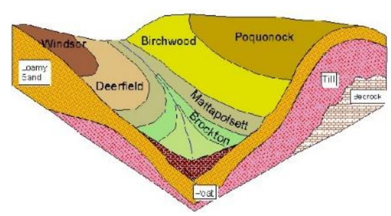
Soil formation can be boiled down to five major contributing factors. In understanding how the environment influences pedogenesis and the lithosphere as a whole, we can gather a better understanding of how existing soils function. For the purposes of our media investigation, it is important for us to understand the factors of soil formation in order to work backwards using understood information and other inferences about the soil's formation. For the duration of our analysis, we will be observing the vegetation of the ecosystem and examining whether the soil science makes sense for the ecosystem presented. Thus, we must take a look at the five contributing pedogenic factors that will be crucial to our investigation. Climate, relief, organisms, parent material, and time – CROPT.

The acronym CROPT lists the factors in soil formation from most to least significant. Thus, climate, the first pedogenic variable we will be discussing, is the biggest factor in the formation of soil. Without fertile conditions for growth, it is impossible for soil to form. Ideally, soil formation requires specific climatic conditions, and any variation can have a significant effect on the fertility of the resulting soil profile. Too much humidity will create soil incapable of



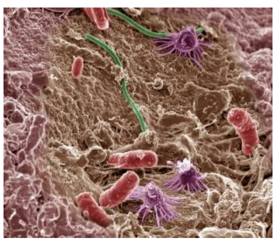
properly draining precipitation, eventually forming a wetland ecosystem. Not enough humidity develops soils with poor infiltration, resulting in deserts and similarly dry ecosystems. Other significant factors include temperature, precipitation, and other weather factors such as wind.

The relief or topography can also have a significant effect on the development of a soil profile, although we will not be using it in our analyses as its ramifications are usually small-scale, although very significant to the specific variation of each epipedon. Water flows from points of high elevation to low elevation, so the topography of the region changes the drainage conditions of the soils. Soils on sloping surfaces are often excessively drained due to surface



runoff and are deeper due to the smaller water table. Subsequently, soils at low topography receive the drainage and are often saturated as a result. Their soils are often shallower, as the increased water ingestion raises the water table.

The third significant factor in soil formation is the presence of pedogenic microorganisms to help break down the soil into its more fertile components. Organic material is needed to increase the ion exchange capacity of most soils, in order to ensure that plants receive proper ion nutrients from the soil. In addition, soil microorganisms are absolutely necessary to decompose plant material into usable humus for the future generations of the plants. Humus is the organic component of soil – think of fertilizer or compost. It serves as a natural fertilizer for the soils, helping return the nitrogen and carbon to the soil to improve the



health of the soil and thus the plants. Without humification (the production of new humus), it is impossible for healthy soil to form. This is why biospheres such as deserts are so hostile to plant life – very little organic material exists in their soils due to the aridity of the climate.

Following this, the next most important factor to soil formation is the parent material from which the soil forms from. As I have already discussed while talking about the bedrock and substratum, the parent material is one of the biggest influences on soil formation, since whatever forms will have the chemical makeup of whatever it formed from. This will have strong implications on all sorts of soil behaviours, such as the texture and infiltration of the soil. In conjunction with the climate, the parent material will shape the type of soil that forms and what kind of vegetation it may be suitable for, often corresponding to its host biosphere.

The final factor involved in soil formation is time. Time is hugely important to soil formation, as soil formation can be an incredibly time consuming process. Not only do the biological processes need time to take place, they also require time to shape their environment and mature. Soils are in constant change, so developing to a medium at which they are most fertile is a slow evolution. The most significant instance of this is the subsoil. The subsoil is very important to the behaviour and fertility of a subsoil, but it can take anywhere between a hundred to ten thousand years for a distinct subsoil to form and mature to match the soil ecosystem it belongs to.

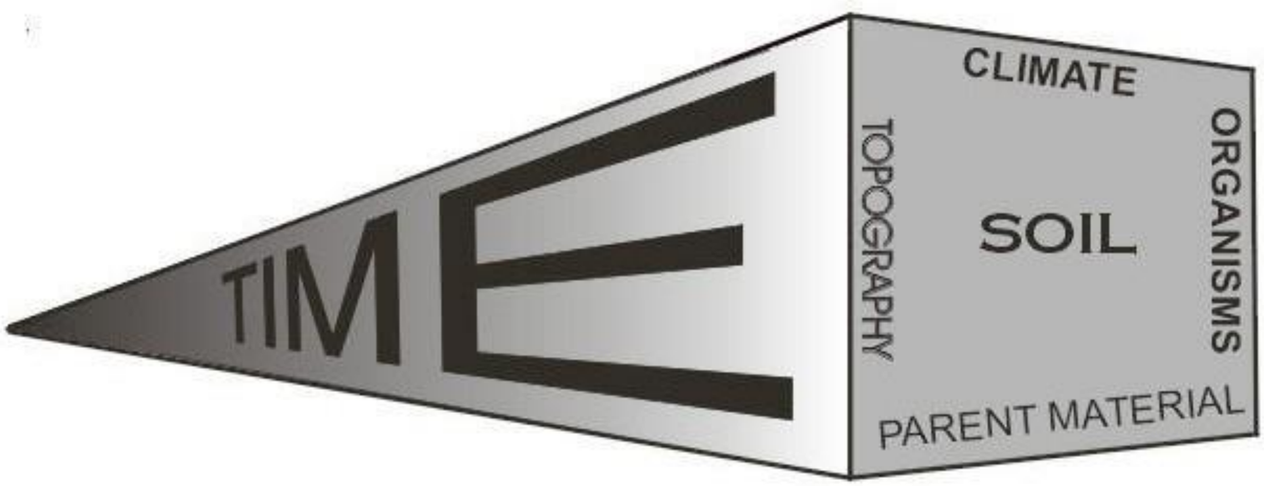


Exhibit A: The Wizard of Oz (1939)

The World of Oz

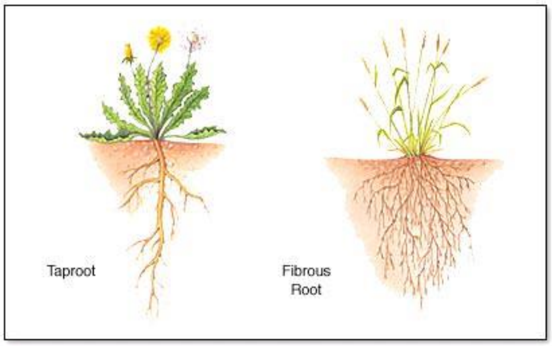
The Wizard of Oz is a classic movie and was released in the early stages of colour movies in cinema, emphasizing the grand scale of the set design. For the first time, the Yellow Brick Road was actually yellow. *The Wizard of Oz* is one of the most notable early examples of worldbuilding in cinema. Dorothy is transported via tornado to the world of Oz, a sprawling, green landscape of wistful wonder and vast fields of flowers and grains. I always interpreted the land of Oz – with its magic and wonder – to be something of Dorothy's dreams, but recent canon interpretations of the story of *The Wizard of Oz* – including 2013's *Oz the Great and Powerful* confirm that the land of Oz is meant to be a world of science fiction, existing in the same universe as our own. Although I am willing to excuse the existence of living scarecrows, flying monkeys, and wicked witches, I will not stand by the blatant inaccuracy of the soil of the background shots.

The Shortcoming of *The Wizard of Oz*

Although the soil rarely takes centre stage in *The Wizard of Oz*, I have one massive gripe about the movie's handling of Oz's ecosystem in regard to the inconsistency of its vegetation.

Although most of what we see of Oz is grassland, Dorothy arrives to the sight of massive fields of flowers and grains growing in giant rows. The most rural parts of Oz appear to the viewer as a vast, domesticated grassland. We can make lots of inferences about the soil present by analysing the vegetation we see – or more importantly, the vegetation that doesn't appear to be growing. In the vast fields of Oz, even on spaces that do not appear to

be used for farmland, there is an apparent lack of trees. This, in addition to the knowledge we have of Oz's vast grassland, tells us that there is an apparent lack of fertility for at least one reason. Common adverse soil characteristics of grasslands include acidic soil, poor infiltration due to limited porosity, a low presence of organic material, and a water table that is too low. Trees may also struggle to grow due to a thin layer of soil – a weakness they share with all dicot plants, which rely on deep taproots. Due to these limiting factors, only monocot plants like



grasses are able to grow, and dicots such as trees and flowers are unable to survive. The reason for this could include one or all of the soil characteristics mentioned above. Dicot plants require deep, organically rich, pH neutral, porous soil – all of which are hard to come by in grasslands such as Oz.

Due to everything mentioned above, it is ecologically impossible for a humongous expanse of *dicot* flowers to thrive in such an environment. Although it seems possible for the flowers to be growing in soil that better suites them that has been placed there artificially, in a deeper topsoil bed, but even this explanation falls short. Subsoil horizons are in constant change under the environmental influences around them, such as climate and relief. As a result, the subsoil would undergo change, also changing the ped formations within the topsoil and subsoil to peds that would be suboptimal for dicot growth. This situation clearly is not occurring, as the flowers are flourishing when they should be struggling. The only other possible explanation then, is that the inhabitants of Oz decided to clear cut all trees – in which case, I can only assume *The Wizard of Oz* and The Lorax take place in the same universe.

The second error in *The Wizard of Oz* ties directly to the still image shown above. Just one look at the above image is immediately quite jarring to the viewer. Often, screenshots of movies can be difficult to identify as they are rooted in reality, making them immersive and easy to adjust to. In *The Wizard of Oz*, this is not the case. The backgrounds are painted with enough realism to trick the distracted eye but fail to do as something about them is off.

Exhibit B: Star Wars (1977)

Star Wars

There very well may be no cinematic universe as iconic as that of *Star Wars*. The whole universe is an amazing example of just how far worldbuilding goes. Complete with 11 movies, several TV series, and way too many books, *Star Wars* has a massive universe filled with alien planets, races, cultures, history, languages, and customs. Such expansive worlds can be so immersive they almost seem like they could be real, which is teased at in the iconic *Star Wars* quote, “A long time ago, in a galaxy far, far away.” Amassing such a repertoire of worldbuilding gathered countless fans to immerse themselves in the *Star Wars* universe, leaving nothing without analysis or scrutiny. As an aspiring pedologist, I will now make my tribute to the *Star Wars* universe by analysing the scientific accuracy of the soil behaviours of multiple worlds, in addition to explaining the conditions of the planet in relation to their soil structure, climate, relief, and vegetation.

Tatooine Deserts

Tatooine, the home of Jedi Master Luke Skywalker, is one of the most prominent planets in the entire *Star Wars* universe. It is a desert planet – never do we see vegetation, water, or even clouds – the planet seems devoid of all things we associate with life. That is, except for humans, who totally live there for some reason. The deserts of Tatooine highly resemble those of Earth, which is understandable, as may of the shots were filmed in the very real deserts of

Tunisia. As a result, we can assume that the soil behaviour of Tatooine is at least similar to that of Earth's deserts and use that assumption to better understand what is happening on the desert planet. On Earth, deserts form when the humidity from the air is prevented from entering an area by mountains, as the water vapour precipitates before it reaches the other side. The reason we see snowy peaks on the tops of mountains is because the precipitation is forced out of the air as it travels upward to the peak, where it forms snow as a result of the lower temperature and atmospheric pressure. In essence, deserts are the result of a lack of water vapour in the air. Because of this, we can assume the entire planet of Tatooine is relatively devoid of humidity.

Knowing this, and observing the relative lack of plant life of the planet, we can make a lot of assumptions about the pedologic conditions of Tatooine. There are no mountains to block precipitation, so we can assume the entire atmosphere simply contains little water across the board, with no obvious geographic contingencies. With this information, we can justify the assumption that the planets surface contains almost exclusively sand, not that this should come as a surprise. With no humidity in the atmosphere, we get no water to dissolve into the surface of the soil. Normally, water would help to make the top of the soil more dense, preventing necessary fine materials such as humus, silt, and clay from being swept up by the wind. With no moisture to undergo this necessary first step of soil formation, all fine materials necessary for organic growth are

basically eliminated. These fine materials would likely end up forming geographic clusters, such as loess plateaus – giant formations of predominantly silt, generated by the caking of fine windblown sediments. As for organic material, with no plant life, humus would be so hard to come by that the decomposition of organic components would never be enough to fuel soil formation, and would likely become scattered across the atmosphere of the planet to no benefit. It is likely that clay sediment wouldn't even be able to form on a planet like Tatooine, due to the low reactivity of the surface – being without water and other necessary chemical reactants and catalysts. Without any clay, the soil's ion exchange capacity would suffer, as would the overall fertility of the surface for plant life.

Dagobah Swamps

The planet of Dagobah appears to be one giant forest wetland – or swamp, as they're more commonly referred to. The planet is also host to a huge selection of trees – called gnarltrees, according to Wookiepidia. Although it may seem otherworldly, these expanses of forest-swamp hybrid are commonly found in real life, although they are not so common in the North American swamps we are most familiar with. They were modeled after Nigerian swamps, which are significantly more lush in tropical life than somewhere like the Everglades, which are closer to wetlands than forests. Like real afrotropical swamps, the swamps of Dagobah have two main seasons – wet season, and dry season. The names are pretty explanatory on their own. The constant shifting between wet and dry would cause significant soil leaching, stripping the topsoil of its nutrients. However, the soil is able to replenish itself due to the high concentration of organic material, similar to the nature of rainforests. Swamps are ideal locations for algae and other microorganisms to grow, which eventually die to replenish the soil's organic material. In addition, the algae block out the sunlight from the surface, making growth of sunlight-dependant shrubbery impossible. Because of this, the trees have less competition for soil nutrients and sunlight, making the disadvantages of swamp growth more feasible. However, because of all of these drawbacks, only specified trees that have adapted to grow in such saturated environments are able to grow in such swamps, unlike

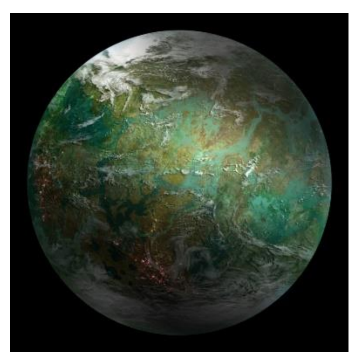
rainforests, which are havens of biodiversity. The gnarltrees of Dagobah do appear to be swamp-adapted trees, as they are described as "beginning life as pale, slender shoots, and then growing to such sizes that the roots fashion themselves into living caves" (Wookiepedia). Dagobah clearly follows the soil science of Earthly afrotropic swamps.

Kashyyyk Jungles

Kashyyyk, home of the Wookies, is one of the more interesting terrestrial planets from the prequel trilogy. From an ecological standpoint, the entire planet essentially serves as a rainforest jungle. Most notably, Kashyyyk, along with Endor, is home to giant trees the size of buildings. The Earth is home to some incredibly large trees. The coast Redwood trees native to California are the tallest species of tree on Earth, frequently growing over two hundred feet. Hyperion, the tallest tree on Earth, is three hundred and eighty feet tall – taller than the

Statue of Liberty. General Sherman, a giant sequoia, located in the Giant Forest of California, boasts the titles of largest stem circumference of any living tree, and most badass tree name of all time. It has a circumference of over a hundred feet, wide enough to fit a school bus. Still, it is not the largest tree ever recorded – that record goes to the Crannel Creek giant, which was allegedly 115 to 125 feet in circumference. Even at such massive sizes, these trees pale in comparison to the wooden behemoths that spot the archipelago coasts of Kashyyyk. The stems of the Kashyyyk trees are even greater than anything we see on our planet, and trees of such magnitude appear to be common. Although this may appear to be a choice for the sake of aesthetic, it aligns with the real soil science of jungles, and why they are able to host such a large concentration of vegetation.

The trees on Kashyyyk are gargantuan and would consequently require excessively deep and extensive root systems in order to stand erect. Fortunately, everything about Kashyyyk's ecology points towards the presence of deep soils to house the roots of these giants. First and foremost, Kashyyyk is a system of archipelago islands, so there is always a waterbed in close proximity to the trees. This is important for many reasons. Being near a waterbed moistens the soil, allowing plants to draw more water



from their roots. Moist soil enables more chemical degradation of the substratum into smaller, more fertile soil components. In addition, the water seeps into the soil and physically erodes the substratum and bedrock layers, further carving the rock to instigate deeper soil layers. In addition, Kashyyyk is clearly a jungle rainforest, and thus likely receives a great deal of rainfall. Rainfall, in addition to providing the benefits of soil moisture described above, encourages soil leaching – a process in which soil nutrients and salts are washed down the soil profile by gravity. In migrating the humus to the lower material, and eventually, the bedrock, it is common to incite decay of the regolith. Although soil leaching is usually bad for the fertility of a soil, jungles have unique nutrient cycles that will constantly replenish the nutrients migrated to the lower horizons. The resulting effect on the soil is relatively unchanged at the rich organic layers while becoming more organic and moist at the less fertile underlying layers, increasing the depth of the soil.

Conclusion

Pedology and Worldbuilding

From the mystical inaccuracies of Oz, to the tantalizing realism of Kashyyyk, it is clear that we have made significant advancements in our depictions of pedology in popular cinema. Our ability to create real-to-life ecosystems that are true to life even down to the finest soil interactions has increased alongside our push towards worldbuilding. The examples I have listed have gone from simple interpretations (or misinterpretations) of ecosystem pedology down to genuine accuracy in how certain elements would exist within a pedogenic context; additionally, the examples have also gone in chronological order of cost towards the set design. As more effort has been put into building immersive worlds (and set costs have increased), so too has our ability to depict accurate soils.

The Wizard of Oz had a budget of 2.77 million dollars, and its background setting was limited to hand-painted sets. As a result, its pedologic accuracy suffered greatly, as the push towards expansive worldbuilding had not yet occurred. *Star Wars: A New Hope* was the debut of desert planet Tatooine, with a budget of 11 million dollars. It did a simple but accurate depiction of a desert climate, and began the worldbuilding saga that would become one of the most iconic cinematic universes of all time. By the release of *Star Wars: Return of the Jedi*, six years after the first movie, the push towards worldbuilding was in full swing. The budget for the second installment of the series was 32.5 million dollars, almost three times as much as the first. *Return of the Jedi* gave us the debut of Dagobah, a swamp planet. What separates Dagobah from Tatooine is that Dagobah was actually a set that was artificially built, meaning all of the lithospheric accuracy within its ecology would have had to have been implemented deliberately. The last planet we looked at, Kashyyyk, was from the prequel trilogy, more than twenty years after *Return of the Jedi*. In *Star Wars: Revenge of the Sith*, many of the planets and backgrounds were implemented digitally, including Kashyyyk. This shift to digital set design allowed the producers to implement far more outlandish features in their planets, such as Kashyyyk's larger than life trees. Since the trees required a painstaking amount of time to digitally render into the universe, its certain that the impressive accuracy of its depiction of the ecosystem of Kashyyyk with regards to its abnormal vegetation was an intentional illustration. *Revenge of the Sith* was released well into the wake of the push towards

worldbuilding, and included an immense budget as a result – 113 million dollars. With the materials and time allocated to creating the most immersive universe possible, minor details such as the pedologic accuracy of an ecosystem can be addressed, regardless of their weight to the overarching plot. The sudden push towards hyperrealism in the 21st century has created the most true to life depictions of escapist fantasy worlds we have ever seen.

An Ode to Soil

I have a strange, unwavering curiosity for the physical world around me, and I take great pleasure in satisfying my need to understand the environment. Environmental science is an enticing field of study to me as it answers questions I didn't know I had. Throughout researching this project, I have come to better understand all sorts of pedologic factors, and even interesting bits of information on ecology and climate in general. Soil science is interesting to me because of how interconnected it is – there is no microscopic detail that doesn't play in to a much grander scheme of soil behaviour or growth. Health science is especially prone to this minute detailing that leads nowhere. Although it is interesting to learn about the body and its functions, it doesn't supply the moments of revelation that the integrative sciences are able to supply. I can look at a part of nature and understand, *that's why it looks like that*, whereas in health science its more along the lines of, *I guess that happens.* There is no macroscopy in health science, and that bothers me. Everything is to be understood down to the

molecular level, regardless of how necessary that may be. It takes all the fun out of learning something new about the world.

Its hard to put words to properly explain why soil is worth writing several thousand words about. I honestly don't quite remember how this started, or how it got to this point. Its rather difficult to tie it back to one thing as its been a mixture of many significant influences, spanning all the way from my childhood to a few short months ago. I have spent a lot of time outdoors throughout my life. My family has a trailer near Carnarvon, and I spent a few weekends up there every summer. I used to go to a summer camp a little ways away, called Camp Arrowhead. There we had an activity dedicated to Ecology – it was one of my favourites growing up, and I ended up earning all 3 ecology levels. Later I would start to go on the canoe trips into Algonquin park – I quickly found myself addicted to tripping. I have spent around 25 nights on various lakes in the Algonquin, including two five-night canoe trips. Later, in grade 9, Ms. Csordas – who I had as a science teacher all four years – took us to Apps Mills to do a stream study. I loved the trip and fantasized about doing that kind of work for a living, but it took a few years for me to realize it was actually possible. Ms. Csordas always justified cutting our plant units short by saying that only a handful of her students have ever gone into Botany. Being stubborn, I immediately decided to go into Botany. However, my plans to show up Ms. Csordas were interrupted due to the fact that I completely hated botany. However, the idea was planted, and that's all that matters. My brother graduated from University of Waterloo with a Bachelor of Environment in

Environmental Management and Geography. One day he explained a soil chart to me to show off his fancy university education. I then explained the soil chart to my Ethiopian friend Jack as part of a joke about botany, and then continued to look up facts about soil to continue the joke. By the end of the month, I had read the entire Wikipedia page on soil. If you want an idea of how much reading that is, I invite you to look up the Wikipedia page for soil.

I think I want to become a soil scientist. I'm not entirely sure what it entails, but I know that I want to learn more about the fascinating layer over our planet that no one seems to know about. The only way people seem to know anything about the lithosphere surrounding them is if they've taken classes on it, and most of the time that's not by choice. How is it that something so vital to life on Earth is so ignored by the vast majority of people? I would reckon that most people don't know that soil epipedons can 'die'. Lots of people can tell you all about

the different types of clouds, or birds, but no one knows anything about the ecosystem right under their feet. It grows our food, nurtures our parks, stabilizes our buildings, produces our beaches, and holds down our infrastructure, but we really don't seem to care. Its almost criminal how little most people understand about the skin of our planet. Not even gardeners have time for the lithosphere – many don't even use proper soils anymore, opting instead for quick-fix soil media. Most people don't even realize that soil and dirt aren't the same thing. The lithosphere deserves better – and it starts with a 6503-word independent study project.

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