

MORNING EARTH

Yearning to be Round:

A Primer in Ecological Concepts in 16 Parts

8. Succession: Transformation of Natural Communities

Note: For a Graphics-rich treatment of this material, go [Here](#)

Succession is the process of community change and development that happens when 1) a natural community is disturbed or 2) when new land become available to life.

- Some succession is an ecosystem's response to an injury, the way we heal a cut.
- Some succession, in other words, is the transforming of a disturbed or damaged part of a community.
- Some succession, on the other hand, is the process by which life colonizes dead or sterile areas such as volcanic lava flows and new sand dunes, or rock left behind by melting glaciers, and transforms them into living communities.

Succession is the process of living communities transforming their nature and



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membership over years or centuries by altering their environments.

Living systems modify their environments to be more hospitable for life.

The evolution of the community and the modification of the environment go hand in hand.

Four Examples of Succession

1) A Bare Rock

Imagine a bare rock sitting by the side of a dry wash (dry streambed).

The rock was excavated and carried there by a sudden cloudburst and flood. The rock is bare and looks devoid of life.

Come back in five years.

Now there are several small black spots of something on the rock, and a few little yellow spots as well. These spots are young lichens.

Come back in ten years.

The little lichens have grown and almost cover one side of the rock. Lichens have the ability to dissolve a tiny bit of rock and make those nutrients available to themselves.

They are true pioneers, converting bare rock into a place to live.

Come back in ten more years.

Now it appears that some of the lichens have died, while others still thrive. The dead residue has created what appears to be a sort of soil, while wind has blown in some dust, and on that soil a little moss is growing, and out of a tiny crevice in the rock some sort of green plant is sprouting.

Under magnification you can observe a tiny spider web on one lichen, and see several little

red mites moving about.

This pioneering process takes place whenever life has an opportunity to create an environment for itself in a lifeless place.

2) A Volcano

In 1963 a fiery volcanic eruption underwater just off the Iceland coast pushed the island of Surtsey above the waves. At first a black cinder cone, it was barren of life. It slowly grew to about a square mile in area. Ecologists seized on the chance to see how life would go about colonizing Surtsey. Six months after the eruption the new island had been colonized by a few bacteria, a few molds, insects and birds. All had apparently arrived by air. Soon a beach plant called a sea rocket made its appearance. Its seeds are waterborne and floated to Surtsey. Within thirty years, hundreds of species were living on Surtsey. Surtsey was the first really well-studied process of succession, which of course is still taking place.

3) Lake to Peatland

The classic textbook example of primary succession is the glacial lake or pond left behind when the glacier melted.

The lake at first is surrounded by essentially bare land. After a time, plants establish themselves there. After more time, a forest grows there.

Near the shores of the lake grow reeds and cattails and floating mats of sedges, which are cousin to grasses.

Slowly, slowly, generations of sedge-mats die and sink to the bottom of the lake and decompose. After centuries of plant matter building up on the lake bottom, the lake becomes shallower. Given enough time, the lake becomes a cattail marsh or sphagnum moss bog. Eventually there is no open water left.

The lake has transformed from an aquatic community to a wetland community and will eventually become a wet meadow or, further north, a black spruce forest growing on peat.

4) Mind Experiment: An Abandoned Field

Imagine a farm field of ten acres in northern Minnesota. It was cleared of trees in 1909. Around the edges of that field was the forest: maple and basswood and other trees such as red pine, ironwood, aspen, and birch. The farmer grew hay for his horses in that field for thirty years, until 1939.

Each fall he had to plow the borders of his field to destroy the seedling trees which had taken root inside the field. The farmer retired in 1940.

None of his kids wanted to farm, so he and his wife left the place and moved into town. Ever since then, the field has been unattended.

When the farmer would visit the old place, he was struck by Nature's ability to undo his work. Imagine it is now 2004, 64 years later.

- Question 1: Is there any open land left in the field?
- Question 2: What part of the field would have the tallest trees?
- Question 3: What part of the field would have the greatest variety of species?

We can speculate about these answers, but we cannot know for sure. It is an imaginary field.

- Answer 1: A ten acre field would probably be completely overgrown in 57 years. If the field were circular or square, the last place to be filled in by trees and brush would be the center—the place farthest from the forest edging the original clearing.
- Answer 2: The tallest trees in what was the field would be near the original field edge. They would be the oldest trees.
- Answer 3: The greatest number of species would probably be in the center, where the brush and trees would be shorter (younger) and there was more light reaching the ground than where the trees were taller and cast more shade.

More kinds of plants could live in the youngest part of this successional community, because of increased light on the surface of the ground.

A greater variety of animals would also be seen there, partly because of more kinds of plants to feed on. Because the shrubs and trees were younger at the center, their bark would be thinner and easier to eat in winter by rabbits.

For the same reason, the center would make better deer browse. Male deer like to rub the 'velvet' off their full-grown antlers (which they grow each year) by rubbing them up against sapling trees of about 2" diameter, so they would frequent the center also.

Everything in nature builds on everything which may provide energy or nutrients or 'housing' opportunities.

For instance, deer droppings and rabbit droppings are eaten by certain beetles, so those beetles would be at the center too.

Those beetles are eaten by such ground-feeding birds as the brown thrasher and robin, who dance their feet and sweep their beaks through the ground litter and pounce on whatever moves, insect or worm.

Where there are mammals such as rabbits and deer, there will be hair left behind. Nesting birds love mammal hair; it is a prized inner lining for nests. So many songbirds may be found at the center too in the late spring.

What kind of organisms probably lived in the field, when it was a field, that don't anymore, now that it is wooded again? We can guess that pocket gophers lived there—they love fields and quickly establish themselves wherever there is grassland. But they do not thrive in woods, so they are no longer part of this community. Perhaps meadowlarks and bobolinks lived there too, for they only nest in grasslands.

Few species are likely to thrive outside the living communities in which they evolved.

Pioneer Species

The process of Succession depends on the presence of certain pioneer species of plants.

These are plants which specialize in growing on disturbed ground, where a community has been injured somehow. The injury may be small, some newly exposed soil where a rabbit or woodchuck dug a den.

Pioneer species often use wind-borne seeds so they can travel long distances. So dandelions may show up on that bare patch, or milkweed, or thistle.

Pioneer species of plants prepare the soil for more long-term residents. So pioneer plants tend not to be long-term members of any community, unless it's the artificial community of a suburban lawn.

Where pioneers succeed in beginning to transform a community back to health, their local populations die out.

The pioneer species survive because their seeds are windborne and prolific and there are always disturbances to restore to health. It is the community that benefits, not the individuals. This is still another example of cooperation in nature.

Life adapts. Life is prepared for change and disturbance.

In northern conifer forests where fires are common, many plant species produce seeds that remain dormant within the soil until the heat of a fire stimulates them to germinate.

The beautiful red flowers of the fireweed plant are a fine contrast to blackened trunks in the summer following a fire.

The hard gray cones of jackpine tree hold their seeds tight for many years until the heat of a fire releases them to help re-seed the forest. The seeds readily germinate and flourish in the ashes left behind, using them for nutrients, and the jackpine seedlings also benefit from the reduced competition for light that is one result of fire.

Again, it is the community that is adapted to fire, and it is the community that survives.

Some Sources for Transformation in Natural Communities

Capra, Fritjof, *The Web of Life*

Encyclopedia Britannica

Odum, Eugene, *Fundamentals of Ecology*

Tester, John, *Minnesota's Natural Heritage*

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