**Wildlife Conservation**
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**Lecture - 14**
**Habitat Management & Improvement**

[FL] In today's lecture we will have a look at the tools of Habitat Management.

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So, there was a person by the name of Aldo Leopold, he did extensive work on the management of game animals. Now, game animals in the context of African countries means those animals that can be hunted.

So, he said that there are five tools of habitat management. So, he wrote a book called Game Management in 1933. So, this is one of the earliest books on the management of wildlife.

So, the five tools of habitat management according to Aldo Leopold are the axe, the cattle or the cow, plough, gun and fire. Now if we look at it in more detail all of these five tools are also the tools of habitat destruction.

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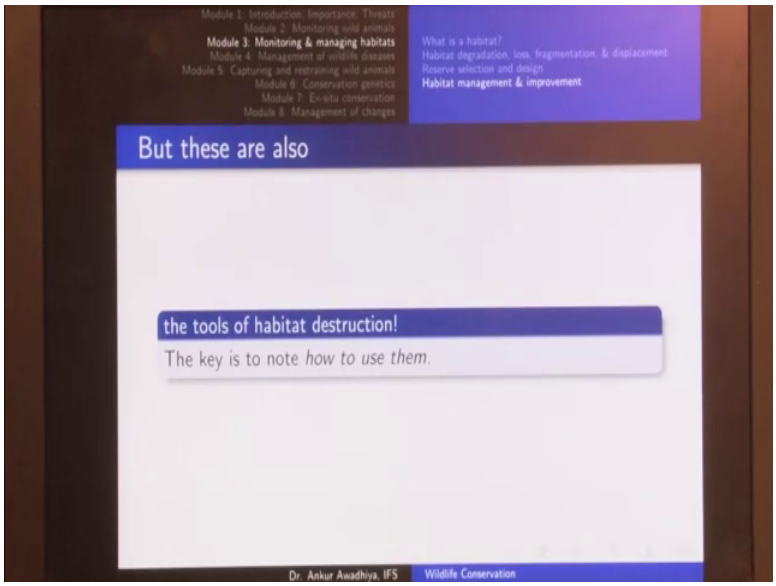


Because the same axe that can be used to remove weeds can also be used to remove trees from then area. The cattle that can be used for habitat management can also be lead to can also be used for habitat destruction in the form of over grazing. The plough which can facilitate the regeneration of plants can also be used to convert a forest land into a farm land. The gun which can be used to kill excess animals or to kill invasive animals or those animals that are getting into conflict can also be used for poaching. Fire which can be used to remove dry grasses or weeds from an area can also be used to put the forest on fire.

So, all of these five tools of habitat management are also the tools of habitat destruction. The key here is to know when to use them and how to use them.

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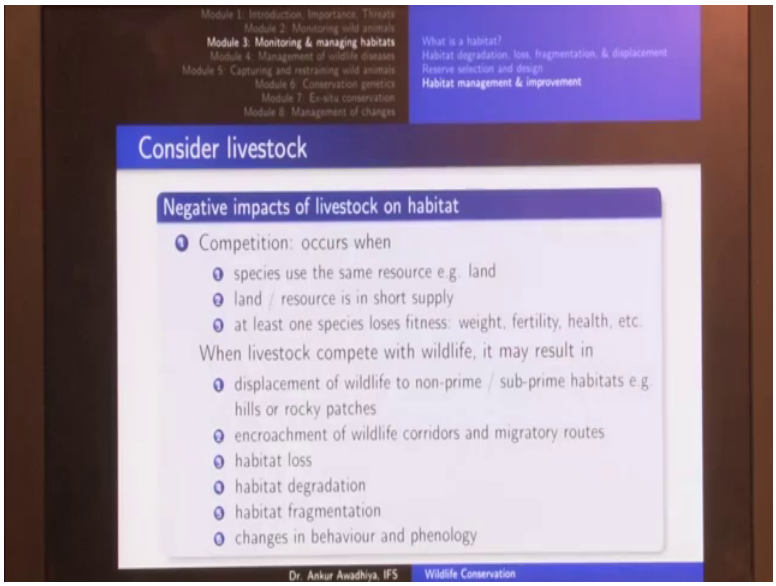


So, to look at it in greater detail we consider one of these tools livestock. The livestock includes cattle which people can use for grazer. Now, let us begin to look at the negative and the positive impacts of livestock and habitat.

So, the first negative impact that occurs is competition. Now competition occurs when there are a number of species that are using the same resource. Now in this case the resource is land that is providing fodder. The second thing is that even when they are using the same resource if the resources in plenty, they would hardly be any competition, but if the land or the resource is in short supply then it creates conditions of competition.

And when competition happens at least one species loses fitness in the form of weight, fertility, health or so, on. Now, in most of the situations when there is a competition between wild animals and the livestock it is the livestock that prevails because there are humans to take care of the livestock and to get rid of the wild animals when they compete.

Now, when livestock compete with wildlife it results in a number of other impacts. It displaces wild life to non prime or subprime habitats example hills or rocky patches. So, as we saw in a previous lecture as well.

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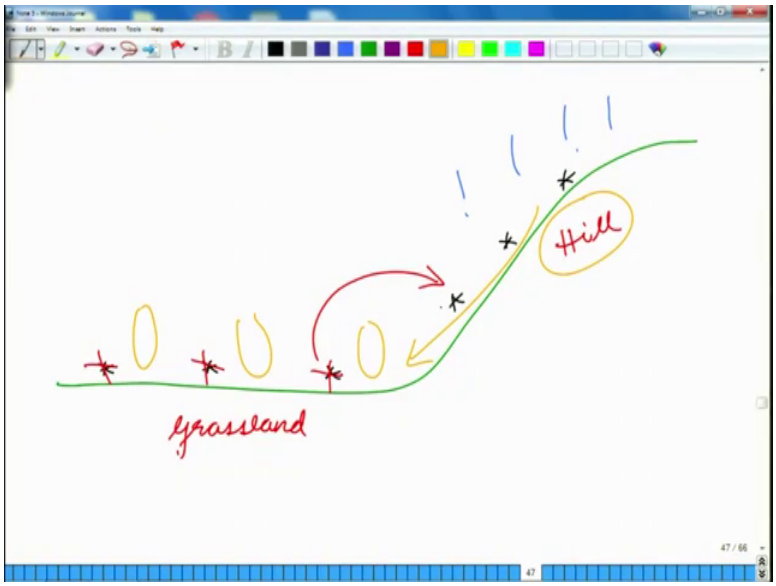


Suppose we have an area that has a hill and that also has a piece of grassland. Now in the normal circumstances the livestock would use the grassland for feeding and would use the hills as a shelter when they are being chased by the predators.

Now, when cattle come here into these areas, then it because they are able to outcompete the wild animals because of the help of the human beings then these wild animals are then displaced into the hill hilly terrains. Now hilly terrains as we know do not have quite a lot of grasses they are mostly rocky and barren areas because whenever there is rainfall in this area.

So, all the soil gets washed down into the plain area. So, whenever we see a situation of competition between the livestock and the wildlife in most of those situations these livestock are able to push the wild animals into subprime habitats such as the hilly habitats. Now another impact that occurs is the encroachment of wildlife corridors in migratory routes now what do we mean by these wild life corridors in migratory routes.

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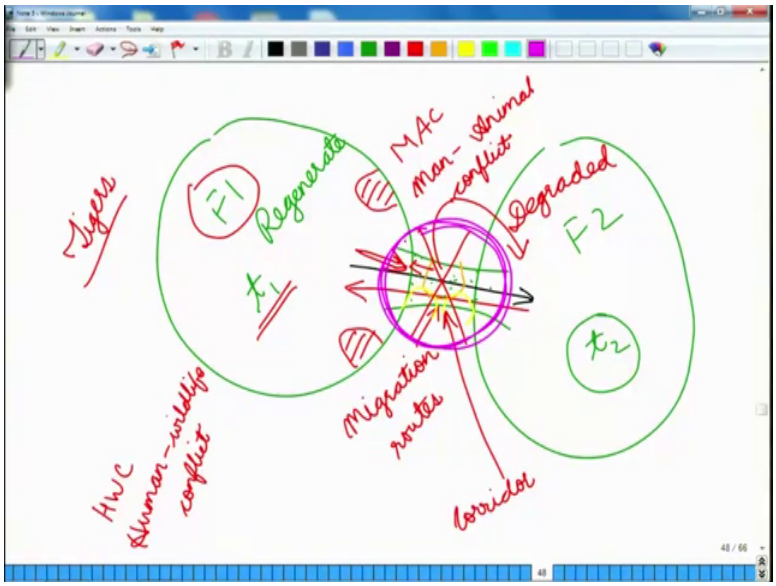


So, we saw in one of the previous lectures that there are number of animals that want to disperse from one area to another area. So, that there is lesser competition with the parental generation there is lesser amount of inbreeding with the previous generation. Now there are two things that happen one is dispersion. So, dispersion is the movement of animals from their place of origin to other areas thus the second thing that happens is migration.

Now, migration happens because if the animals say an elephant is living in a small patch of forest and the and the elephant requires quite a lot of vegetation to support itself then if we continue to keep the elephant in a small patch then all the trees of the area would get eaten up by the elephants and the habitat would get degraded.

Now to ensure that this habitat is not degraded the nature has found out a way that the elephant would move from one area to another area. So, for instance if there is forest F1 and there is forest F2.

So, the elephants would move from forest F1 into forest F 2 for some time. And while doing this they would be using some migratory routes that are connecting both these patches of forest. Now the elephant has spent some time say t1 in the first forest and then after spending of time t 1 it moves to the second forest and spends time t 2. While it is spending its time in the second forest the first forest is able to regenerate itself.

So, essentially in this period the trees that were deprived of their leaves have grown up new leaves they have given out new shoots there are some new trees or some new plants that have come up in this area and so, this forest has regenerated itself.

So, it is able to have more amount of fodder for these animals while the animals are spending their time in the forest F 2 for the period t 2. Now when this time t 2 has elapsed, this forest F 2 has now become degraded. It has become degraded because all these animals are now using all the resources that are there in the forest patch F2. So, after time t 2 the elephants would then go back into the forest F1 and then spend some time there allowing the forest F2 to regenerate.

Now, whenever this happens, this phenomenon that goes by the name of migration it occurs through specific routes that are known as migration routes. Now this is one such migration route it is a patch of forest that is connecting two pieces of forest patches.

Now in areas where the animals are using some specific routes are again and again we also call them as corridors because this acts as a corridor that is connecting two pieces of the forest. Now when there is competition with livestock we could see encroachment of wildlife corridors and migratory routes.

So, what happens in this case is that there could be people who want to to dear animals and because this is a very small patch which is connecting two larger patches of forest and this is generally outside the control of the forest department.

So, what people would do is that they would encroach into this area and say create of a piece of pasture land here. Or say create another piece of farmland somewhere here. So, essentially what happens is that this corridor connectivity is lost.

Now, when this corridor connectivity is lost if when you have your animals who want to move from forest F1 to forest F2 and there is no corridor connectivity then where would the animals go. Now elephants for instance are known to follow certain routes they stored in their memory. So, they have this knowledge that is passed from generation to generation. Now when an elephant comes into this area and it sees that there is no migration corridor here, but only say farmlands or pasture lands the elephants might try to enter into these areas. Whenever the elephants enter into these areas we have

situations which we call as MAC or man animal conflict. In these days we also use another term which is HWC which stands for human wildlife conflict.

So, when we have situation of man animal conflict or human wildlife conflict depending on the terminology that you are using. What wheels observe is that we would see some newspaper reports that elephants have come into a human habitation area elephants are causing. So, much amount of crop destruction or property damage or maybe even loss of life and livestock.

Whereas, in actuality in the correct sense it was actually human beings that had and that had encroached into their migratory routes. Now, these and these animals though they are intelligent animals, but they tend to follow the same routes.

So, if you have a new settlement or a new farmland or a new pasture land that has come up into their migratory route inevitably it will lead to situations of conflict.

Now, another thing to note in this situation is that because the livestock in this case have the support of human beings it is generally observed that it is the wildlife that is in a perilous situation because what would happen when the elephant is trying to get into this area is that we would be having human beings forest department or the villagers that try to push this animal back into the forest. How do they do this they would try to it will light firecrackers they would try to light fires make some noises or in any way try to push these animals back into the forest.

Now, when such a situation occurs now looking at the Ecology of this region the forest F1 is already a degraded forest after the span of time t 1. Now if you push the animals back there again it would lead to further degradation of the habitat and might even lead to situations of habitat loss completely because once they these forests are completely degraded then people would start to encroach into these forests as well because now these areas have a very less density of trees. So, whatever trees remain there they would be cut down and then people would establish a farmland or a pasture land or a settlement here as well.

So, this is one common phenomenon through which we are losing our habitats. Now coming back to the situation of competition; so, when livestock compete with wildlife it also leads to encroachment of wild life corridors and migratory routes also leading to

habitat loss degradation and fragmentation. Now fragmentation again as we know it would occur when we have lost this corridor connectivity. So, this was a corridor that was providing our connectivity between both of these pieces of forest when this corridor is lost then forest F1 and F2 become small fragmented patches which we also go say by the term of habitat fragmentation.

So, it leads to habitat fragmentation it also changes the behavior and phonology of the animals. Because earlier these animals such as the elephants they were trying to avoid human beings they were happy and they were contained in their own forest areas they were getting enough fodder and.

So, there was nothing to push them into the human settlements, but now that we have removed their corridor connectivity they inevitably have to go and have a conflict with the human beings because they because they need to move out of this forest area which is already degraded.

So, we also observe situations in which the behavior of the animal changes whenever we have these situations of competition. Another way in which we could have situations of behavior changes is because if you go into any of the pristine wild life areas you would observe that most of the wild animals are generally shy of human beings.

So, as soon as you see a wild animal you were always observe that it is running away from you. Except in situations such as tiger reserves in which the animals become habituated to the presence of human beings in vehicles, but as soon as you try to get out of the vehicles the animal should again run away because they are only habituated to the presence of human beings in vehicles not on foot on the land.

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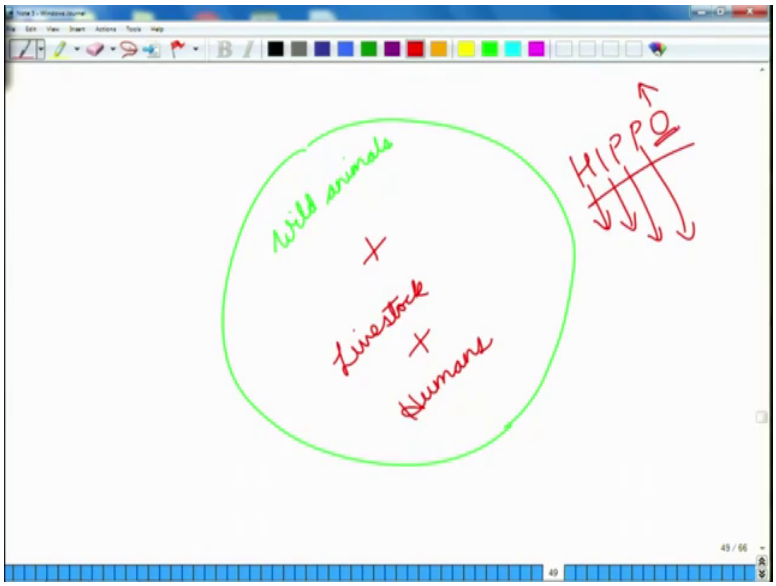


Now when we have situations of competition so, we have single piece of forest or grassland in which we are having wild animals and we are also having livestock and we also have humans in the same area.

So, because in these situations the wild animals are continuously coming in contact with human beings and livestock they lose their fear of these animals and the human beings and they essentially become comfortable to come into human habitations. So, this is also another change in behavior that we observe whenever there is a situation of competition between wild animals and livestock.

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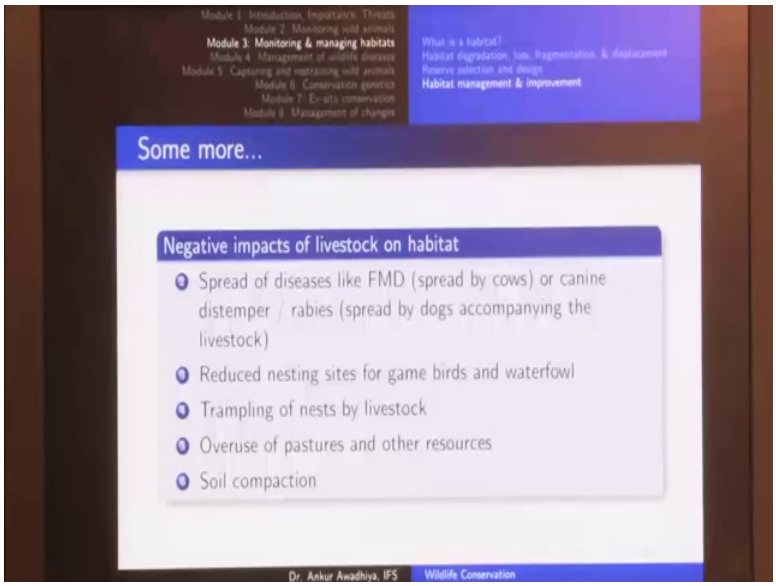


Other negative impacts could be the spread of diseases such as FMD. So, FMD stands for foot in mouth disease. So, it is spread by cows. So, cows can have this disease and when they are going into the forest areas when they are using the same pasture lands.

So, they can also spread these other disease to other herbivores or things like canine distemper or rabies in which are spread by dogs that are accompanying the livestock.

So, if that we generally observe that when people are getting into the forest areas with their livestock they also a carry the village dog. So, along with them and if those dogs have such diseases like canine distemper or rabies they can also spread it to the wild animals.

Another thing is reduced nesting site for game birds and waterfowl because you have trampling of nests by the livestock and also change in the habitat. So, essentially when all the grasses are eaten up by the livestock then it could also change the distribution of species that are there. So, we could also observe the growth of more weeds into the those areas. Also other things could be overuse of pastures and other resources. So, like when we talked about the term hippo.

So, hippo stands for all the factors or most of the factors that lead to habitat loss and degradation. So, here O stands for over utilization of resources. So, in the case of loss of

biodiversity we have habitat loss degradation and fragmentation invasive species pollution human overpopulation and overuse of resources.

So, in the case of competition we also observe overuse of pastures and other resources such as the availability of water. Also we have situations of soil compaction. So, when these heavy animals the livestock when they are moving in these areas, so, the soil gets compacted and when we have a compact soil. So, in those situations the regeneration of the grasses becomes more and more difficult because plants find it very difficult to penetrate their roots and to come out. So, soil compaction is also another negative impact.

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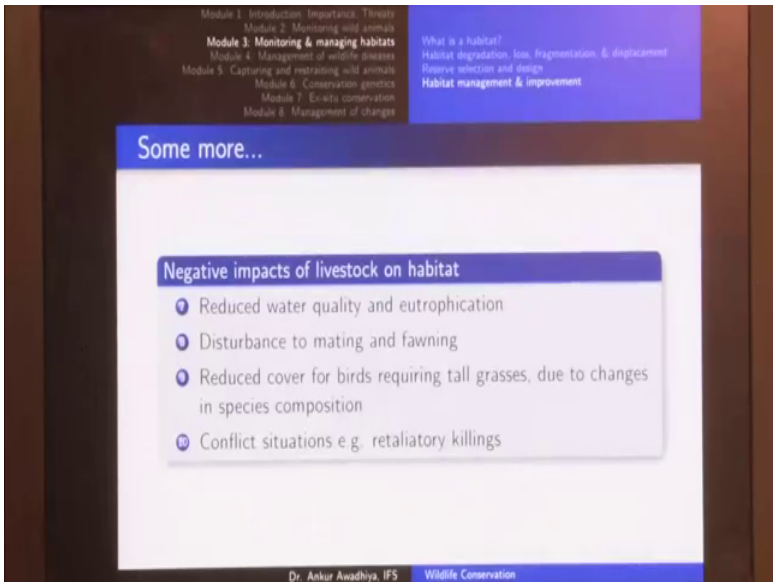


Also we can observe situations of reduced water quality and eutrophication especially because the water is being over utilized also by the livestock. And they are also contaminating the water sources through their dung and urine.

So, dung and urine also provide fertilizers into the water which could also lead to eutrophication then it also leads to disturbance to mating and fawning behaviors because the mating and fawning behaviors of the wildlife because essentially we are seeing human and livestock lead disturbance into their behavior. Then we have reduced cover for birds requiring taller grasses due to changes in the species composition because the tall grasses are now being eaten away by the livestock. And also conflict situations such as retaliatory killings.

Now what do we mean by retaliatory killings? So, coming back to this screen, so, when we have a situation in which we had a loss of corridor connectivity. And suppose this corridor was being utilized by tigers.

Now, inevitably when a tiger is inside a forest area then it would be predating upon on the wildlife when it is coming into the human dominated area it would predate upon the livestock. Also when you have situations in which people are taking their livestock into the forest and. So, there is a situation of conflict in those situations all as well tigers could predate upon the livestock.

Now whenever a tiger periods upon a livestock it is an economic loss to the farmer or to the livestock corridor that was owning that cattle. So, suppose a cattle cost somewhere say around 15000 rupees. Now if a tiger eats away my cattle I would I would feel that that I have been deprived of a resource that was costing me 15000 rupees and who is the culprit here a farmer would say that my cattle was eaten away by the by the tiger. So, the tiger is the culprit.

So, then how do we a solve this situation. The farmer would say let us punish the culprit let us kill the culprit if there are no tigers then there would not be any killing of my livestock or any livestock the predation. Now such forms of killings; so, what people normally do is that tigers are known to eat their prey in a span of say two to three days because they livestock is the large size prey.

So, a tiger would not be able to eat it in one go. So, there is a carcass or a or a dead cattle that is lying there in the forest the farmer might go there and then put some poison into the carcass. So, when the tiger comes back and eats that carcass it would get that poison and it would die.

Now, things such as these are known as retaliatory killings in certain situations people also get into the forest and then actively try to hunt the animal the wild animals. So, why did these why did we have a situation of retaliatory killing because tiger eat away our livestock why did tiger eat away our livestock either because it did not have enough wildlife in the in its own area because people were getting inside and hunting away all the herbivores for meat or else people were putting their livestock into the forest area.

So, it also came in the food chain and. So, also tiger also found that that this is one animal that it could kill third because of regular interactions with the livestock and the human beings. Now tiger is familiar with this with a livestock.

So, it considers that that a livestock is not something to be feared of and. So, it can go and kill those animals or else there was corridor connectivity some sort of a corridor that the tiger was using to move from forest A to forest B. And now that area itself has a number of livestock's. So, when tiger is using that area it would find those I livestocks and it would kill it.

So, essentially in any of these situations we can very clearly observe that that tiger was not at fault it was made familiar with the livestock its areas were taken away its prey were taken away and because of which it had to feed on something. So, it killed livestock, but then in most situations we would observe that people would use this excuse to say that that tiger is leading to their economic losses let us kill the tiger.

Now in such situations people do not note that a tiger happens to be a keystone species for the habitat. So, if you remove this tiger you would see an overabundance of herbivores and then that would also lead to habitat degradation in the near future, but then these things happen.

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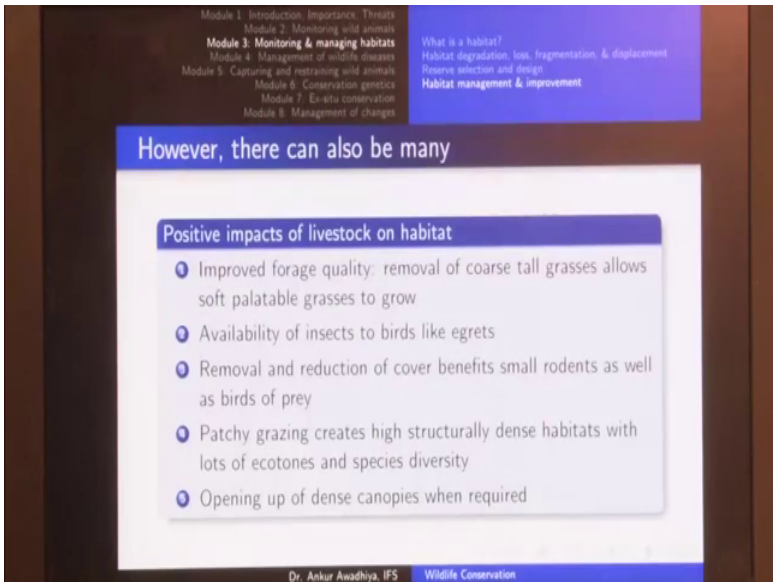

Now, coming back to the impacts of livestock and on habited. So, why did Aldo Leopold say that livestock is one of the tools of habitat management because when used properly we can enhance positive impacts of livestock.

So, there are also some positive impacts that come out of the interaction between the livestock and the wild animals. One is improved forage quality because if you feed your livestock with coarse grasses then it may also lead to the development and growth of soft palatable species of grasses or at least some new shoots of grasses that are soft and palatable, but then this thing would only happen when you make your livestock feed on the coarse and tall grasses.

if you make your lifestyle or stop feed on the soft and palatable grasses then you would have even less amount of order of label further wild life. Then availability of insects to birds such as egrets what it says is that when livestock are grazing in grassland. So, their movement also causes insects to move out of the grasses and. So, some predatory birds some insectivorous birds can get access to those insects.

Next is removal in reduction of cover benefits small rodents as well as birds of prey. So, essentially when you have removed the cover you have removed the tall grasses. So, birds of prey such as eagle would be better able to locate their prey in those areas, but then again this is only possible if you are doing a concentrated management and using livestock as a tool it would not happen automatically then patchy grazing creates high structurally dense habitats with lots of ecotones and species diversity.

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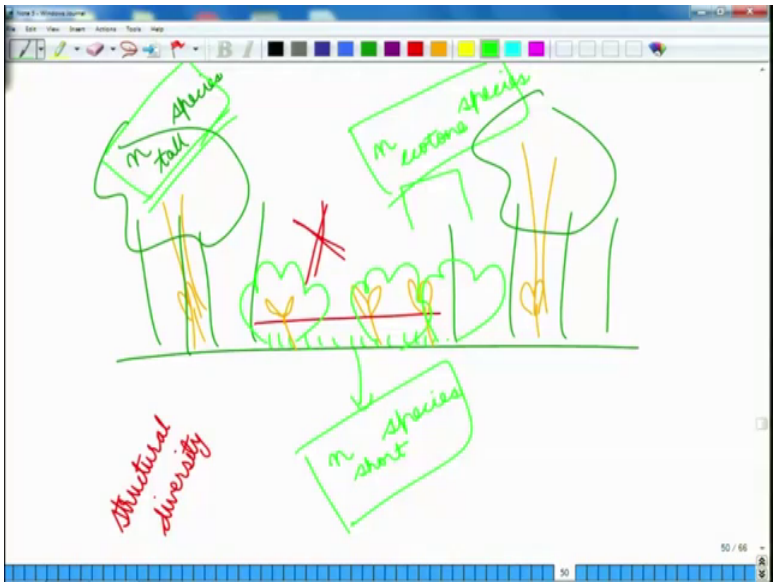


Now, what we mean by this is that if you have an area in which you have tall grasses everywhere. Now, tall grasses would support say n number of species. So, let us call it n tall. So, n tall number of species are being supported by tall grasses. Now, if you make your livestock graze away this area and then because this area was preferentially grazed away. So, now, you have some small grasses that have come up into this area.

Now these small grasses would then support another is a number of species let us call it n short for the short grasses. So, n short number of this species are supported by these short grasses, but then we also have a situation of an ecotone. So, ecotone is this boundary where you have tall grasses on one side and short grasses on the other side. Now this ecotone would also support n ecotone number of species.

So, these are species that are not comfortable to live n tall grasses these are not comfortable to live in the short grasses, but they are extremely comfortable when you have a mixture of tall grasses and short grasses together.

So, in those situations you would have n number of species that are also being supported by the ecotone species. So, essentially when we look at the species diversity earlier we only had n tall number of species, but now we have n tall species together with n short species n ecotone species. And this sort of diversity in the habitat goes by the name of structural diversity; a structural diversity because we have changed the structure of the

ecosystem. So, in case of only tall grasses now we have short grasses and we have patches where we have tall grasses and the short grasses together.

So, patchy grazing now again the term to note here is patchy grazing any sort of grazing would not create a structurally dense habitat, but patchy grazing if they are using it as a management tool then it also leads to opening up of dense canopies when required.

So, essentially you are removing tall plants from certain areas just because of your patchy grazing. So, essentially in these areas suppose we had some tree species that were also growing here and they were in the form of plants we also have some here we also have some here.

So, what happens in this case is that when cattle are grazing into these areas these plants are also removed. So, later on we would find tall trees here and here, but not in the central region. So, essentially this would also lead to another level of structural diversity.

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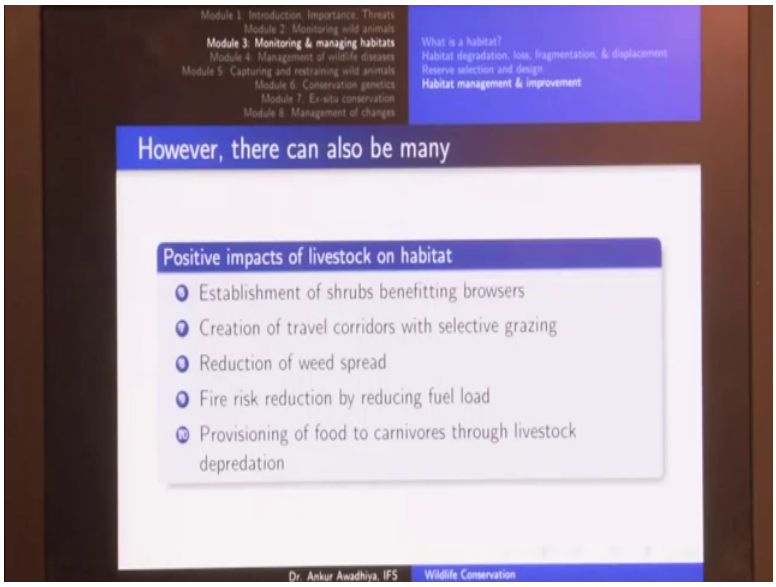


Next we could observe establishment of shrubs that benefit the browsers now when you do not have these trees in this area in the central region coming back to the drawing board.

So, if you do not have trees in this central area now trees take quite a lot of time to grow, but when you have removed all these trees then herbs and shrubs grow faster. So, we

would observe that after this grazing is done and after all these trees are remove trees with that for in the plant stage we would observe some shrubs growing in the these areas.

Now shrub also provide another level of a structural diversity that benefits browsers or animals that feed on leaves or of the shrubs and not on the grasses, Then it can also lead to creation of travel corridors with selectively grazing. So, essentially as in the case of the patchy grazing we could create corridors that can be used by animals for the movement it could also lead to reduction of weed spread if we are making our Herman to remove these weeds as well. Then fire risk reduction by reducing off by the reduction of fuel load.

So, when you are removing grasses from a certain area. So, the amount of dry grasses in the dry season would also be less which would reduce the risk of getting fires in those areas and also provisioning of food to carnivores through livestock depredation only when there is no retaliatory killing will involved.

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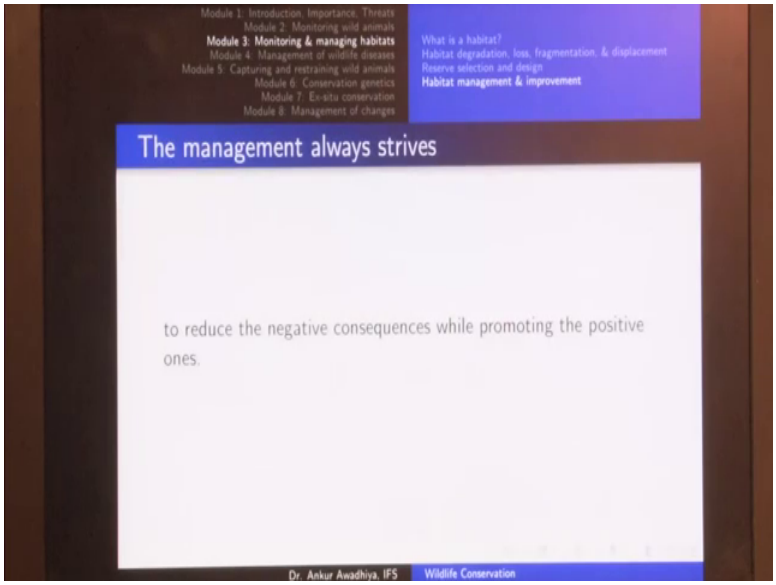


So, now a management would always try to reduce the negative consequences while promoting the positive once. So, we saw in the case of livestock that we have both the negative influences and the positive influences and it is the role of the management or the person who is doing wildlife conservation to enhance the positive impacts to use livestock as a tool by reducing their negative impacts of competition and other shrubs.

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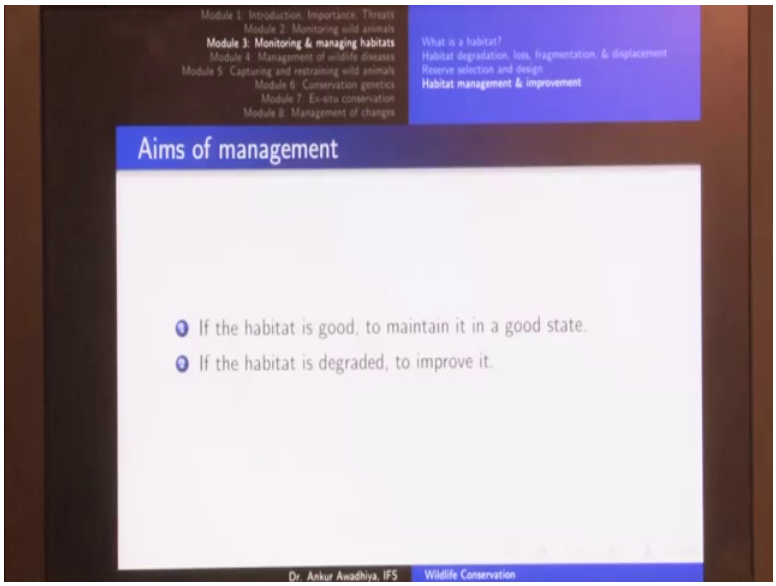


So, the aim of management is that if the habitat is good maintain it in a good state if the habitat is degraded try to improve it. And we can use these tools of habitat management these five tools as told to us by Aldo Leopold to improve a habitat.

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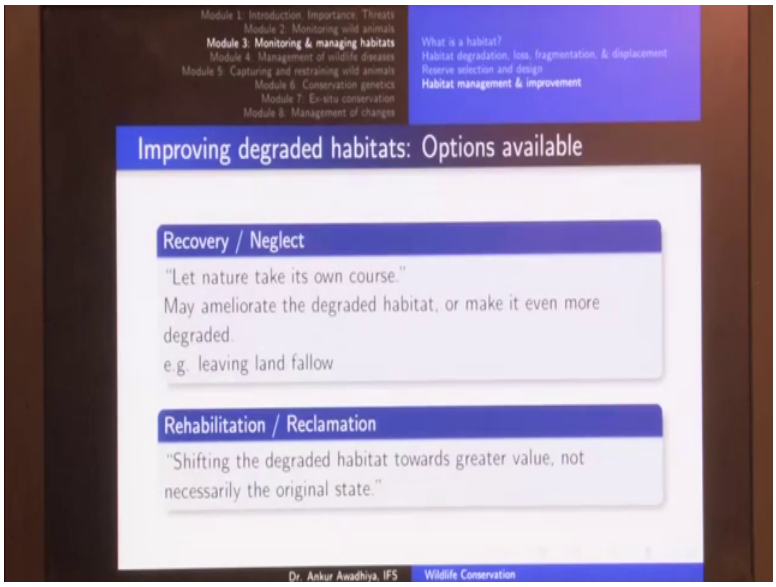


Now, when we are improving a habitat we have certain options available with us. One option goes by the name of recovery or neglect. So, the recovery or neglect means just leave the land as it is just leave the land fallow and nature will take care of itself and it would recover the habitat by itself. Second is rehabilitation or reclamation. So, we have a

degraded habitat and we are trying to move it towards greater value habitat even though it might not be on the complete original state of the habitat. So, for instance if there was forest and that forest was degraded away it was converted into say a barren land and that barren land we are trying to go to grow certain species.

So, it does not become as good as the original forest, but we are trying to rehabilitate or reclaim some part of that degraded area into a forest.

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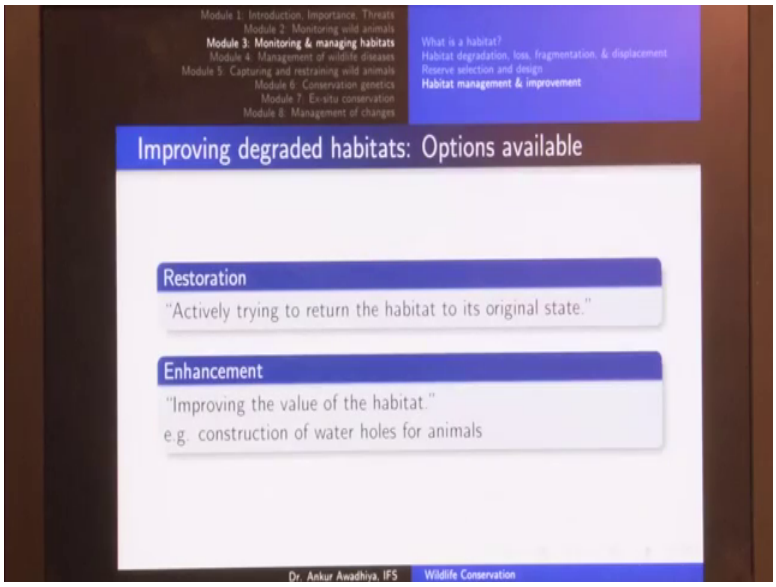


Next is restoration in which we are actively trying to restore or return the habitat to its original state. So, it could involve heavy dose of planting of the nature species. Next is enhancement which is improving the value of the habitat. So, in this case we are not trying to convert it into the original state, but we are trying to improve the value of the habitat say by construction of water holes for animals. So, that more of the animal diversity is supported.

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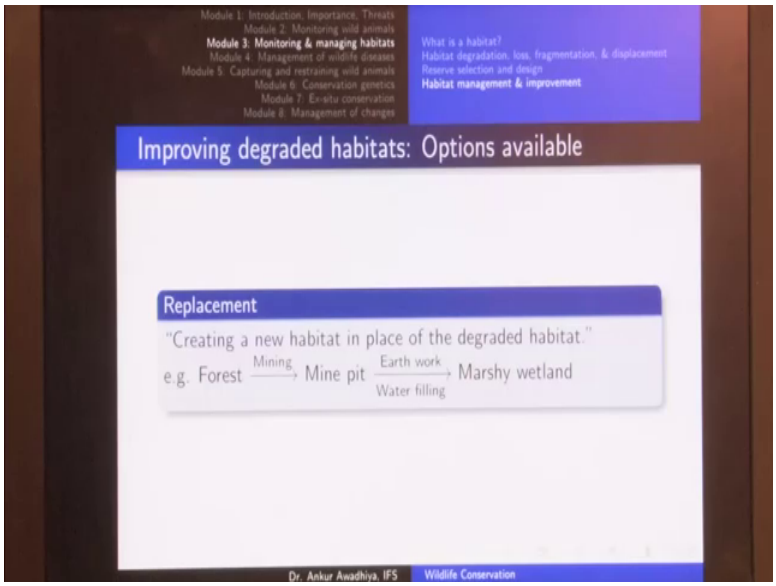


So, and the fifth option is the replacement. So, when we are not able to move a degraded habitat into its original state or even into some state that is in between. We try to replace that habitat which is the creation of a new habitat in case of a degraded habitat. So, for instance there was a forest and then there was mining permitted into that area. So, we have large sized mine pits now in the case of mine pits if you want to move it back into the forest you will have to fill up all of this these mine pits that would be extremely cost intensive.

So, other way is that you can do some amount of earths work and do some water filling. So, that all these pits are converted into a wetland. And then this wetland can then be used birds for instance.

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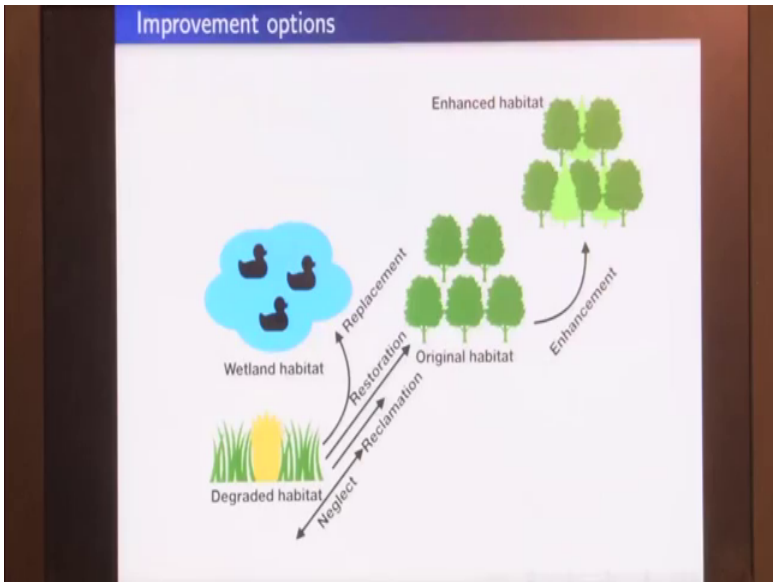


So, here are the improvement options. So, you have an original habitat that has become degraded. So, in this degraded state you have some grasses and you have some shrubs for instance. Now the first option is neglect. So, in the case of neglect you just leave it as such it might become even more degraded because you can have some more livestock coming into this area and making it even more degraded. Or then it can become slightly improved by itself. In the case of reclamation we would try to move this degraded habitat towards the original state though not completely.

So, if we have reached somewhere in between we would call it reclamation if we have reached to the extreme end. So, we have converted it in from a degraded habitat back to the original habitat we would call it a restoration. So, reclamation and restoration are nearly similar, but reclamation is not full restoration is complete restoration or else we could convert it through replacement into a wetland habitat.

So, essentially in place of forest now we have created a wetland which can be used by birds. Once we have reached the original habitat we could we could even go for an enhancement. So, in the case of enhancement we would plant certain other species of trees here and then this would lead to an enhanced habitat this would this would also involve creation of more ecotone in which we have a more structural diversity of trees.

So, in case of having this original habitat which had only one sort of habitat, now we could create a mixture of habitats. So, that would be called an enhanced habitat and this process would be called as enhancement.

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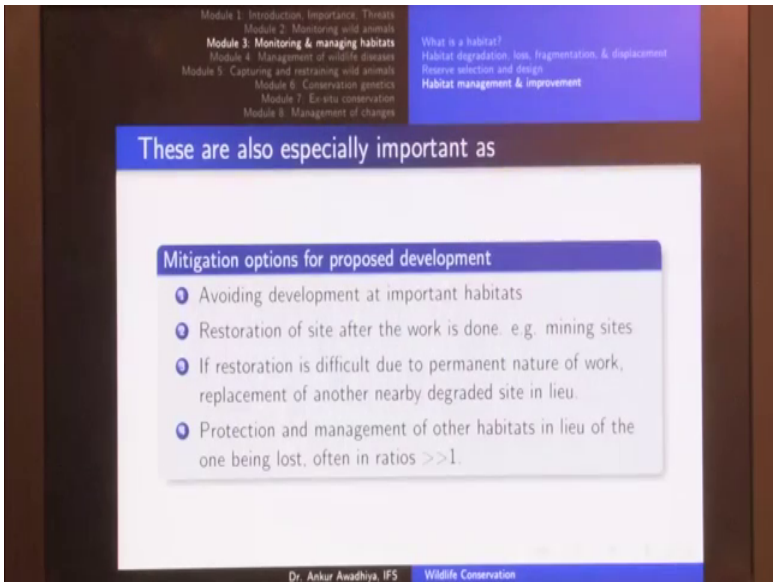


Now, all of these options are also important as mitigation options when we are doing any developmental activity. Now this developmental activity could be as a construction of a road or say construction of railway line construction of a dam and. So, on or construct or doing some mining work.

So, now, the mitigation options that are available to us for any developmental activity is one avoid development at important habitats and in this context the most important habitat we would consider to be the corridor areas.

So, essentially this corridor area is the most important habitat and we would avoid doing any sort of development in this area second. If rest if you cannot avoid it then at least restore that site after the work is done. So, if you have a mining site try to restore it back into its original habitat a now if the restoration is difficult due to the permanent nature of work at least try to replace it. So, replacement of another degraded area in lieu.

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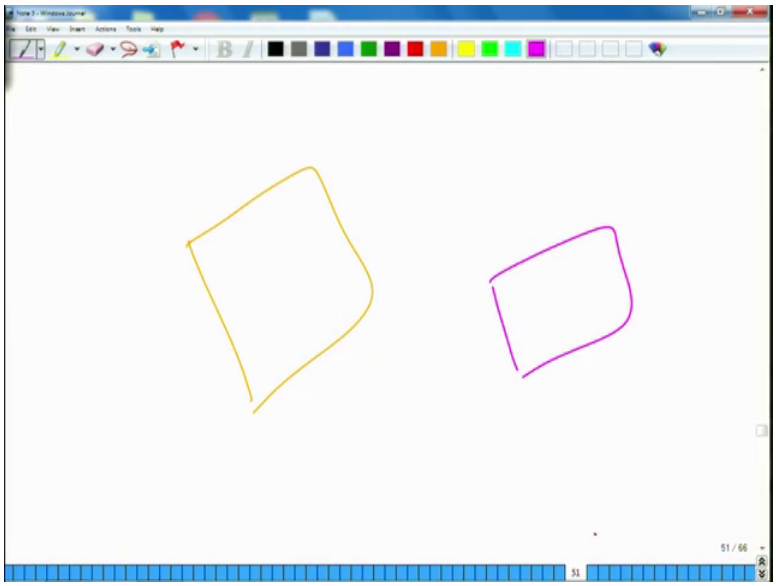

So, essentially what we are saying in this case is that even if this area became degraded you cannot completely restore it at least try to replace it or replace some other degraded area in lieu of it. And then the fourth option when nothing else is of label is protection and management of other habitats in lieu of the one being lost often in ratios much greater than one.

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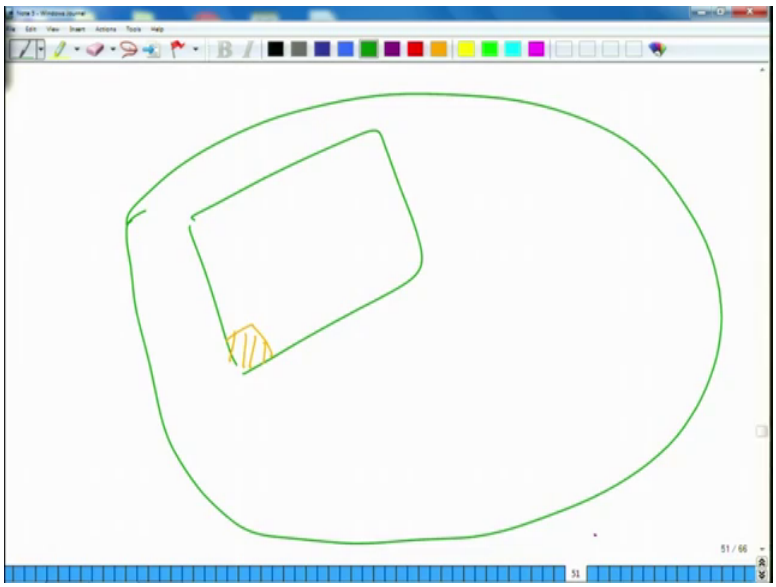

So, essentially what we are saying in this case is that there was a forest area and in this forest area we diverted some area into mining. And this mining was done in such a

manner that we can neither replace it nor we can restore it or not we can reclaim it. So, what we would do is that we would if we do not even have any other area in which we could do this replacement work we would say that in lieu of doing mining in this area you should provide funds that this much area of the forest can be protected. So, we are essentially bargaining with the developer.

So, that we can we can have protection and management of other habitats in lieu of the one being lost often in ratios of much greater than one.

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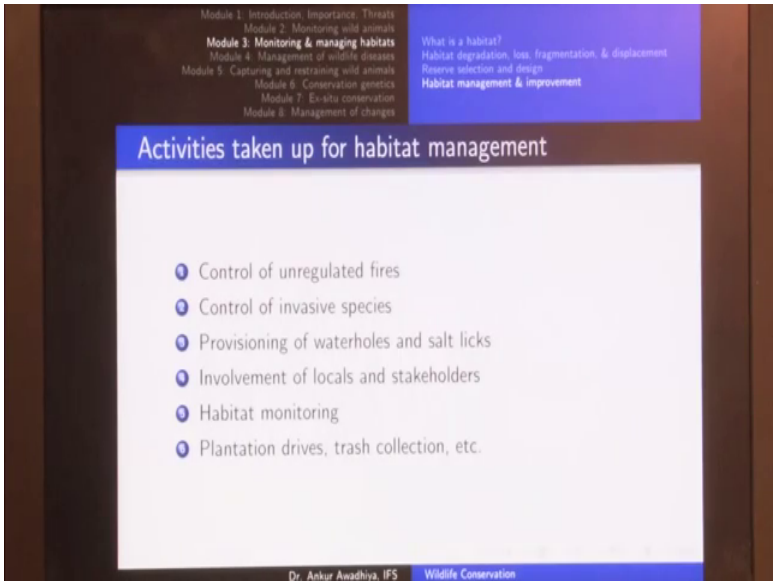


Now, activities that are taken up for habitat management in protected areas include control of unregulated fires.

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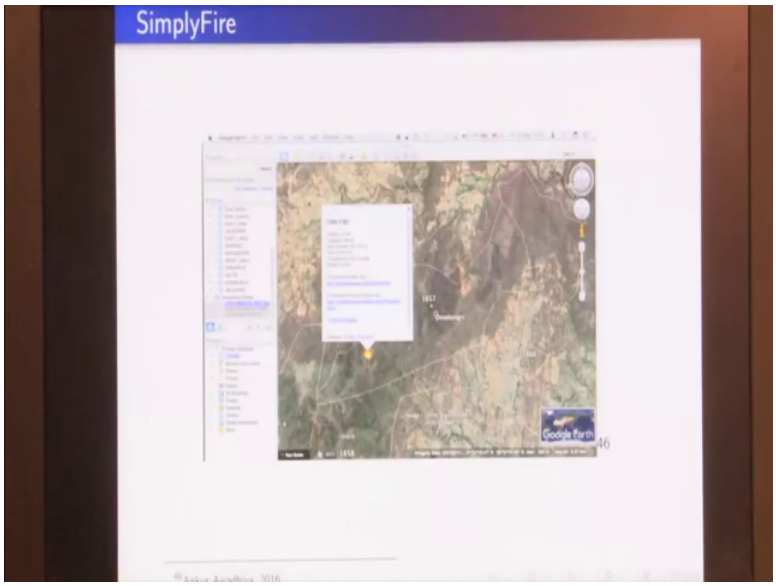


So, we use applications such as simplified. So, this application tells us using satellite data where we have the where we have the fire. And then if we have these compartments it would tell us where exactly do we have the fire and then when we know that we have this fire and we know it in a very short interval of time.

So, now our forest guards can go into these areas and extinguish this fire. So, it tries to reduce the impacts of the fire by extinguishing them.

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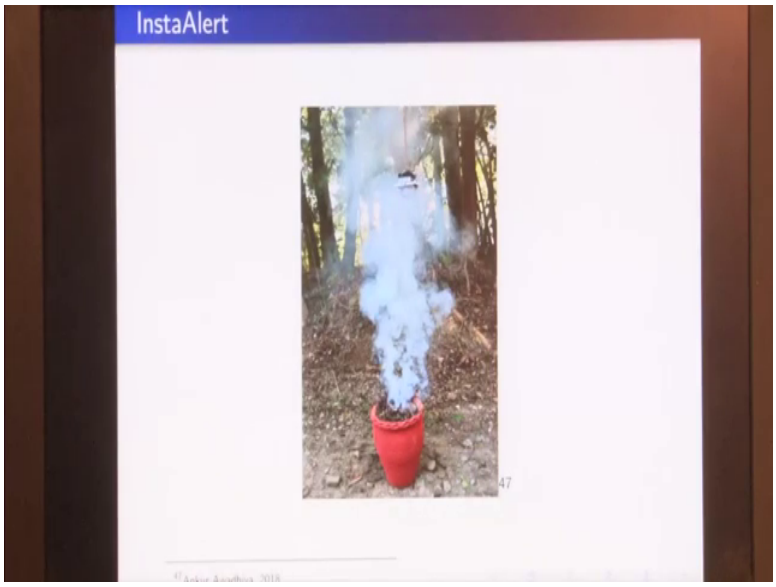

We also use instruments such as install out. So, in this case this instrument whenever it detects any smoke or any high temperature in an area it gives us a very quick warning that that there could be a fire in this area.

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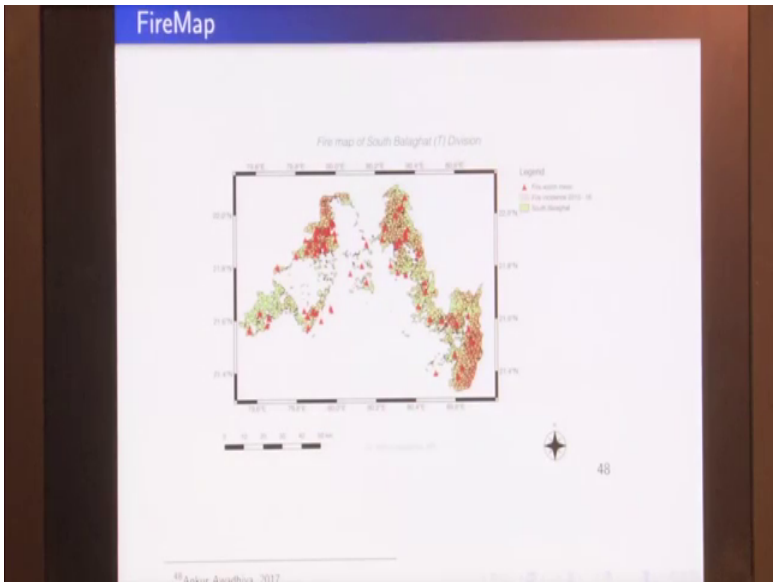


Then we also try to prioritize our resources by the construction of fire maps. So, this is a fire map of the South Balaghat Division in Madhya Pradesh.

So, in this case we mark out those areas that have that are regularly seeing fires. So, all these are darker colored regions are the ones that have seen more fires in the recent past as compared to these greener areas in which there were less incidences of the fire. And then these triangles represent the fire watch towers and then we can use this information to move our fire watch towers into areas where we need them in more priority.

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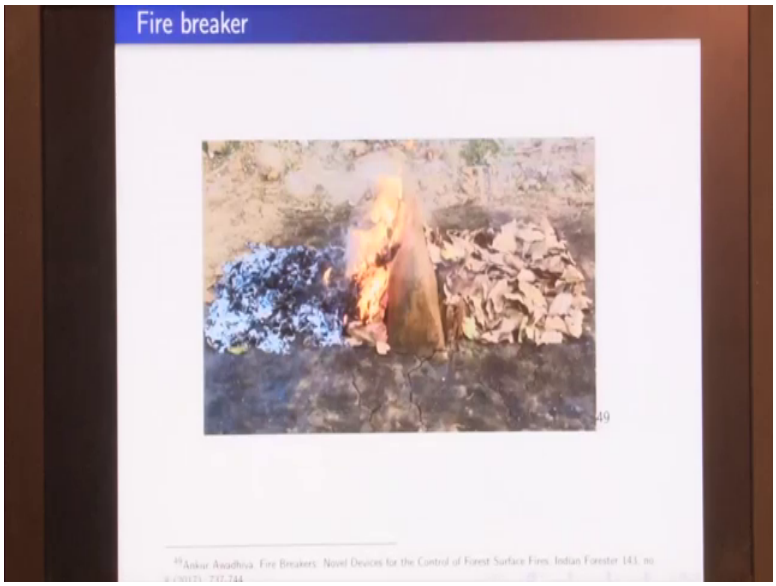


We also make use of constructions such as fire breakers. So, fire breakers are these pyramidal shaped structures. So, that if there is any fire that is moving from one side end of the forest then it encounters this fire breaker and then it is not able to spread to other areas. So, essentially this is an ephemeral structure it is made out of only out of mud. So, it does not have any great impacts on the any great negative impacts on the habitat, but at the same time it prevents the spread of fires in the forest.

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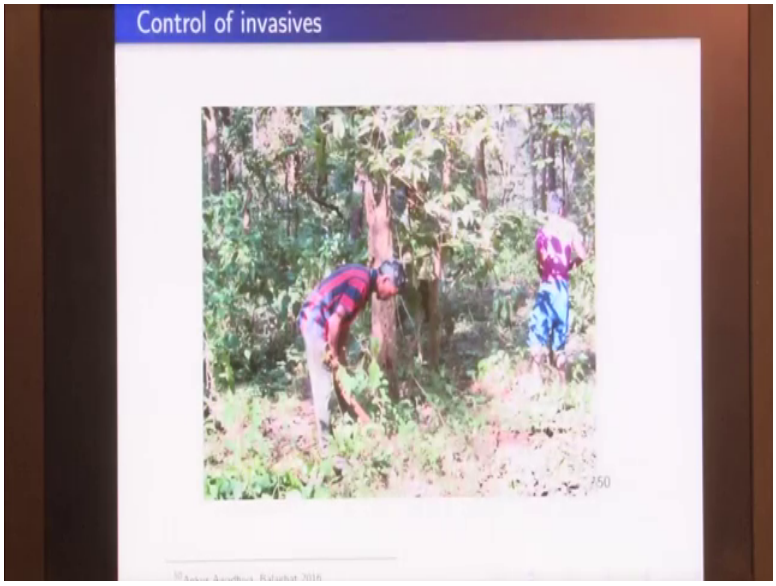

Other activities include control of invasive species which is mostly done manually. So, in this picture we can see that these villagers are being employed to remove these weeds from the forest areas. Weeds or the invasive species that are degrading our habitat can be manually uprooted. Other things are provisioning of water holes in salt licks.

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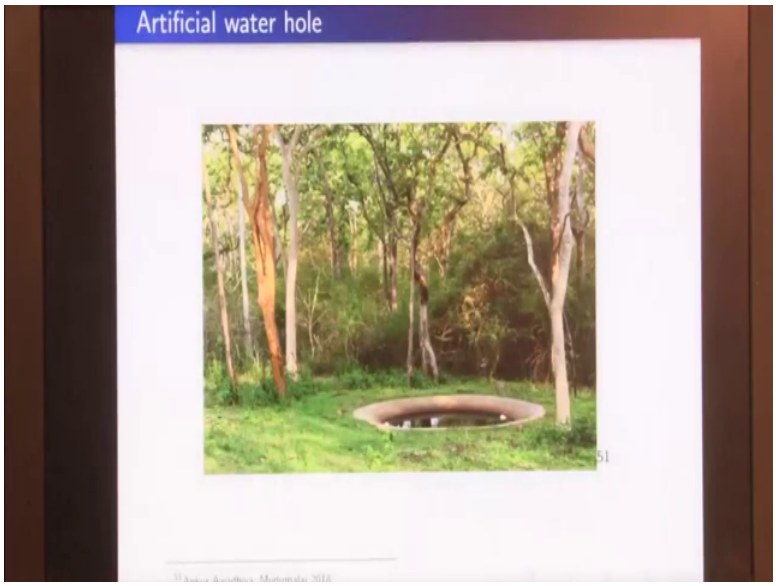


Now, water holes are provided in some in certain areas for the wildlife. If the amount of water that is available to them naturally is very less. So, in these situations we would create this concrete structure it is in the form of a trough and then we would employ vehicles that would bring water and fill these up at regular intervals.

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At the same time we can make use of salt licks. Now salt licks provide sodium chloride and also other micronutrients. So, these can be made available to animals especially in those areas where the micronutrients are not available in plenty. O-ther thing that we do for habitat management is the involvement of locals and stakeholders.

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And to gain their trust we also have a number of activities such as now this activity is showing us that we brought a doctor into the area and we had a free health checkup camp in that area.

So, essentially when we are benefitting the local villages then they become more tuned to our cause of habitat protection then we can also make use of their help when we have any activity such as forest fire or say invasion by invasive species. No doubt we always pay for those activities, but having these activities such as free health camps or say free teaching sessions also helps by creating a positive for these activities. Next is habitat monitoring.

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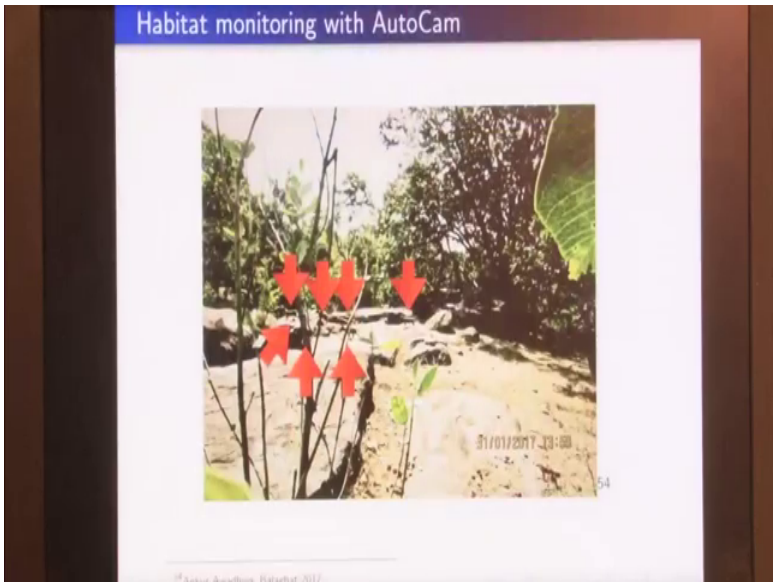


So, in the case of any habitat you need to have a continuous monitoring and these days we are also using devices such as auto camps.

So, this picture shows us an image in the forest area and all these little animals are wild dogs. So, in this case we can deploy these camera devices into the forest. And then they would record the activities of the animals and then we can have a very good monitoring regarding say the birth rate in that area or say the number of tuffs that are there in any cave and so, on. We also have plantation drives, trash collection drives and so, on.

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So, this is a plantation drive that is being carried out in a degraded area. So, as you can observe that in this area we hardly have any trees of label and so, these villagers are being used as laborers to plant trees into this area.

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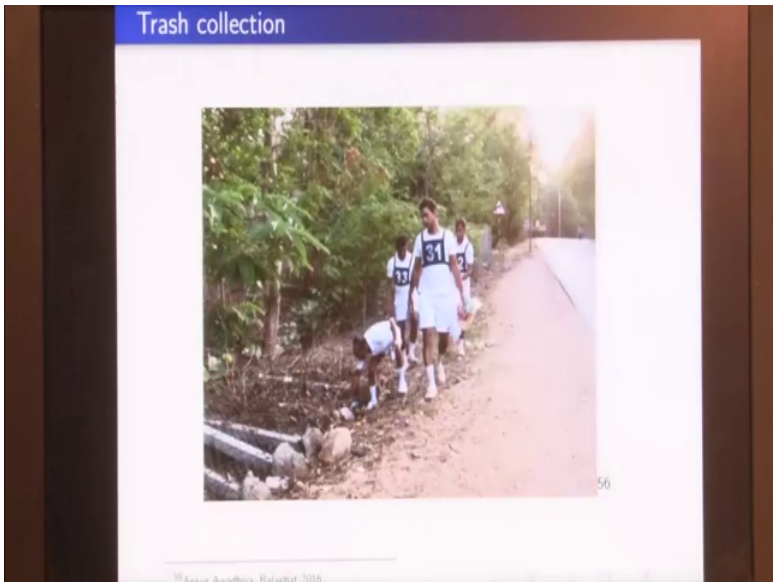


Also we have trash collection drives especially for the removal of plastics from forest areas. So, that there is a certain level of habitat improvement. So, in this lecture we looked at different tools and techniques of habitat management and improvement.

So, we began with Aldo Leopold's five classical tools of habitat management, we looked at positive and negative interactions that can happen when we are using any of these tools and also looked at modern technologies that we are using these days for the habitat management in our forest areas. So, that is all for today.

Thank you for your attention [FL].