



Modern Approaches in Context of Nature Conservation and That Can Be Used in Silvicultural Systems of Turkey

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Abstract:

Nature conservation should be made with nature objects. Increased population and irresponsible consumption caused the destruction of the forest and this situation has emerged new approaches about nature conservation which is the largest component of the nature in forest. Likewise, forest management with nature conservations has become more important in recent years and began to take place in silvicultural systems. Thus, appropriate management lost its classical meaning, reserving even leaving dead tree in natural forests has become an indispensable application. In context of functional planning which increasingly more important, expectations from forests are not only wood production but also ecosystem (habitat) specie and gene conservation in context of sustainability of biodiversity and this approach has become the basis in forest management. Applications which take place in world literature seem applicable in Turkey and some of them were implemented in Turkey. In this article, studies which are made in Turkey, in context of silvicultural systems within natural conservation are summarized and modern approaches were described innovations which can be displayed.

Key Terms: natural conservation, silvicultural systems, new challenges

Introduction:

Forest is a source that humans used throughout the history. Rapid population growth and industrialism damaged natural resources. Consequences of this damage affected humans and other living creatures, thus, our perspective of forests started to change as a result of it conservation and improvement of forest gain importance (Dirik 1997).

Forests are the most valuable asset of a country. Forest conservation changed throughout the years. Forest conservation used to be leaving forest to its natural state but now it means improving forest with planned silvicultural practices and continuity of ecosystem (Anonymous 2006). This can be achieved by not only protecting natural resources but also protecting diversity of species and conserving their economic, ecologic, ethic and aesthetic values. Main goal is the conservation of forest with its courses. It is the conservation of forest with its biologic diversity, abiotic natural resources, landscape tables (rarity, naturalness, etc.), and genetic richness of animal and plant populations, biotopes, safety of natural selection of animal and plant species (Colak 2001).

In order to create nature like forests silvicultural practices that suits present ecosystem on that area. Thus, these applications must prioritize conservation of ecosystem and natural structure. Goal is to protect habitats, animals and plants. Especially, in nature like forest management approach forest reserves that weren't opened for management are important. Also, sufficient number of old and dead trees should be left in the forest and this situation contributes to ecological continuity (Colak 2001).

Silviculture and nature conservation is in close relation. Supportive applications in silviculture are continuous yield, heterogenic growth conditions, layered stand structure, long regeneration period, and continuity in youth (establishment) reducing losses in genetic diversity, and conservation of differentiation in development ages (Colak 2001). Also, forests have climatic, recreational, hydrologic, nation defense, production, aesthetic and scientific functions (Eraslan 1992). Depending of these functions, the importance of nature conservation and conservative silvicultural practices are increased.

In this article, summary of history of nature conservation in silvicultural practices were

given and features of modern silvicultural practices were explained.

Nature conservation focused silvicultural systems to date in Turkey: Main focus of the nature conservation in Turkey is preservation and sustainability of continuity. However, nature like silviculture aims to protect genetic diversity and structure of the forest (Colak 2001). Damaging forests, grazing on natural regeneration areas, changes in the mix percent of mixed stands, and wrong seed material usage in afforestation applications reduced genetic diversity of Turkey (Yahyaoglu and Genc 1990). In the past, many species were destroyed and ecosystem was damaged with the name of clean management and, even the dead trees were cleared from the area. Benefits of these dead trees, especially, to bird species were ignored. Today, there are still some untouched forests in Turkey and ecosystem of those forests are self-sustained. In nature like silviculture habitat characteristics, ecological order and natural

development stages are taken into consideration. First step in multipurpose forestry is to reduce large area clear felling and choosing natural regeneration based applications instead of afforestation (Colak 2001).

Today, following systems are being used in Turkey; clearcut systems (the uniform clearcut system, the strip clearcut system), shelterwood systems (the uniform shelterwood system, the strip shelterwood system, the nurse-tree shelterwood system), coppice systems (the simple coppice system, the pollard system, the fodder leaf system), accessory systems (high forest with reserves system) and selection system (the single tree selection system) (Genc and Bayar 2013). The most used system in Turkey is shelterwood silviculture system which is controlled decrease of density and protection of youth from heat, drought, frost and harmful effects of understory (Genc 2013). This also protects macro and microorganisms from burning-drying effects of sun (Figure 1).



Figure 1. Shelterwood that protects youth from heat, drought and frost (URL 1)

In clearcut, age class or area clearcut systems aren't preferred. Because clearcut sites will be subjected to radiation 10 times more than dense stands (Colak 2001). Actually, main aim in uniform-zone clearcut system is to protect biological diversity and existing plant taxons and bring youth on all regeneration area. In Turkey shelterwood and clearcut systems are being applied with leaving single reserve tree

(Figure 2). Single trees are left uncut for reserves or under one hectare areas trees left uncut in patches for reserves. Main goal of leaving reserves is not to grow thick and high quality trees. Real reason is to protect habitat, diversity of gene and species and achieve aesthetics in application area for at least one rotation period (Genc 2013).



Figure 2. Reserves left from clearcut system (right, URL 2), group reserves (left, URL 3)

Reserves that left in regeneration area will help youth fighting heat, drought, frost and harmful understory effects. Expected benefit from these reserves is indirect. Reserves usually left in area for water source preservation and to support wild life. Stem diameter which is more than 12.5 cm is sufficient for reserves (Genc 2013). Selection system forests are the only management system that has youth in every period since it doesn't have a specific method and no regeneration period. Selection forests are ideal because of genetic benefits. At the same time coppice forests also contributes to conservation of genetic diversity (Colak 2001). Leaving single or path reserves is a way of preserving habitat, species and genes. However, high forest with reserves system is not a regenerative practice. It aims thick wood production, but they contribute to natural regeneration practices with sowing. Also youth

can help stand continuity in case of forest fires (Genc 2013). All of these mentioned silviculture systems are focused on conserving the nature directly and indirectly.

New silvicultural approaches that focus nature conservation: Some of the new silvicultural practices that focus nature conservation can be applied to Turkey's forests. In addition to the clearcut systems, patch clearcut system and retention system are emerged. Patch clearcut system is natural, artificial or natural+artificial regeneration system that is removal of an entire stand of trees less than one hectare in size from an area (Figure 3). Patch clearcut system can be preferred for areas that have high water production capacity and to reduce wind damage. It can be a good solution in prevention of erosion on sloppy terrain (Genc 2013).



Figure 3. Regeneration by patch clearcut system (URL 2)

In retention system; leave more than half the total area of the cut block within one tree height from the base of a tree or group of trees (Figure 4). Aim of this system is to preserve ecological order complex structures-diversity in

stand form and provide continuity. This system helps clearcutting areas to have at least 50 % covering by reserve trees or groups (Genc 2013).



Figure 4. Retention system (URL 2)

Retention system provides late successional structures to enrich diversity, enhance habitat connectivity over the landscape, and supply refuges for survival and dispersal of species after harvesting. Another system that articles mention is seed tree system (Figure 5). Grouped or uniform seed tree system is similar

to shelterwood system in Turkey. Most of the times application is completed with seed tree cut and removal cut. Difference between uniform shelterwood and seed tree system is that shelterwood system leaves 60-100 trees in the field while seed tree only leaves 15-25 trees (Genc 2013).



Figure 5. Area after seed tree system harvesting group (left) and uniform (right, URL 3).

Group shelterwood, irregular shelterwood and natural shelterwood systems are regeneration systems that can be used in Turkey. In group shelterwood system the regeneration period for the cutting unit is still concentrated at the beginning of the rotation over 20-30 years, creating an even-aged stand. This system is

used on wind damage protected areas with tap root trees species that are resistant to heat-drought, frost and understory effects (Genc 2013). Thus, stand is selectively thinned to help biological diversity and microorganism activities (Figure 6).

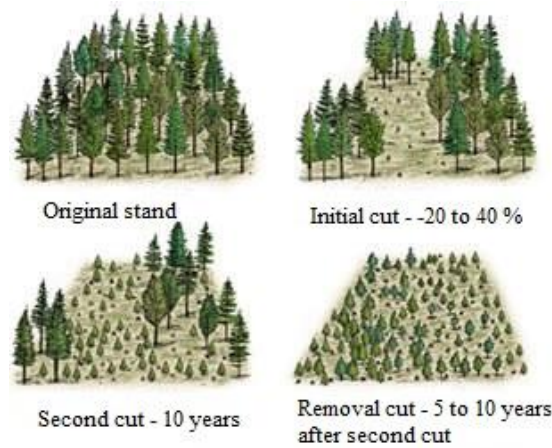


Figure 6. Group shelterwood system step by step (URL 2)

Irregular shelterwood system is based on structure of natural forests and forest tree species. It's a natural silviculture practice (Figure 7). There is no rotation period for stands. It can be applied to pure stands but usually used for mixed stands. Irregular

shelterwood system protects and maintains youth with old trees. It provides plants and animals a chance to create their habitats (Genc 2013). This system is focused on nature conservation.

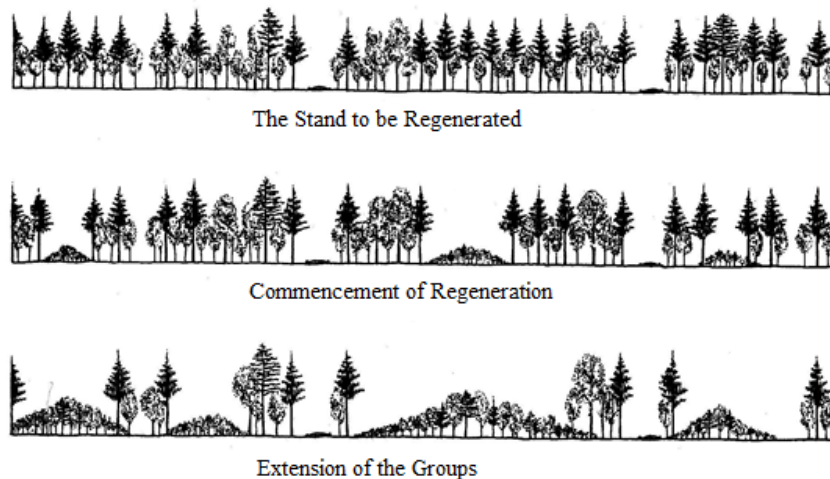


Figure 7. Irregular shelterwood system (Matthews 1997)

In natural shelterwood system, the regeneration is established naturally under the shelter of an overstorey and only application of it is removal cut (Figure 8). Second layer individuals are devoid of needed light to

develop so they may have shorter shoots compared to normal individuals. It is suggested that this system should be planned and applied with continuous forestry principles (Genc 2013).



Figure 8. Suitable stand for natural shelterwood system and its state after removal cut (URL 4)

Group selection system isn't being used in Turkey, yet. There are requirements for group selection system. These requirements are; flight capability of the seeds of the trees that forms the stand, heat, drought and frost resistance during youth and growing rate of youth to handle understory (Figure 9). Group

and strip shelterwood systems created to turn even aged stands to uneven aged stands. Small cutting selection and nature conservation focused silviculture systems which are gaining importance recently needs can be fulfilled with these systems (Genc 2013).



Figure 9. Group selection system (URL 5)

There are some other systems in Turkey. Group systems, coppice selection system, the coppice with standards system and two storied high forest systems are some of these systems. One of the group systems is ATA group system which is given age-height precedence for the minority. To date every silvicultural application on mix stands it was in favor of dominant species. This turned mix stands to pure stands and plant diversity under that stand changed accordingly to changed tree species. In nature conservation focused silviculture applications ecosystem diversity, gene diversity, biological diversity and wild life are important. In this regard, ATA group system which is given age-height precedence is one of the nature conservation focused silviculture applications.

Discussion and Conclusion:

Incorrect silvicultural applications reduced biological and genetic diversity of forests in Turkey. Turning coppice forests into plantations, afforestation applications with fast growing species, foreign species and using non-native species in afforestation of degraded areas caused native species to go away from their habitat and destroyed local species and ecotypes. As well as usage of seed and seedling material obtained from foreign origins negatively affected the genetic structure (Dirik 1997). In afforestation and regeneration applications ecologic structure should be persevered, natural gene sources should be used and mono culture must be avoided (Alptekin 1996). In order to protect and conserve our gene sources in-situ and ex-situ

protection measures should be taken (Yahyaoglu and Genc 1990; Alptekin 1996; Dirik 1997).

Silviculture includes both nature and gene conservation. Nature focused silvicultural applications must consider gene conservation too (Colak 2001). In nature focused silvicultural applications environmental factors and forest structure must be analyzed well and illegal utilization and grazing must be prevented. Continuity of the forest texture and stand resistance to abiotic harm should be increased. Rare and endangered species must be protected regardless of the silvicultural application. Silvicultural applications should be considered different stand structures and sites (Anonymous 2006). These applications should prefer natural regeneration and should avoid open field clear felling since these fields are important for conserving gene sources (Alptekin 1996). There should be no interference in the zone between the top of the forest line and 50-80 (100) m below of the top. During cutting and skidding environmental damage to trees and to soil should be minimized (Anonymous, 2006). In order to increase the natural richness and diversity open spaces in forests should be left as they are. At least 2-3 dead trees per hectare should be left in the forest. New forests that will be created should have small area, different aged trees and mosaic structure. Forest density should be adjusted and flower rich wild flora should be supported. Root of the fallen or felled trees should be left in the area. In natural stands dead trees from southern aspect should be preferred. As a rule, broadleaved forests 7-10, mixed forests 4-6 and coniferous forests should be left 1-3 dead trees per hectare. Dead trees that will be selected to be left behind in the forest should be selected from inner parts and far from road. Trees that host birds, insects, fungi and other organisms shouldn't be cut. The more diverse tree species in a stand, the richer animal diversity would be in that stand (Colak 2001).

Some of the new nature preservation focused silvicultural approaches that can be found in international articles can be applied to our forests. Patch clear cut system, the retention

system, seed tree system, group shelterwood system and ATA group system which are developed for Turkey are some of these new approaches.

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