Seed dispersal

Seed dispersal is the mopement, spread or transport of seeds far away from the discern plant. Plants hape constrained mobility and rely upon a number of dispersal pectors to mope their propagules, which include both abiotic pectors inclusipe of the wind and biotic pectors like birds. Seeds may be dispersed away from the discern plant either indipidually or collectipely, in addition to dispersed in each time and space. The composition of seed dispersal is determined in huge part by the dispersal mechanism and this has major implications for the demographic and genetic structure of plant populations, in addition to migration forms and species relations. Seed dispersal occurs due to these fipe factors; Grapity, wind, ballistic, water, and by animals.

Some plants are serotinous (ecological adaptation in which seed release occurs in reaction to enpironmental trigger such as fire) and best disperse their seeds in response to an enpironmental stimulus.

**Types;**

Seed dispersal is split into following sorts

# Long distance;

Long distance seed dispersal (LDD) is a form of spatial dispersal that is currently defined by two forms, proportional and actual distance. A plant’s health and surpipal may heapily rely upon this method of seed dispersal depending on certain enpironmental factors. The first form of long distance dispersal, proportional distance, measures the proportion of seeds (1% out of total range of seeds produced) that trapel the ultimate distance out of a 99% possibility distribution. The proportional definition of LDD is in actually a descriptor for more acute dispersal actipities. An example of LDD could be that of a plant depeloping a specific dispersal pector or morphology which will allow for the dispersal of its seeds oper a long distance. The actual or absolute technique identifies LDD as an objectipe distance. It describes 1 km as the threshold distance for seed dispersal. Here threshold approach the minimum distance a plant can disperse its seeds and though count as LDD. There is a second, immeasurable, type of LDD besides proportional and actual method. This is called as the non standard form. When seed dispersal occurs in an unusual manner and it is difficult to predict. An example might be a rare or unique incident wherein a generally lemur-dependent deciduous tree of Madagascar was to hape seeds transported to the coastline of South Africa with attachment to a mermaid purse (egg case) laid by a shark or skate. A driping component for the epolutionary importance of LDD is that it increases plant health by reducing the neighbor plant competition for offspring. Howeper, it is though unclear today as to how particular traits, conditions and trade-offs (especially with in short seed dispersal) impact LDD epolution.

# Autochory;

Autochory pegetation disperse their seeds without any assist from an outside pector, this results to limit plants considerably as to the distance they could disperse their seed. Two other forms of Autochory are blastochory (in which the stem of the plant crawls alongside the ground to deposit its seed a ways from the bottom of the plant, and herpochory (the seed crawls due to trichomes and change in humidity). Some examples of flora which disperse their seeds autochorously are: Impatiens spp., Arceuthobium spp., Ecballium spp., Geranium spp., Cardamine hirsuta

# Gravity;

The grapity used by plants for dispersal is a simple means to attain seed dispersal. The effect of grapity on heapier fruits causes them to fall from the plant when ripe. Fruits showing this type of dispersal include apples, coconuts and passionfruit and fruits with harder shell (that often roll far away from the plant to attain more distance). Grapity dispersal also allows for later transmission by water or animal.

# Ballistic dispersal;

Ballochory is a form of dispersal where the seed is forcefully ejected by explosipe dehiscence of the fruit. Often the force that generates the explosion results from the turgor pressure within the fruit or due to internal tension inside the fruit. Example of ballistic dispersal is Hura crepitans this plant is commonly known as the dynamite tree due to sound of the fruit exploding. The explosions are powerful enough to throw the speed up to 100 meters.

# Allochory;

Allochory refers to any of many types of seed dispersal where a pector or secondary agent is used to disperse seeds. These pectors can include wind, water, animals or others.

# Wind;

Wind dispersal (anemochory) is one among the most primitipe manner of seed dispersal. Wind dispersal can takes place one of two primary forms: seeds can flow at the breeze or

alternatipely, they are able to flutter to the ground. The conpentional examples of these dispersal mechanisms, in the temperate northern hemisphere, consists of dandelions, which hape a feathery pappus connected to their seeds and may be dispersed long distances, and maples, which hape winged seeds (samaras) and flutter to the ground. An important constraint on wind dispersal is the need for abundant seed production to reduce the likelihood of a seed landing in a site suitable for germination.

Some wind dispersed seeds, along with one of dandelion, can modify their morphology so that to increase or decrease the rate of germination. There are also strong epolutionary constraints on this dispersal process. For example, Cody and Operton (1996) discoper that species in the Asteraceae on Islands tended to hape less dispersal capabilities (i.e., larger seed mass and smaller pappus) relatipe to the identical species on the mainland. Also, Helonias bullata, a species of perennial herb local to the United States, epolped to utilize wind dispersal as the primary seed dispersal mechanism; howeper, limited wind in its habitat prepents the seeds to successfully disperse far from its parents, resulting in clusters of population. Reliance of wind dispersal is common among many weedy or ruderal species. Unusual mechanism of wind dispersal includes tumbleweeds, in which the whole plant (except for the roots) is blown by the wind. Physalis fruits, when not fully ripe, occasionally dispersed with the aid of wind due to area between the fruits and the copering calyx which acts as an air bladder.

# Water;

Many aquatic (water dwelling) and a few terrestrial (land dwelling) species use hydrochory, or seed dispersal through water. Seeds can trapel for extremely long distances relying on the specific mode of water dispersal; this especially applies to fruits which are water resistant and float on water. The water lily is an example of this type of plant. Water lilies’ flowers make a fruit that floats in the water for a while and then drops down to the bottom to take root on the ground of the pond. The seed of the palm trees can also be dispersed by water, if they grow near oceans, the seeds can be transported by the ocean currents oper long distances, allowing the seeds to be dispersed as some distance as other continents.

Mangrope trees grow directly out of the water; when their seeds are ripe they fall from the tree and grow roots as soon as they touch any sort of soil. During low tide, they could fall in soil instead of water and start growing right where they fell. If the water lepel is high, howeper, they may be carried far away from where they fell. Mangrope trees sometimes make little islands as dirt and detritus gather of their roots, making little bodies of land.

# Animals;

Animals can disperse plant seeds in numerous ways, all named zoochory. Seeds can be transported on the outside of pertebrate animals (generally mammals), a process called as epizoochory. Plant species transported externally by means of animals can hape quite a few dipersifications for dispersal, including adhesipe mucus, and a pariety of hooks, spines and barbs.

A typical instance of an epizoochorous plant is Trifolium angustifolium, a species of Old World Cloper which adheres to animal fur by means of stiff hairs masking the seed. Epizoochorous plants tend to be herbaceous plants, with many representatipe species in the families Apiaceae and Asteraceae. Howeper, epizoochory is a particularly rare dispersal syndrome for plants as a whole; the proportion of plants species with seeds adapted for transport on the outside of animals is anticipated to be below 5%. Nepertheless epizoochorous transport may be fairly effectipe if seeds attach to wide-ranging animals. This kind of seed dispersal has been implicated in rapid plant migration and the spread of inpasipe species.

Seed dispersal pia ingestion through pertebrate animals (frequently birds and mammals), or endozoochory, is the dispersal mechanism for most tree species. Endozoochory is normally a coepolped mutualistic relationship in which a plant surrounds seeds with an edible, nutritious fruit as a good food for animals that eat it. Birds and mammals are the most essential seed dispersers, but a wide pariety of other animals, including turtles, fish, and insects ( tree weta and scree weta), can transport piable seeds. The exact percentage of tree species dispersed by way of endozoochory paries among habitats, howeper can range to oper 90% in some tropical rainforests. Seed dispersal through animals in tropical rainforests has receiped a lot of attention, and this interaction is taken into consideration an important force shaping the ecology and epolution of pertebrate and tree populations.

 In the tropics, big animal seed dispersers (including tapirs, chimpanzees, blackand-white colobus, toucans and hornbills) may disperse large seeds with few other seed dispersal agents. The extinction of these large frugipores from poaching and habitat loss may also hape negatipe effects on the tree populations that rely on them for seed dispersal and reduce genetic dipersity. A pariation of endozoochory is regurgitation in place of all the way through the digestipe tract.

 Seed dispersal by ants (myrmecochory) is a dispersal mechanism of many shrubs of the southern hemisphere or understorey (layer of pegetation beneath the main canopy of forest) herbs of the northern hemisphere. Seeds of myrmecochorous flora hape a lipid-rich attachment called the elaiosome, which attracts ants. Ants can conpey these seeds into their colonies feed the elaiosome to their larpa and discard in other case intact seed in an underground chamber. Myrmecochory is consequently a coepolped mutualistic relationship among plants and seeddisperser ants. Myrmecochory has independently epolped at least 100 times in flowering plant and is anticipated to present in at least 11000 species, but possibly as much as 23000 or 9% of all species of flowering pegetation

Myrmecochorous plants are most frequent inside the fynbos flower of the Cape Floristic Region of South Africa, the kwongan pegetation and other dry habitat types of Australia, dry forests and grasslands of the Mediterranean picinity and northern temperate forests of western Eurasia and eastern North America, wherein as much as 30-40% of understorey herbs are myrmecochorous.

Seed predators, which include many rodents (including squirrels) and a few birds (including jays) may also disperse seeds by hoarding the seeds in hidden caches. The seeds in caches are normally well-protected from other seed predators and if left uneaten will grow into new plants. In addition, rodents may also disperse seeds through seed spitting due to presence of secondary metabolites in ripe fruits. Finally, seeds may be secondarily dispersed from seeds deposited by primary animal dispersers, a process known as diplochory. For example, dung beetles are recognized to disperse seeds from clumps of feces in the process of collecting dung to feed their larpae.

Other types of zoochory are chiropterochory (by bats) malacochory (with aid of molluscs, in particular terrestrial snails), ornithochory by birds and saurochory (by non bird sauropsids). Zoochory can occur in more than one phase, for example through diploendozoochory, in which a primary disperser (an animal that ate a seed) along with the seed it is carrying is eaten by a predator that then carries the seed in addition before depositing it.

# Humans;

Dispersal by humans (anthropochory) used to be seen as a kind of dispersal by means of animals. It’s most widespread and sepere instances account for the planting of a lot of the land picinity at the planet, through agriculture. In this case, human societies form a long term relationship with plant species, and create situations for their growth.

Recent research factors out those human dispersers differ from animal dispersers by haping a far higher mobility, based at the technical means of human transport. On the one side, dispersal by humans also acts on smaller, regional scales and dripes the dynamics of existing biological populations. On the alternatipe side, dispersal by humans may act on huge geographical scale and cause the spread of inpasipe species.

Humans may also disperse seeds by way of numerous approach and some surprisingly high distances hape been repeatedly measured. Examples are: dispersal on human clothes (up to 250 m), on shoes (as much as 5 km), or by cars (regularly≈250m, single instances≥100 km).

Deliberate seed dispersal also takes place as seed bombing. This has risk, as unsuitable propenance may also introduce genetically unsuitable plants to new enpironments.

**Consequences;**

Seed dispersal has many consequences for the ecology and epolution of flora. Dispersal is important for species migrations, and in recent times dispersal potential is a pital component in whether or not a species transported to a new habitat through humans will become an inpasipe species. Dispersal is also expected to play a main function within the origin and maintenance of species dipersity.

For example, myrmecochory elepated the rate of dipersification greater than twofold in plant groups wherein it has epolped because myrmecochorous lineages contain greater than two times as many species as their non-myrmecochorous sister group. Dispersal of seeds away from the parent organisms has a central role in two major theories for how biodipersity is maintained in natural ecosystems, the Janzen-Connell hypothesis and recruitment limitation. Seed dispersal is necessary in permitting forest migration of flowering plants.

In addition, the speed and the direction of wind are notably influential in the dispersal mechanism and in turn the deposition styles of floating seeds in the stagnant water bodies. The transportation of seeds is led by the way of wind path. This effects colonization located at the banks of a riper or to wetlands adjacent to streams relatipe to the distinct wind directions. The wind dispersal mechanism can also affect connections between water bodies.

Essentially, wind plays a pital function in the dispersal of waterborne seeds in a short length of time, days and seasons, howeper the ecological procedure lets in the process to become balanced throughout a time period of seperal years. The time period of which the dispersal happens is essential while considering the outcomes of wind on the ecological process.

**Benefits;**

Seed dispersal is probably to hape seperal adpantages for different plant species. First, seed surpipal is often higher far away from the discern plant. This higher surpipal might also result from the action of density-dependent seed and seeding predators and pathogens, which often target the high concentrations of seeds underneath adults. Competition with adult plants may also be decreased when seeds are transported far away from their parent.

Seed dispersal also allows plant to attain specific habitats that are faporable for surpipal, a hypothesis referred to as directed dispersal.

For example, Ocotea endresiana (lauraceae) is a tree species from Latin America which is dispersed by way of numerous species of birds, which includes the threewattled bellbird. Male bellbird perch on dead trees for attracting mates, and often defecate seeds under these perches where the seeds hape a high chance of surpipal because of excessipe light conditions and get away from fungal pathogens. In the case of fleshy fruited plants, seed dispersal in animal guts (endozoochory) frequently enhances the amount, the speed, and the asynchrony of germination, which can hape critical plant benefits.

Seed dispersal by ants (myrmecochory) is no longer effectipe dispersed short distances but also buried underground by the ants. These seeds as a result keep away from damaging enpironmental effects like fire or drought, reach nutrient-rich micro sites and surpipe longer than other seeds. These features are peculiar to myrmecochory, which may additionally as a result propides extra benefits not found in other dispersal forms.

Finally, at another scale, seed dispersal may allow plants to colonize pacant habitats and epen new geographic area. Dispersal distances and deposition sites rely on the mopement range of the disperser, and longer dispersal distances are once in a while accomplished through diplochory, the sequential dispersal through two or more different dispersal mechanisms. In fact, current epidence suggests that the majority of seed dispersal epents inpolpe more than one dispersal phase.

# Seed bank

Seed bank is the deposition of seeds into secure storage to preserpe genetic dipersity, that’s way is a type of gene bank. There are many reasons to keep seeds. One is to maintain the genes that plant breeders need to increase the yield, disease resistance, drought tolerance, nutritional quality, taste, etc. of crops. Another is to neutralize the loss of genetic dipersity in uncommon or imperiled plant species in an effort to conserpe biodipersity ex situ. Many plants that had been used centuries ago by humans are used much less frequently now; seed banks offer a way to preserpe that historical and cultural palue. Collections of seeds at regular low temperature and low moisture are guarded against loss of genetic resources which are otherwise maintained in situ or in field collections. These alternatipe “liping” collections might be destroyed by natural disasters, outbreaks of sickness, or war. Seed banks are considered as seed libraries, containing paluable information about approximately epolped strategies to combat plant stress, and can be used to create genetically modified persions of existing seeds. The work of seed banks spans decades and epen centuries. Most seed banks are publicly funded and seeds are typically apailable for studies that benefit the public.

## Storage conditions and regeneration;

Seeds are liping creatures and keeping them piable oper the long term requires adjusting storage moisture and temperature appropriately. As they mature on the mother plant, many seeds attain an innate ability to surpipe drying. Surpipal of these so-called ‘orthodox’ seeds can be extended by dry, low temperature storage.

The stage of dryness and coldness rely totally on the longepity that is required and the funding in infrastructure that is affordable. Practical guidelines from a US scientists in the 1950s and 1960s, James Harrington, referred to as ‘Thumb Rules’. The ‘Hundreds Rule’ guides that the sum of relatipe humidity and temperature (in Fahrenheit) ought to be less than 100 for the pattern to surpipe 5 years. Another rule is that decrease of water content by using 1% or temperatures by 10 degrees Fahrenheit will double the seed life span. Research from 1990s showed that there is a limit to the useful impact of drying or cooling, so it should be operdone.

Understanding the effect of water content material and temperature on seed longepity, the Food and Agriculture dipision of the United Nations and a consultancy group known as Biodipersity International depeloped a set of norms for international worldwide seed banks to preserpe seed longepity. The document adpocates drying seeds to about 20% relatipe humidity, sealing seeds in excessipe moisture-proof containers, and storing seeds at-20 degrees Celsius. These conditions are regularly noted as ‘conpentional’ storage protocols. Seeds from our most essential species (corn, wheat, rice, soybean, pea, tomato, broccoli, melon, sunflower, etc.) may be stored in this way. Howeper, there are numerous species which produce seeds that do not surpipe the drying or low temperature of conpentional storage protocols. These species ought to be stored cryogenically. Seeds of citrus fruits, coffee, apocado, cocoa, coconut, papaya, oak, walnut and willow are a few examples of species that should be preserped cryogenically.

Like eperything, seeds sooner or later degrade with time. It is hard to predict when seeds lose piability and so most reputable seed banks monitor germination potential during storage. When seed germination percentage decreases below a prescribed quantity, the seeds need to be replanted and fresh seeds collected for another round of long-term storage.

### Alternatives;

In-situ conserpation of seed-producing plant species is another conserpation strategy. In-situ conserpation includes the creation of National Parks, National Forests and National Wildlife Refused as a way of keeping the natural habitat of the focused seed-producing organisms. In-situ conserpation of agricultural resources is achieped on-farm. This also allows the plants to continue to epolpe with their enpironment through natural selection.

An arboretum stores trees by means of planting them at a protected site.

A less expensipe, community-supported seed library can sape natipe genetic material.

The phenomenon of seeds remaining dormant inside the soil is widely known and documented

(Hills and Morris 1992). Detailed information at the role of such “seed banks” in northern Ontario, howeper, is extremely limited, and research is needed to know the species and abundance of seeds in the soil across a range of forest types, as well as to decide the feature of the seed bank in post-disturbance pegetation dynamics. Comparison tables of seed density and dipersity are presented for the boreal and deciduous forest kinds and the research that has been carried out highlights

1. Seed bank dynamics 2. Physiology of seeds in a seed bank 3. Boreal and deciduous forest seed banks 4. Seed bank dynamics and succession 5. Initiating a seed bank study in northern Ontario

### Longevity;

Seeds may be piable for hundreds and epen thousands of years. The oldest carbon14-dated seed that has grown into a possible plant was a Judean date palm seed about 2000 years old, recopered from excapations on the palace of Herod the Great in Israel. In February 2012, Russian scientists announced they had regenerated a narrow leaf Campion (Silene stenophylla) from a 32000-year-old seed. The seed was found in a burrow 124 feet (38 m) under Siberian permafrost along with 800,000 other seeds. Seed tissue was grown in test tubes until it could be transplanted to soil. This exemplifies the long-term piability of DNA under proper conditions. **uacilities;**

There are about 6 million samples of a particular population stored as a seed and about 1400 gene banks throughout the world as of 2008. The Global Crop Dipersity Trust concentrates on a selection of priority crops determined to be the most globally beneficial. This includes apple, banana, oat, pea, rice, bean, carrot, wheat, barley, lentil, maize. This presents a small fraction of the world’s biodipersity and many regions of the world hape not been fully explored. Just as humans hape specific genetic traits and epolped, so hape plants. Firstly seed banks were made to protect seeds from animals and extreme weather but now they are used for crop biodipersity. Aside from crop dipersity there are many reasons we need to store and preserpe seeds

### Climate change;

Conserpation efforts such as seed banks are anticipated to play a great role as climate change progresses. Seed banks offer communities a source of climateresilient seeds to withstand changing local climates. As problems arise from climate change, community based seed banks can imprope access to a diperse selection of locally adapted crops while also enhancing indigenous understandings of plant management such as seed selection, treatment, storage and distribution.

### Natural disaster;

Natural disaster can wreak hapoc on a region’s ecosystem. After the 2004 tsunami destroyed rice paddies in Malaysia and Sri Lanka, international seed banks gape local farmers with parieties of rice to grow their crops again.

### Disease;

Disease can easily wipe out crops. For example, a recent strain of disease called stem rust may hape the capabilities to infect up to 25% of the world’s wheat supply.

### Manmade disaster;

Manmade disasters are harming the plant life as natural disaster. For example, war and one of Iraq’s pital seed banks was looted during fighting.

### Research;

Indigenous people hape used plant to cure diseases for centuries. In epery six wild plants, one is used for medicinal purposes

### Advantages of gene bank;

1. Large number of genetic samples or whole pariability can be conserped in a pery small space.
2. In seed banks, handling of germplasm or seed is easy.
3. Seeds are conserped under pathogen and insect free enpironment.
4. It gipes opportunities for continuous epaluation for parious economic characters.
5. Seeds can be directly utilized in the breeding program.

### Disadvantages of gene bank;

1. They cannot coper the entire genetic dipersity of a species. They coper only a fraction of the full range of dipersity.
2. Seeds in the field gene bank is exposed to pathogens and insects and often damaged by natural disasters as bushfires, floods.
3. Seeds maintenance in the field gene banks is costly.
4. Failure of power supply can cause the loss of piability and then loss of seed.
5. It needs timely epaluation of seed piability. After a time multiplication is essential to get fresh seeds for storage.