Forests and Their Management
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Module – 07
Silvicultural Management – I
Lecture – 20
Silvicultural Systems

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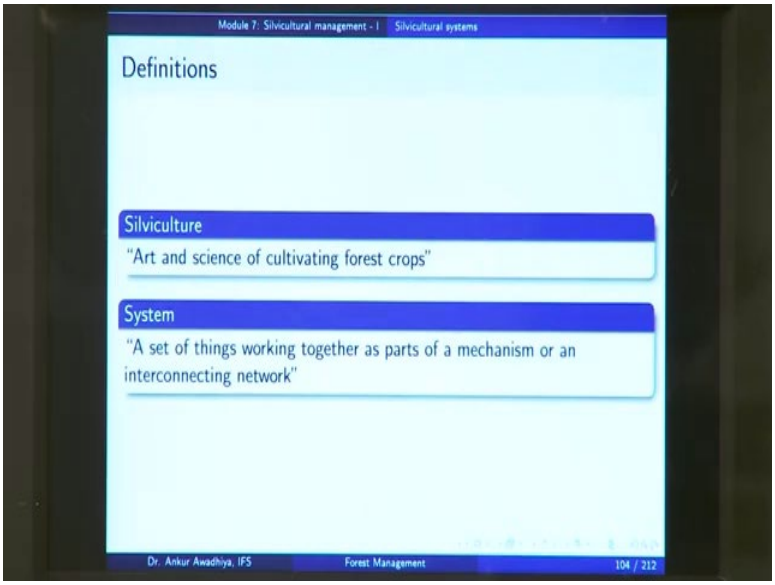

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In today's lecture, we will carry on our discussion and have a look at Silvicultural Systems. We have seen before that silviculture is the art and science of cultivating forests crops. And, a system is defined as a set of things working together as parts of a mechanism or an interconnecting network.

So, when we combine both of these together, what we are saying is that, we are doing silviculture using a system which comprises of a number of things that are working together as part of a mechanism to enable us to reach to our goal of the silviculture and to meet our silvicultural objectives.

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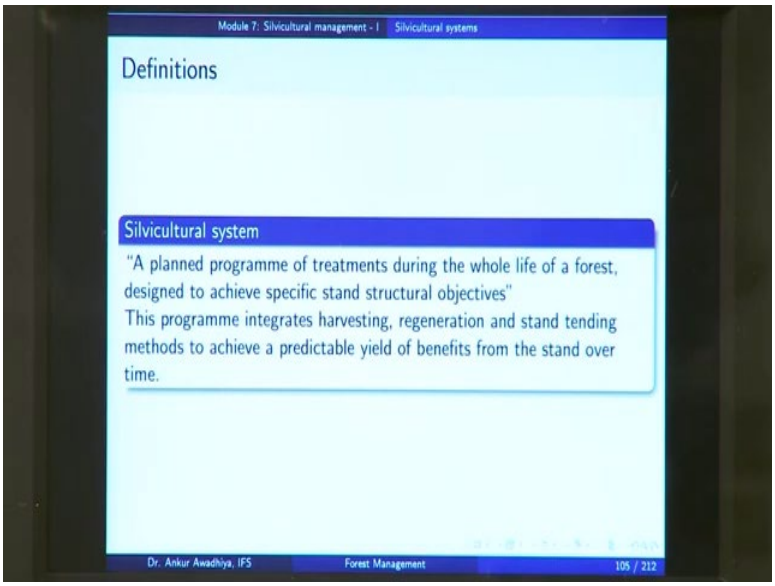

So, silvicultural system can be defined as "a planned program of treatments during the whole life of a forest, designed to achieve specific stand structural objectives." So, it is a planned program. You do not just have a program; it is it goes according to a plan. So, you decide what comes after what. So, it is a planned program of treatments. So, treatments are different kinds of interventions that are given to the forest. So, it is a planned program of treatments or interventions during the whole life of a forest.

So, your silvicultural system does not just deal with the beginning of a forest or just the ending of the forest, but it deals with the whole life of a forest from planting of new plants to the harvesting, and the process then continues. So, it is a planned program of treatments during the whole life of a forest designed to achieve specific stand structural objectives.

So, why are we using a silvicultural system? To achieve specific stand structural objectives. And, what are these stands structural objectives? We will come to it in a short while. Now, this program integrates "harvesting, regeneration, and stand tending methods to achieve a predictable yield of benefits from the stand over time." What it says is we are integrating these three things. One is harvesting.

So, harvesting is the process through which you extract timber from your forest by cutting the trees. Then, you also have regeneration. So, regeneration is putting up the next generation. Once you have harvested a forest, then you need to regenerate that

forest so that the next generation comes up. And, the stand tending methods. So, stand tending methods are those methods that you do for the benefit of your stand. And, the silvicultural system is integrating all these three - harvesting, regeneration and stand tending, to achieve a predictable yield of benefits.

So, you are not working with an unpredictable system. You are doing all of these so that you can achieve a predictable yield of benefits. It means that, every year I should be able to say, how much amount of timber will I be able to harvest from this stand. So, to achieve a predictable yield of benefits from the stand over time, and typically this time is taken to be infinity.

So, I want to manage my forests in such a manner that I am able to extract x amount of timber from this forest every year, till perpetuity. So, I do not want to have a forest that I can only extract benefits from for the next say 20-30 years. I want to have - I want to manage it in such a way that I am able to harvest these benefits over time.

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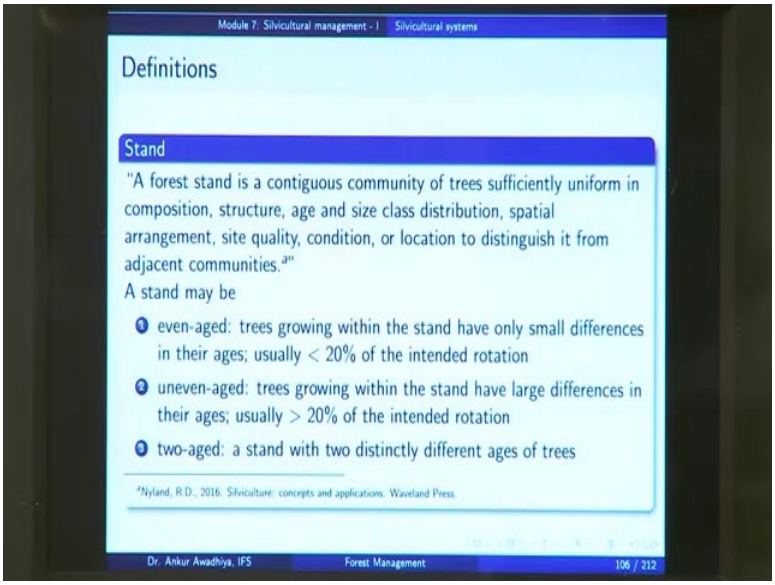

So, how do we define a stand? “A forest stand is a contiguous community of trees sufficiently uniform in composition, structure, age and size class distribution, spatial arrangement, sight quality, condition, or location to distinguish it from adjacent communities.”

What is it saying? A forest stand is a contiguous community. What is the community? A community is a group of individuals that belong to different species.

So, when we are talking about a forest community what we are saying is that, it is not just one species that we are talking about, but we are talking about a combination of species both vegetative and also the animal species. And, in this case what, we are saying is that it is a contiguous community of trees.

So, you have a group of trees together that primarily belong to different species; and, they are contiguous, which means that they are close together. So, it is a contiguous community of trees that is sufficiently uniform in composition, structure, age and size class distribution, spatial arrangement, site quality, condition, and location. What we are saying is that this contiguous community of trees is sufficiently uniform, and it is uniform in terms of a number of characteristics; it is uniform in composition. So, for instance, if we have a stand. So, let us consider two stands.

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So, you have this first stand that is made up of these green trees, and probably some red trees. And then, you have another stand that is made up of yellow trees and see say these blue trees.

So, all of these are different species. Now, if you have a look at these two stands, we can very clearly say that, we can draw a line and say that, this left-side portion is very

different from the right-side portion. Because, this left-side portion is having green and red trees, the right-side portion is having the yellow and the blue trees. But this stand is a uniform stand, and this side is also a uniform stand. It is uniform in terms of the composition. So, composition means that, if you consider that this stand let us extended to some other to some more trees, then what this definition is saying is that, this stand on the left-side is uniform in terms of composition. So, that if you look at this big stand.

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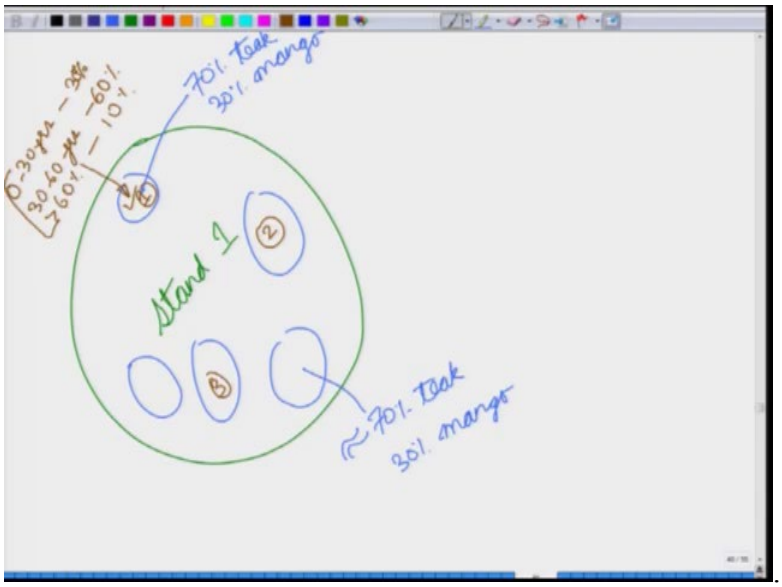

So, let us say that you have this big stand, which is your stand one. So, whether you look at this small portion of this stand, or this small portion of this stand, or say this a small portion of this stand, all of these will appear similar, and we will have common characteristics in terms of composition. Which means that, suppose this one has say 70 percent teak and 30 percent mango.

So, this one will also be having roughly 70 percent teak and 30 percent mango, and so with this, and so with this. So, it is uniform in terms of composition. It is also uniform in terms of structure. So, a structure of a forest by this we mean that you are having a different spatial structure. So, you have your canopy, the emergent layer; you have the understory and you have the forest floor.

So, even this structure will look same, or will be the same, in different parts of the stand. So, the whole stand is uniform in terms of structure. It is also uniform in terms of age

and size class distribution. What do we mean by that? We want to say that if you come back to this drawing board.

So, if this stand has say an age class distribution of, let us say 0 to 30 years. So, you have 30 percent plants that are of 0 to 30 years, 30 to 60 years. You have say, 60 percent trees that are 30 to 60 years, and greater than 60 years is say 10 percent. So, if this is the age distribution in this location 1, then the same distribution will be there in location 2, location 3 and so on.

So, it is uniform in terms of age and size class distribution. Now, age and size class distribution correspond to each other, because as your tree ages the size also increases. Now, your stand is also uniform in terms of the spatial arrangement of trees. What do you mean by spatial arrangement of trees? What we want to say here is that, if you have a stand in which your spatial arrangement is say clumpy.

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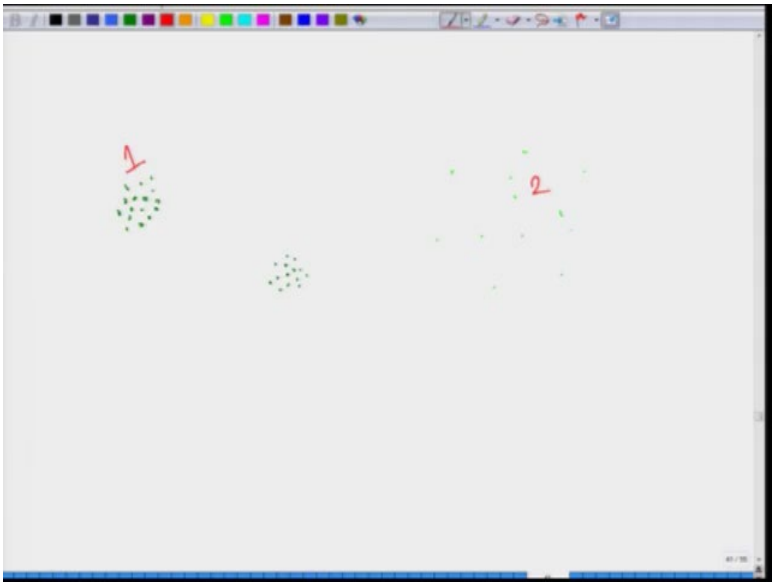

So, you have trees like this here, and if you look at another portion of the stand, you will also have trees in a clumpy formation. And, if you have say one location which is clumpy, and say the other location which is haphazard, then you will say that this portion section 1 and section 2 are not part of the same stand, because they are different.

So, your stand is uniform in terms of the spatial arrangement. It is uniform in terms of site quality. By site quality, we mean to say that the fertility of the soil in all the portions

of the stand is sufficiently uniform. So, you will not have one portion of the stand that is very fertile, and another portion that is very much infertile. So, there has to be uniformity in terms of site quality. Condition or location - the location will also be roughly the same, because the this is a contiguous community. And, it will be differentiated from other such communities in one or more of these characteristics. So, it is a contiguous community of trees that are sufficiently uniform in these characteristics to distinguish it from adjacent communities.

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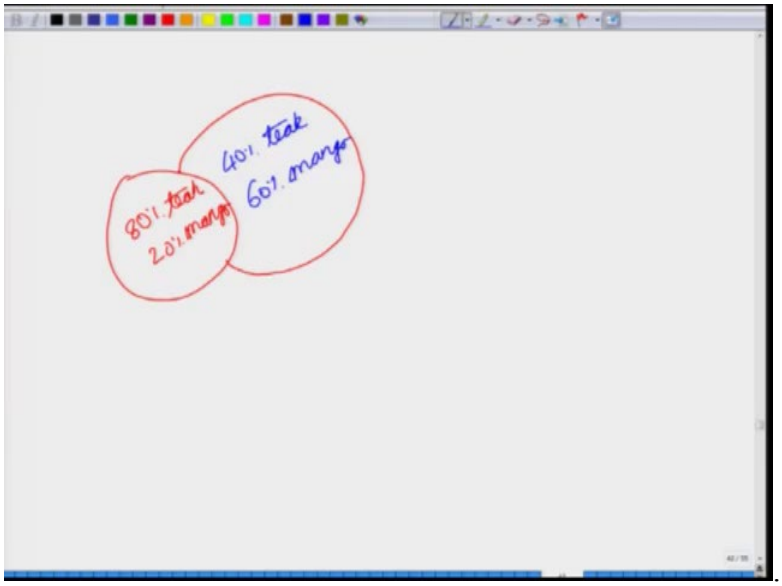

So, if you have 2 communities and say, this one is 80 percent teak and 30 percent mango 20 percent mango, then it will be very different from a contiguous community which is say 40 percent teak and 60 percent mango. So, your stand is a contiguous community that is sufficiently uniform and is a different from the adjacent such communities. Now a stand maybe even aged, uneven aged or two-aged.

Now what we mean by an even aged forest. An even aged forest is when your trees are roughly of the same age. And, when we said roughly, how do we define this roughly. An even aged stand you will have trees growing within the stand that have only small differences in their ages, usually less than 20 percent of the intended rotation.

Now, what do we mean by intended rotation. Rotation is the age at which you consider that your trees are mature. So, suppose there is a forest stand of teak trees, and suppose the rotation age is considered to be 90 percent.

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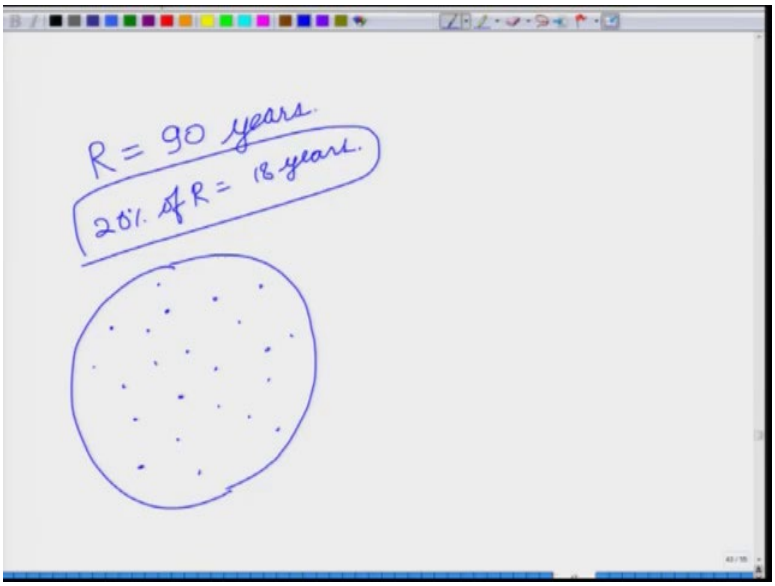

So, here you have R is equal to 90 years. What is 20 percent of R? 18 years. So, if you are talking about an even aged stand of teak trees, so in that case, all these trees will have the same age or the maximum difference between the ages of one tree and another tree will be 20 percent of R which is 18 years. So, you will not have one tree that is say one year of age another and another tree that is say 50 years of age.

So, that is an that is a an even aged forest or an even aged stand. You can also have an uneven aged stand, in which the trees that are growing within the stand have large differences in their ages, usually greater than 20 percent of the intended rotation. So, if the trees are having different ages, they are off and correspondingly they are off different sizes, then we will say that it is an uneven aged stand. And, in certain cases, we also have a two-aged stand in which you have a stand with two distinctly different ages of trees.

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So, in this case, if we draw a distribution of age versus the number of trees. Now, suppose your distribution looks like this. So, in this case, we will say that this is an even aged forest because you have trees that are roughly of the same age; the age distribution is from here to here, and it is less than 20 percent of the rotation age. But, if you have a stand that shows a bimodal distribution, so in this case, you will say that this is two-aged forest. But if you have a stand that has trees of every ages, then we will say that this is an uneven aged forest. So, even aged is when trees have nearly the same age; two-aged forest is when you have two groups of trees and each group is of the same age; and uneven aged is when different trees have different ages. Now, what is rotation?

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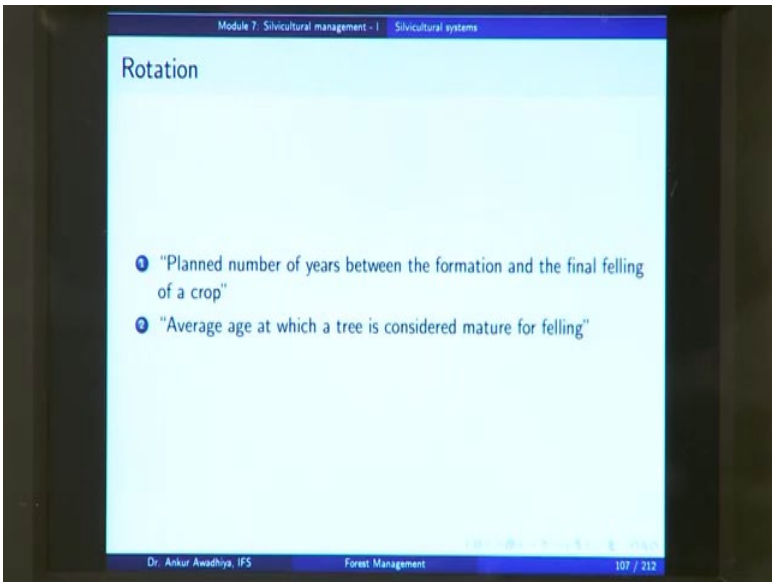

So, we talked about the rotation age. Rotation is the planned number of years between the formation and the final felling of a crop. What we are saying here is that suppose you have a piece of land.

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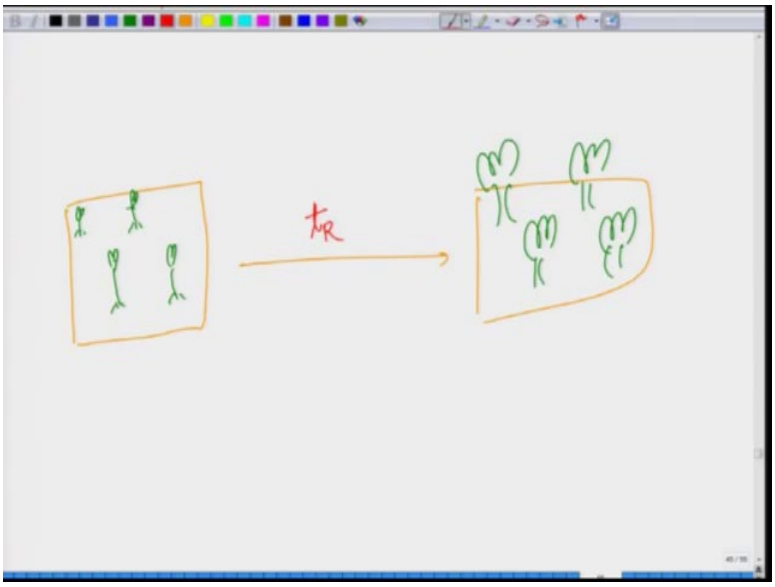

And on this piece of land, you put up teak plants. Now, you are growing this crop because you want to harvest this crop at a later stage, possibly to have timber and to sell that timber, and to earn revenue.

Now, how long are you going to keep these plants in this piece of land? So, typically there will be an age at which we will say that yeah now the now these trees are sufficiently mature, they are not putting up any more growth or the rate of increment of growth is so less, that it is now economically unviable to keep them further in this piece of land. So, from this stage to the second stage where you have trees that have that you now consider to be mature enough for felling.

This is going to take certain time 't' and this time is known as the rotation period, or the rotation age of this particular species at this particular site. So, rotation is the plant number of years between the formation of the stand and the final felling of the crop, or you can also define it as the average age at which a tree is considered mature for felling.

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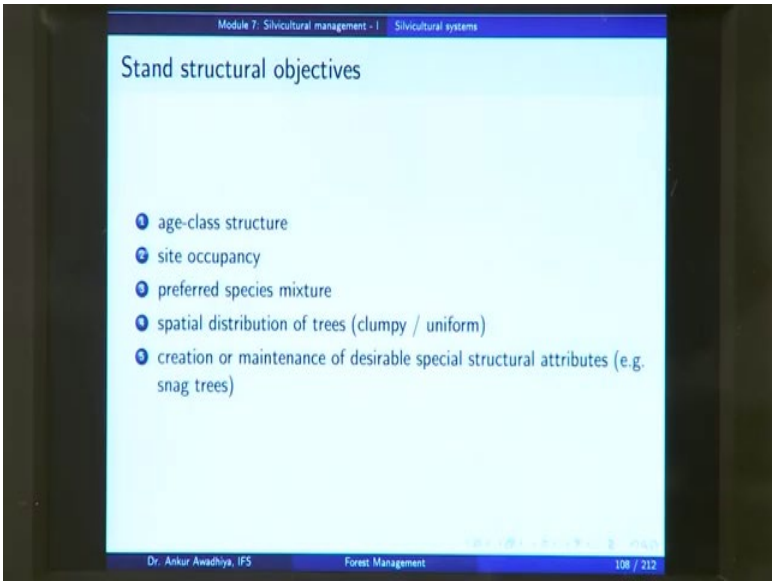

Now, we had said that we are doing or we are adopting a silvicultural system to made certain stand structural objectives.

So, what are these stands structural objectives? You can have a stand structural objective to have a certain age-class structure. Now, what do we mean by this age-class structure? will typically what we are referring to is this curve. Do we want to have R trees that are of the same age? So, when we are talking about an even aged forest; so, this sort of a distribution - the even aged distribution is something that we would want to have. Now, why would you want to have this distribution? Because in the case of an even aged forest, you can very clearly see when you want to cut the these trees, and when you want

to intervene in this forest; you can apply the same intervention on to the whole of the forest, because all the parts of the stand will be having trees of the same age.

So, suppose you have to perform any tending operation, you can apply this tending operation to the whole of this stand. You do not have to search for individual trees on which you want to impart your tending operations. When you want to fell these this particular stand, you can clear fell it all at the same time. So, you can concentrate your management operations, if you have an even aged forest.

So, this is one sort of an age-class structure that you could aim for. Or in other cases, you could aim for this in verse 'j' sort of a curve. Now, this inverse j sort of a curve that you find in an uneven aged forest might also be useful for you, if suppose your aim is to manage this forest for wildlife. Now in the case of wildlife purposes, different age classes of your trees will have different benefits for different organisms.

So, for instance, in the early periods, your crops might be eaten up by the herbivores. So, you have these small plants, and because your forest is having a plethora of these small plants, so herbivores will be able to eat these plants and able to sustain themselves, whereas, in the case of very old plants, you will be having the snag trees.

Because these will be very mature trees, and they will be having certain holes in their body or certain imperfections, that animals can make use of as their home; they can make their nest there. Also, you can you will be having certain trees that are of a mature age, which in turn will be supplying seeds for these early aged plants and will also be supplying for these old aged trees.

So, this could also be your particular stand structural objective - to have your stand in this particular age-class structure. Or, your stand structural objective could be to change or to have a particular site occupancy. So, in the case of a site occupancy, you can say that that you want to have your trees at a particular location.

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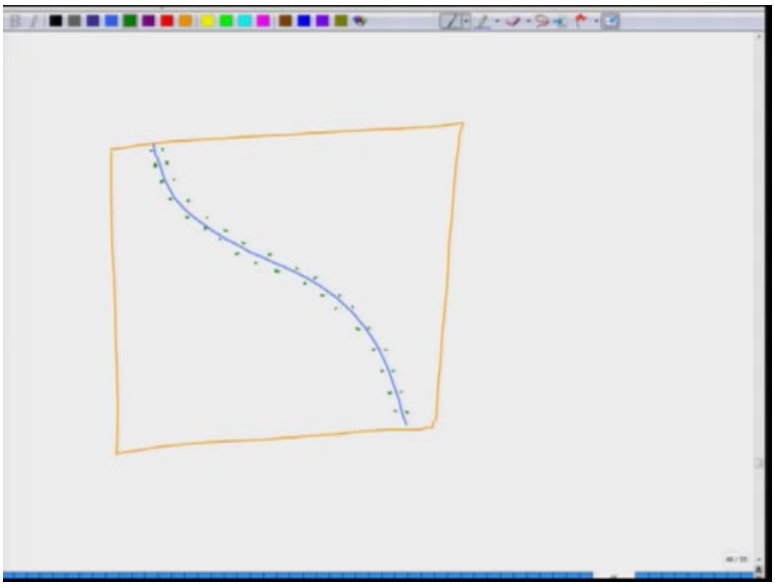

Now, this is possible that in your piece of land. Suppose you have a river that is flowing in this location. So, you can have a stand structural objective to have trees on both the banks of this river, so that erosion is avoided. So, this can be your stand structural objective to have a very dense growth of trees at this particular site.

So, you might want to have a certain site occupancy, probably by a certain species. Another stand structural objective could be have to have a preferred species mixture. So, you could want to go for a monoculture, in which you have only a single species, or you could even want to go for a mixed type of a forest, if you want to raise it for say, wild life purposes. So, it so your particular stand structural objective, in this case, is to have a certain preferred species mixture. Or you your objective could be to have a spatial distribution of trees, as clumpy or uniform.

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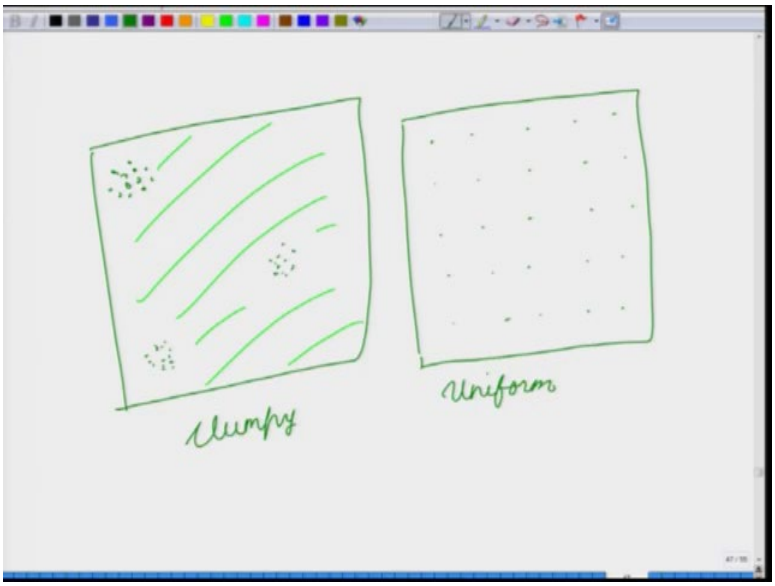

So, you could want to have a forest in which your trees are clumped at this location, and probably at this location, and this location; and in the other areas, you are having a grassland.

So, probably in the case of a recreational purpose, you could want to have such a clumpy distribution of trees. So, you would want to have certain groves of trees, and the other areas will be having very less number of trees, or probably will be grasslands. Or if you are raising a crop for say timber production or to mitigate climate change - for carbon sequestration, then probably you would want to have the whole area to have a uniform distribution of trees.

So, whether you want a clumpy distribution or a uniform distribution could be one of your stand structural objectives. And, you will use your silvicultural system to achieve one of these. You would use your silvicultural system, either to get a clumpy sort of a system clumpy sort of a stand or a uniform sort of a stand. Or, your stand structural objective could be the creation and maintenance of desirable spatial structural attributes, such as snag trees.

So, you could even have a silvicultural system that is designed, so that your forests will be having a lot a large number of snag trees; so that you can convert your forests and to see a bird sanctuary. So, all of these are different stands structural objectives, because of which we are use a silvicultural system.

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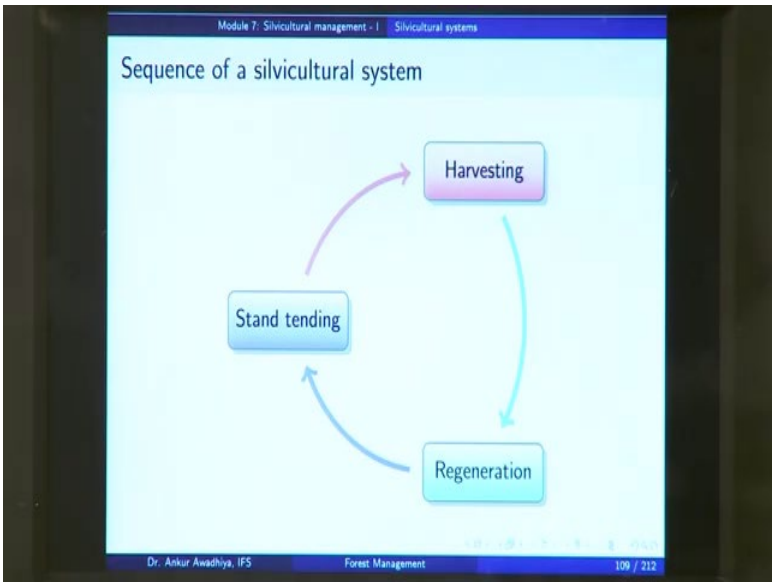

Now, in the case of a silvicultural system, we have this particular sequence. So, you harvest your stand, and after right after harvesting, you go for a regeneration. In the case of regeneration, you will plant your saplings once again. So, that the next generation comes up into the forest and then you tend to the forest.

So, here you have mature trees that you fell, and then you put up the next generation, then you tend to this stand or. So, tending means that you care for this stand, so that after a while it again reaches maturity, and you are able to harvested again. So, this is the sequence of a silvicultural system. You regenerate the stand, then you tend the stand so that it reaches maturity, and you are able to harvest it again, and then this process goes on and on.

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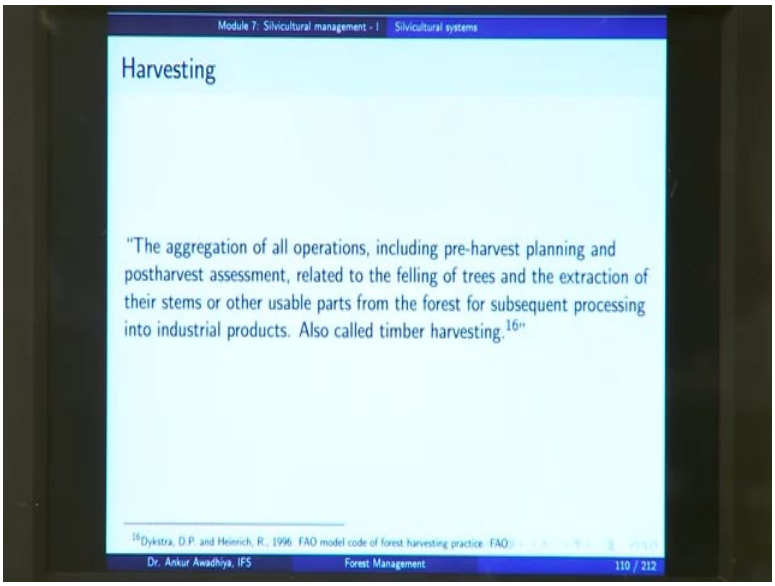

So, how do we define harvesting? Harvesting is "the aggregation of all operations including pre-harvest planning, and related to the felling of trees, and the extraction of their stems or other usable parts from the forest, for subsequent processing into industrial products. Also called timber harvesting."

So, what is a harvesting? It is an aggregation of all operations. So, this is not a single operation, because you will you might have these operations could be pre-harvest planning. Now, what is a pre-harvest planning? The pre-harvest planning says that, I want to harvest my stand, where will I get the labour from; where will I get the machines from; where will I get the trucks from; where am I going to dispose of my produce. So, all of these are pre-harvest planning. Then, you do the harvest that is you cut this timber and do a post-harvest assessment.

So, post harvest assessment is, you go to this stand and you see is the harvesting done in a proper manner, or during the process of harvesting, have I damaged the next generation? Or say, if you wanted to go for a natural regeneration, is it that during your harvesting you have destroyed all the mother trees. So, you have to perform this assessment and this also will be included as part of harvesting.

So, harvesting is an aggregation of all operations including pre-harvest planning and post-harvest assessment that are related to the felling of trees and the extraction of their stems or other usable parts. So, the aim of harvesting is to extract the stem or the timber

and other usable parts from the forest, for subsequent processing into industrial products. So, this is the first stage of a silvicultural system followed by regeneration.

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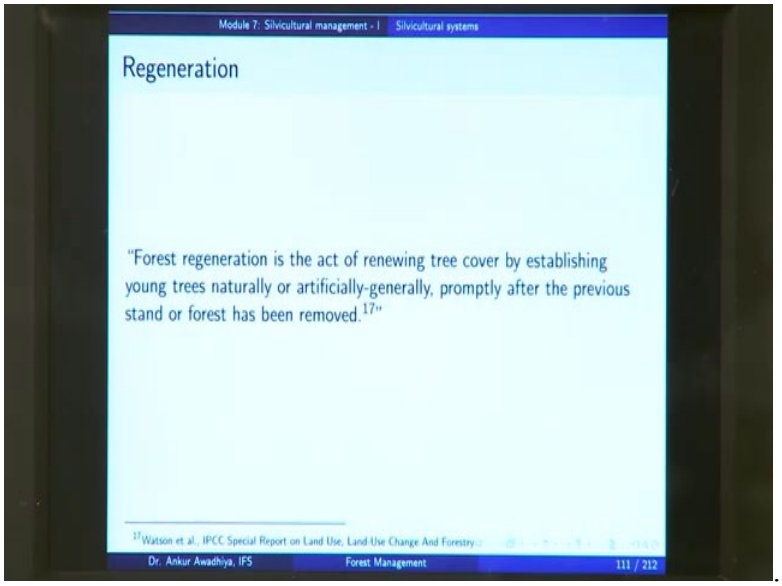

So, regeneration is the act of renewing the tree cover by establishing young trees naturally or artificially, generally promptly after the previous standoff forest has been removed, and we have looked at regeneration in great detail earlier. So, this is the act of renewing the tree cover, because after your harvesting, you have removed the tree cover. And, you want to regenerate your stand, so that it will have trees once again and after regeneration you perform the tending operation.

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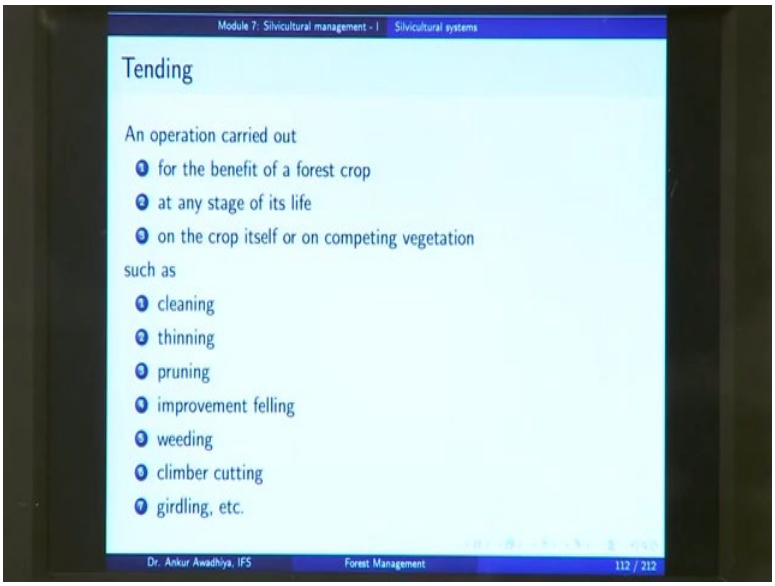

So, tending is any operation that is carried out for the benefit of a forest crop. So, the aim of attending operation is to benefit your forest crop. So, it could be say protecting your forest from forest fires or from insect infestation.

So, if you take steps to protect your forest from insect infestation, you are doing tending or caring of the forest assistance. So, it is an operation that is carried out for the benefit of the forest crop at any stage of its life. So, tending is not an operation that you do only for the young plants, you do it all through the life of the stand. So, in the case of the young plants, then probably your aim would be to protect it from grazing by cattle.

So, that would be a tending operation for the young crops. But in the case of mature trees, probably your tending operation would be to protect it against an insect infestation or to protect it against diseases. So, you will also be doing tending operation when you have a mature tree. So, it will be done at any stage or at all stages of its life; of the crop it itself or on the competing vegetation.

So, you can do an operation on the crop or you can do an operation on the competing vegetation. So, suppose you have a stand in which you are seeing a dense growth of climbers, and you have you have a feeling that these climbers are going to compete against your desired species by binding around them, and probably by also covering up their canopies. So, you can do an operation to remove these climbers. So, this will be an operation that is not done on the forest crop, but it is being done on a competing

vegetation. But still it will be called as tending, because you are doing it for the benefit of the forest crop. Or, you can do a tending operation on the crop itself.

So, for instance, if you are applying certain fertilizers or manures or pesticides to your desired species in the crop, then that will also be called as a tending operation. So, examples of tending operations are cleaning, thinning, pruning, improvement felling, weeding, climber cutting, girdling and so on. So, in these operations what you are trying to do is that you are cleaning up the stand by removing certain individuals that are not of your interest; you are thinning the stand.

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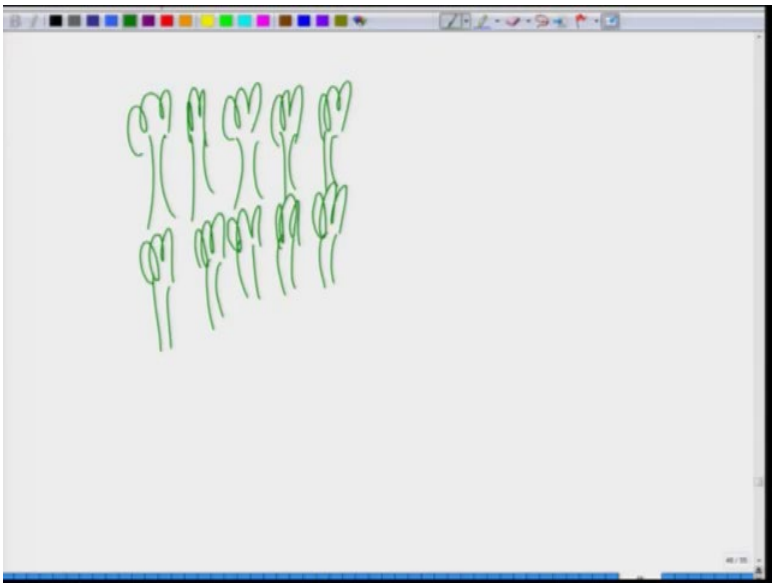

When we say thinning what we are saying is that, suppose you have a forest; you have this stand, and you have trees that are growing very close together. Now, if you have these trees that are growing very close together, they are competing amongst themselves, so that the light, the water, the nutrients all of these have now become limiting for each and every of these individuals.

So, in this case, we may say that we want to thin this stand. So, during this thinning operation, we will remove certain individuals from this stand so that the density of this stand reduces. So, we may say remove this individual, this individual, say this individual, this individual, this individual. So, in place of having a very dense stand, now the density is lesser. So, the amount of intraspecific competition that we were seeing in this stand

has reduced drastically. Now, every plant is able to get sufficient sunlight, sufficient water, sufficient nutrients.

So, this is an operation which comes under tending, and this is known as thinning. Or you could go for pruning. Now, what is pruning? Pruning is an operation in which you remove certain branches of the tree. Why would you want to remove them? Because when you cut a branch, then at certain times, it will give out new shoots and probably the crown density will increase.

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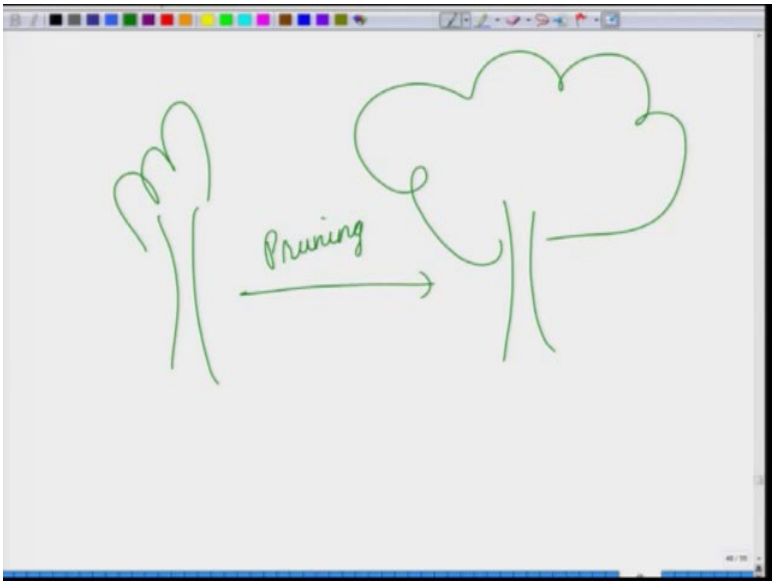

So, in place of having so in place of having this small crown, when you put it through pruning, then you will start getting a larger sized crown. And, if you have a larger size crown, then probably later on you will have more number of fruits, more number of seeds, and so this will be useful when you are trying to regenerate your stand. So, this could be another tending operation. Or, you can have improvement felling.

So, you are felling certain individuals to improve your stand. Or, you could go for weeding, and weeding is especially important in the early stages of life.

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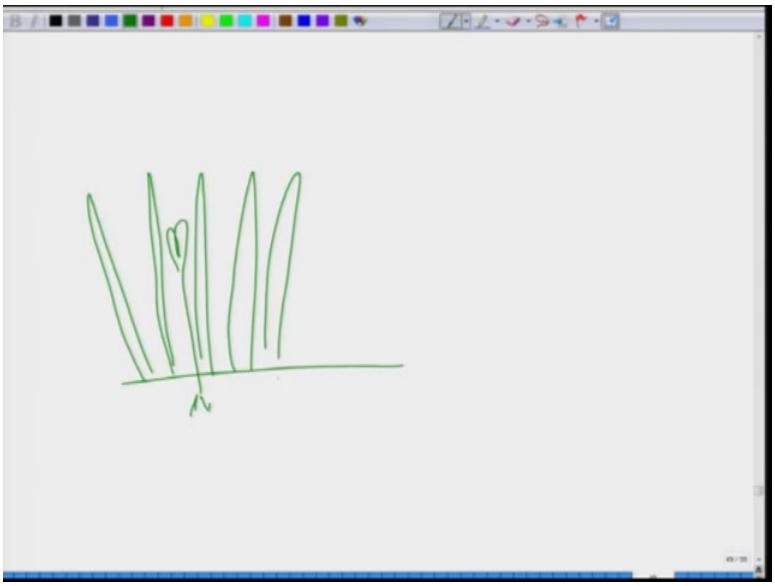

So, for instance, we can have a situation in which; this is your regeneration and this regeneration is surrounded by tall grasses; because of which, it is not getting sufficient sunlight. So, your weeding operation would be to remove these grasses.

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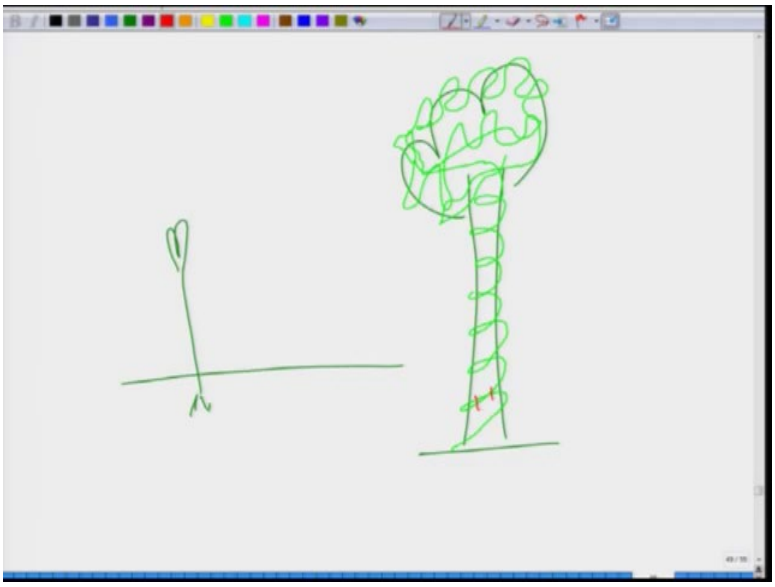

So that your plant is able to get sufficient light, nutrition and sunlight, or it could be climber cutting operation. So, climber cutting is usually done, if you have, say a tree that you are that you are cultivating for timber purposes. Now, if you have a climber that is

going around this tree, then it is possible that this climber strangulates your tree to such an extent that you start getting deformities in the bole.

So, if that is a situation, then you would want to cut this climber and free your tree from these climbers. There could be another situation in which these climbers, ones they reach to the canopy, they grow so profusely that they cover the whole of your tree. So, the whole canopy is covered, and so now your plant is not getting sufficient sunlight, and in that case, also you will cut these climbers, so that your tree is freed from this overgrowth.

Now, another tending operation is girdling. Now, girdling is an operation in which you kill a tree, but you let it remain at the same site, probably because you want your tree to be used as a shelter or as food by other organisms.

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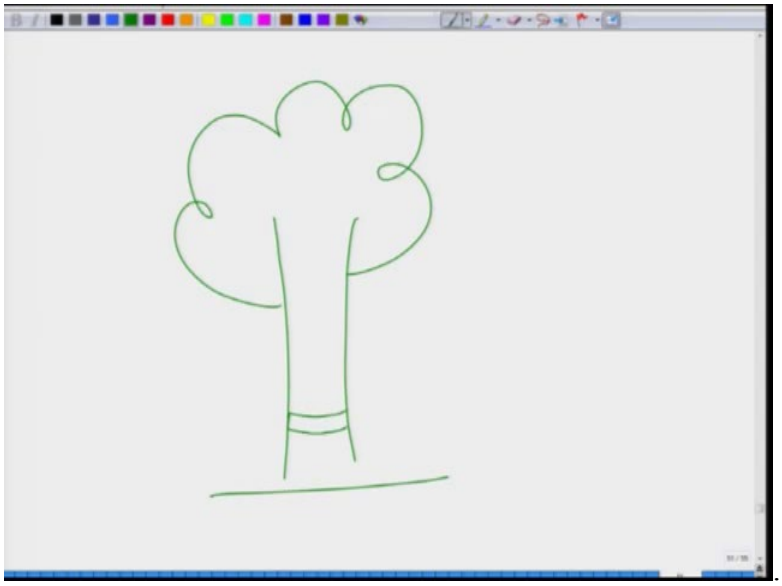

So, in the process of girdling, you cut a strip across this tree and you leave it as such. So, in this case, the vascular tissues of this tree will be disrupted and it will slowly dry out and die.

So, these are the different tending operations that we can do.

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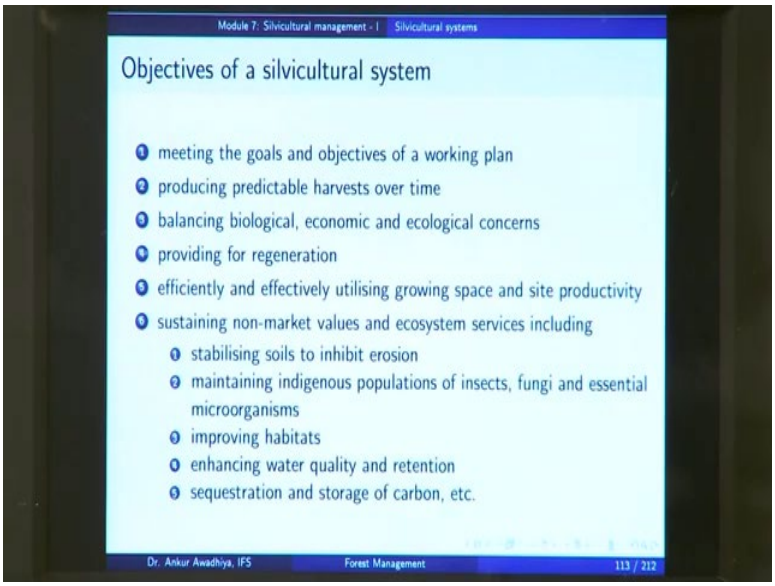

Now, why do we do why do we perform a silviculture or why do we use a particular silvicultural system. So, there are several objectives that we are trying to meet by using a silvicultural system. Your objective could be meeting the goals and objectives of a working plan. Now, working plan is a document that tells you that over the next 10 years what are your objectives and how are you going to achieve them.

So, suppose your working plan says that you want to convert your forests from, say a monoculture into a wildlife habitat. So, this could be a goal and objective that has been prescribed by your working plan. Now, you will use a silvicultural system to achieve this objective.

So, in place of your monoculture, you will put in place a silvicultural system in which your trees are gradually cut and replaced by mixed species. So, this could be one objective of the silvicultural system. Another objective is to produce predictable harvests over time mostly in a sustainable manner. So, you want to have the same harvest every year, year after year. Or, your objective could be to bring about a balance between biological, economic and ecological concerns.

So, earlier you had a forest that was using monoculture, and the only objective was to meet the demands of the timber industry. But then, later on probably you decided that no we also want to have ecological benefits from this forest. And, we need to make a balance between the biological concerns that is the biodiversity. The economic concerns

that is getting money out of this forest, and the ecological concerns that is ecological security, probably getting more groundwater recharge purification of water and so on. So, you want to make a balance between all of these. So, what are the species that you will have in your forest since that you have a balance of all these three concerns.

So, once you have decided that you cannot just cut your complete forest and grow these species, because these species will all will also take time to become a mature forest. So, your silvicultural system, in this case, would be to gradually reduce the number of your trees in the monocultural system, and putting up these new species so that you are able to achieve a final balance between the ecological, biological and the economic concerns. Or, your objective could be to provide for regeneration, or it could be to efficiently and effectively utilize the growing space and the site productivity.

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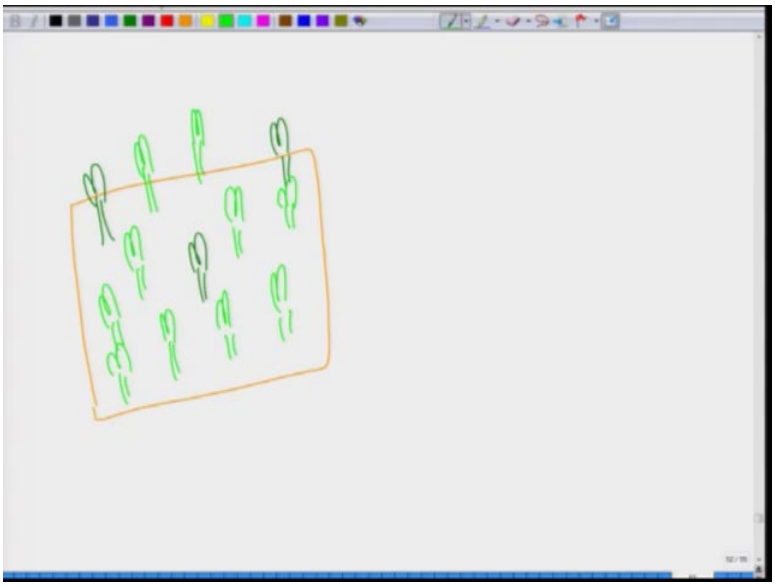

So, what we are saying here is that, you have this piece of land, and on this piece of land probably you were only having say 2 or 3 species. Now, because in on this piece of land fertility is good enough, amount of moisture is good enough, and sunlight is also good enough.

So, probably you could manage this site in a better manner by say putting up more number of trees. So, earlier you were able to utilize only 20 percent of your productivity. Now, you are able to utilize 80 percent of the site's productivity, so that could be another of your silvicultural systems objective. Or, it could be sustaining non-market values and

ecosystem services. So, you can even have a silvicultural system that is not aimed towards the felling of trees, but is more inclined towards meeting the non-market values and the ecosystem services. Now, these services could include stabilizing soils to inhibit erosion. So, you can even have a silvicultural system that just prescribes that you are going to plant trees near the riverbanks, and you are going to leave them as such. You are not going to fell them, so that the river banks are stabilized and the erosion is reduced.

Another ecosystem service could be maintenance of indigenous populations of insects, fungi, essential microorganisms. So, in this case, you could just say that my silvicultural system is going to prescribe that I am not going to make any changes what so ever in my forest, and I will let nature play it is role.

So, in which case, I am not concerned about whether any plant survives or whether any plant dies. If it survives naturally, I am with it. If it dies naturally, I am with it because even when they my trees die off, there they will be used up by other insects, fungi or other organisms as food. So, even in their death, I am happy about it or it could be to improve the habitats. So, improvement of habitat is also another non-market value.

So, in this case, you could have a silvicultural system that prescribes that that near your sewage nalas, you will be growing certain species that are able to take this water and perform bioremediation. Or, you could have a silvicultural system that only aims to increase your groundwater recharge, so that could be another of your silvicultural system objectives.

Or, you could have an objective of sequestration and storage of carbon, in which case you would go for certain species that grow very fast; that can sequester a lot of carbon dioxide into biomass, in a very short period of time, so that could be another objective. So, you can have a silvicultural system that that is meant to meet one or more of these objectives.

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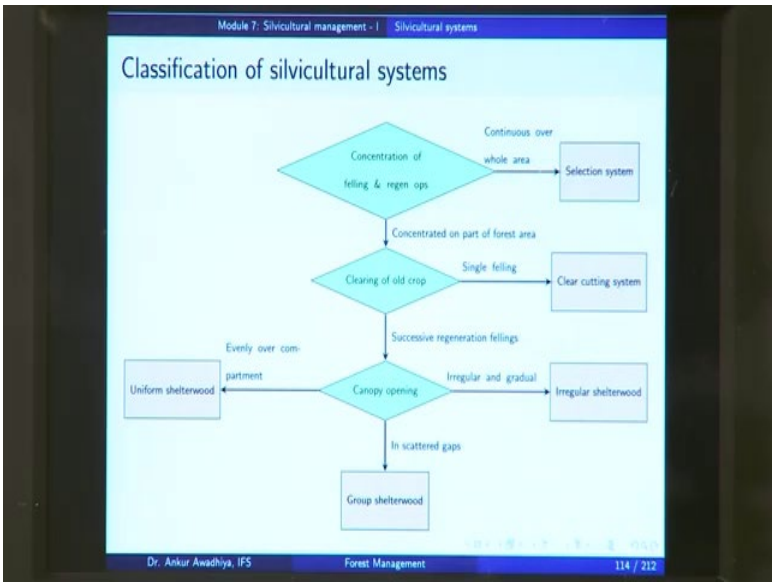

Now, we have different kinds of silvicultural systems. And, this chart summarizes what are the different kinds of silvicultural systems. So, if you go through this flowchart, the first question it asks is the concentration of felling and regeneration operations. Are you concentrating your felling and regeneration operations on one part of the forest, or are you doing your felling and regeneration operations continuously over the whole area of the forest?

Now, if you are doing it continuously over the whole area of the forest, you will have a selection system. But if you are concentrating it on part of a forest, then the next question is it asks is, how do you clear the old crop? Are you killing? Are you clearing the old craft with a single felling, or you are you clearing it with successive regeneration felling.

If you are clearing it with a single felling, then probably you have a clear-cutting system. But if you are clearing the old crop with successive regeneration felling, then how are you opening the canopy? Are you opening it evenly over the whole compartment? In that case, you have a uniform shelter wood system. Are you opening it irregularly and gradually over the whole of the stand? In that case, you will have any regulation to wood system, and if you are opening it in scattered gaps, in that case, you will be having a group shelter wood system.

So, these are different kinds of silvicultural systems and we will look at each of these in the coming lectures.

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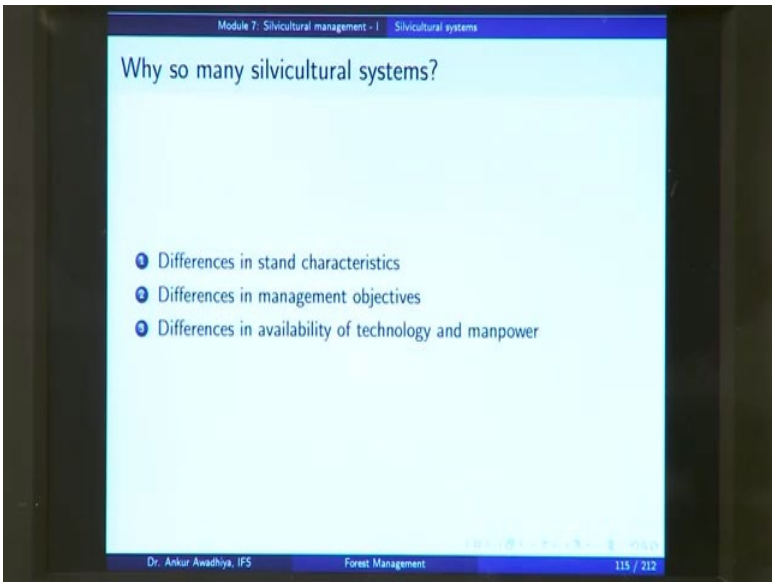

But the question to ask is why do we require so many silvicultural systems? Why cannot we, why can we not have just a single silvicultural system, and use it on each and every forest use it on each and every stand. So, the answer is, because you have differences in the stand characteristics to begin with, So, every stand will have different species, will have different mix of a species, and will have different characteristics whether it is clumpy or uniform and so on.

So, depending on the stand characteristics, you will need to have different operations to meet your objectives. And, for these different - object for these different operations, you need to have different silvicultural systems also there are large differences in management objectives.

So, if you are managing a stand for timber, your management objective is very different from if you are managing your stand for biodiversity. And, if you are having different objectives, then you cannot use the same system and bring about different results. So, your systems have to be different. Also, there are differences in the availability of technology and manpower.

Suppose you want to manage your forest, by say a clear cutting - clear felling system, in which you say that I am going to bring in large size machines, and I am going to cut these forests in one go. And then, I am going to transport it using large trucks, but

probably at the site that you are that you plan to use the system, you do not have access to these large size machines.

Probably you are an island nation, and in this island nation, it is very difficult to bring in these machines. Or, probably you do not have the money to purchase these machines. So, in that case, you cannot just say I am not having my machines. So, I am not going to do anything, because in that case, you will not be able to meet your silvicultural objectives. So, to meet your objectives you will have to go for another system.

So, probably you will say that I am not able to bring in my large size machines. So, I am going to cut my forests in small patches or in small groups, and when you do that, you require a different system. So, we have different silvicultural systems because there are differences in stand characteristics; there are differences in management objectives; and there are differences in the availability of technology and manpower. So, in this lecture, we began by looking at what a silvicultural system is.

So, a silvicultural system is "an integration of different operations to meet certain silvicultural objectives." And, these operations are one harvesting of the earlier timber that was there on your in your forest stand. Harvesting; this followed by regeneration of this stand, in which case, you plant new trees or you go for a natural regeneration. Followed by tending operations, which are operations that are carried out for the benefit of your forest crop at any stage of its life, and you can do it either on your crop or on computing vegetation.

So, we saw the different kinds of tending operations. Then, we had a look at what are the different silvicultural systems that we have, and we require different systems, because we have different silvicultural or managerial objectives. And, to meet each and every of these objectives, we require a different system. We might even have different forest stands to begin with. So, in this lecture, we looked at what are these different silvicultural systems and why do we need them. So, that is all for today.

Thank you for your attention [FL].