MORTICULTURE

Towards a new paradigm for conserving biodiversity

The international community considered measures to reduce the rate of biodiversity loss at national and global levels as a high priority. Different measures have been proposed to this end, including the creation of plantation species mosaics, embedding monocultures in a matrix of intact or restored vegetation, using indigenous species rather than exotic species, or preserving micro-habitats such as dead wood that are known to be particularly species-rich.

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IT was not a poet but an American scientist, Mark Harmon, who nicknamed his field of study "morticulture", to suggest the importance of managing the dead trees in the forest to maintain biodiversity. Deadwood plays a vital role for the functioning of forest ecosystems. Deadwood is an indicator that captures many elements of naturalness and is becoming a general reference for natural forests. Deadwood has become an important indicator to determine 'hemeroby' (the degree of naturalness) of forest ecosystems. It can be found as standing and downed dead trees. Standing deadwood is termed as snag and lying, as log.

"Some people think dead and dying trees look nasty or they are afraid they will fall on their house so they take down the whole tree," says Kathy McNeil, a naturalist at Huntley Meadows Park in Alexandria, Virginia. "But snags are rich in fungal life and beetle larvae channels." Both snag and log have significant impact on several ecosystem processes, including habitat for small animals, seedbeds for plant establishment, and storage of carbon. Approximately a fifth of the plants and animals found in the forest, that is to say over 6000 species, are dependant on deadwood as a place to live and as a source of food (Xylobionts). They provide nesting, roosting, feeding, loafing, and storage sites for birds, small mammals, reptiles, and amphibians. Deadwood reduces soil erosion and affects soil development, stores nutrients and water, and is a major habitat for decomposers and heterotrophic organisms.

Different sizes of snags encompass the needs of a broad suite of different bird species: small tree (e.g., chickadees, downy woodpecker, asian hairy bluebirds etc.), medium tree (e.g., eurasian kestrel, magpie robin, hairy woodpecker, red-breasted nuthatch), and large tree (e.g., different types of woodpecker and owl). Generally small standing deadwood is considered to be of some value for foraging birds and small cavity nesters.

Several species of birds, including woodpeckers act as primary cavity excavators, meaning that they excavate holes, or cavities, in snags both when looking for food and to build homes. Without snags, these birds could not live in forests. Some birds as well as most cavity dependent mammals are secondary cavity users, meaning that they depend on primary excavators and/ or natural decay of trees to form cavities that they can use for nesting. Cavity-dependent bird species comprise 20-40% of the birds in a given forest anywhere of the world. Snags serve as important habitats for the insectivorous birds.

There is strong relationship between forest-floor vertebrate occurrence and deadwood volume. Certainly salamanders, small mammals, and ruffed grouse use deadwood in the forest. There are many other living creatures that benefit from snags for a variety of reasons. Raptors use snags as perches, bats often roost under bark flakes, and small mammals may use excavated cavities for feeding, foraging, and protection from thermal drought. Snags also provide some cover and, thus protection, from predators for small mammals. The availability of standing deadwood influences the population size of cavity breeding animals. Small mammals depend on log for feeding and foraging sites as well as for protection from predators. Amphibians such as toads and frogs rely on logs to protect them from thermal drought (i.e. drying out of their skin), predators, and to provide them foraging sites. Moreover, these species depend on logs in streams and lakes for breeding and feeding habitats as well.

Deadwood not only provides critical habitat for animal species, but it also is a preferred growing medium for various species of bryophytes, lichens, and fungi. Fungi and bryophytes have their highest diversity on logs. Natural dynamics of logs is very much essential for the abundance of fungi. Mushroom has the highest diversity on logs of intermediate decay phase. Different edible ferns like both intermediate and late decay stages. Rotting wood on the forest floor can also provide good seedbeds. Logs supply moisture and nutrients, which encourages good seedling growth, which, in turn, promotes the natural succession of these species in the forest. Without this deadwood many animal species will be without homes and/ or sources of food, which could eventually result in these species becoming locally extinct.

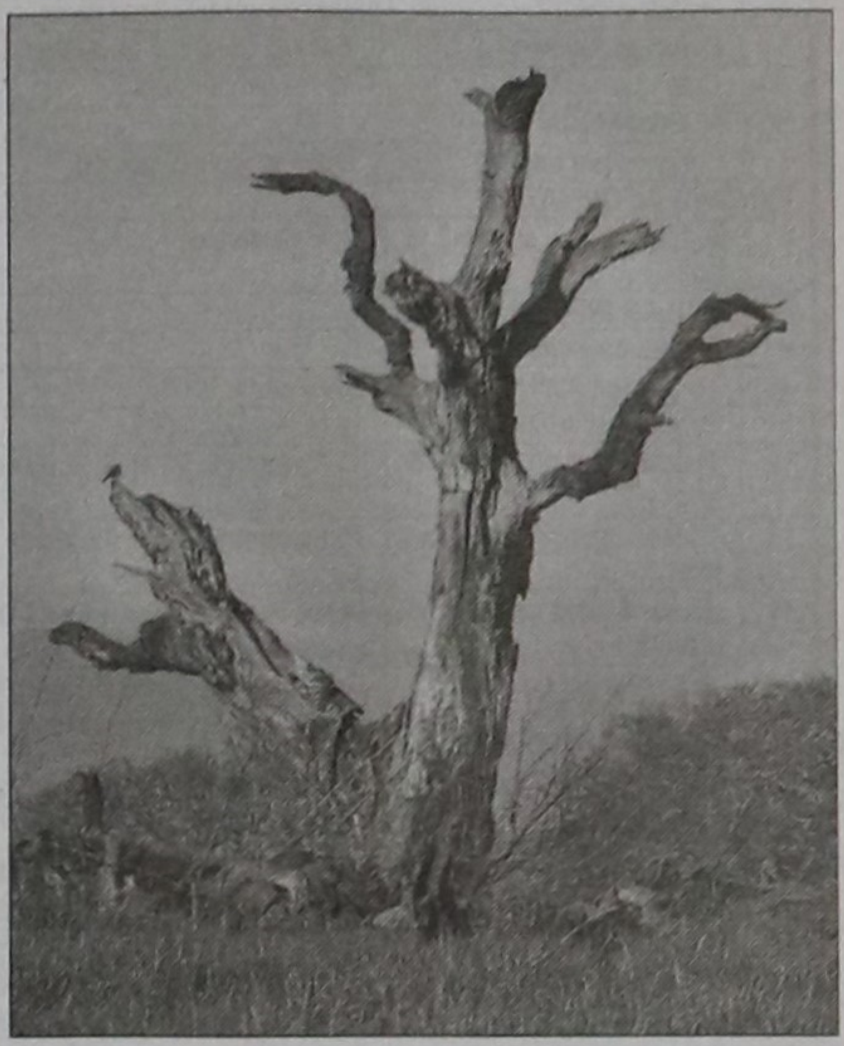
Forest management has come a long way in terms of its treatment of deadwood. There is recognition that the removal of all deadwoods following harvesting can be extremely harmful to the forest ecosystem. The increased awareness of the importance of deadwood as critical habitat coupled with the ever increasing importance put on mimicking natural disturbance patterns in forest management across the world have resulted in an augmented desire to manage deadwood in reserve forests.

From a wildlife habitat point of view, it has commonly been assumed that some deadwood is better than none and that more is better than some. The size of a snag is of utmost importance, as larger animals are not able to utilize snags that are too small in diameter and/or height. Attempts should be made to maintain larger dead trees when harvesting. Snags will be utilized by certain species whether or not they occur as single stems or clumps of snags over the landscape. Single stems may help ease competition between species because they provide a wider range of potential habitat. However, clumps of snags scattered throughout the harvested landscape can be quite beneficial for snag users as well. Clumps of snags can help make foraging more efficient and can provide protection from predators for animals roaming on the ground.

Small mammals, as well as fungus, bryophytes, mosses, and lichens, all benefit from a variety of sizes of downed woody debris. From a management point of view, this means leaving branches and twigs, as well as some larger pieces of wood (i.e. small stems or bits of stems that are damaged). The importance of both fine and coarse woody debris should not be overlooked and efforts should be made to leave quantities of both on site after harvesting. Perhaps, more amenable to both tree species and wildlife is to spread logs evenly in lines (if exposed mineral soil is necessary for seedlings) in between planting rows over the entire landscape. This has the added benefit of providing a continuous travel route for wildlife using logs as Subnivean habitat and/or as protection corridors from predators. It is obvious to keep the right balance of snags and logs to conserve the forest biodiversity.

The presence of deadwood in the forests of Bangladesh is a very rare case. Due to the scarcity of fuelwood, local people cut trees immediately after their death. The writer found only 11 snags in the core area of Madhupur National Park, which was very poor a number compared to the dead wood level of natural tropical forests in India. Actually, there is no reference level of deadwood for sub-continental tropical forests. The amount of dead wood in natural forests can be very extensive: up to 30% of dead stems, 25% of aboveground biomass or about 40% of the volume of living trees in European temperate forests. The amount of dead timber retained within managed forests is open to debate and management decisions will require detailed knowledge of local conditions. A general rule will probably be the more the better, although the quantity will be a trade off against the value of timber and the practical inconvenience of large amounts of deadwood in production forests.

For the forests of Bangladesh 5% of total volume of wood could be suggested as a reasonable amount, divided between snags and logs .Lacking of deadwood is one of the major causes of the disappearing, or red-listing of most of the birds, mammals, reptiles, and amphibians in our forests. The white-backed woodpecker is one of several specialised forest species whose population has declined. It is considered as an indicator, or umbrella, or keystone species in different parts of the World. Considering its indicator value, its specialised habitat requirements and its potential as a communication tool, using the white-backed woodpecker as an umbrella species provides a coarse filter for the conservation of several other animal species of the deciduous forests.



As a keystone species, it substantially alters the physical structure of the environment, influencing both available habitat for other species and various ecosystem processes. The effects of its conservation for many other species and various ecological processes are both wide and unique. For conserving woodpeckers it is obvious to conserve the deadwood in the protected areas of our country. Deadwood is increasingly being accepted as a key indicator of naturalness in forest ecosystems all over the world.

An integrated strategy may be adopted to conserve the deadwood in the protected areas, which should include: a) quantifying the extent of the challenge, b) identifying and protecting key sites, c) providing effective guidance within protected areas, d) legislative needs , e) educating users, f) enforcing controls, g) using surrogates, h) public awareness, i) developing guidelines for deadwood monitoring and management including minimum thresholds for deadwood as an indicator for biodiversity and naturalness, j) using active restoration measures, k) including deadwood in national biodiversity strategies and national forest programme, l) stopping removal of old trees and deadwood from the protected areas, and m) supporting and collaborating on key research projects aimed at quantifying the biodiversity values of deadwood.

At the World Summit on Sustainable Development held in Johannesburg in 2002, the international community committed itself to protect and restore the integrity of our planet's ecological systems. Reaffirming the goals and objectives already laid down in the Rio Declaration on Environment and Development and the Agenda 21, including the Convention on Biological Diversity, the community considered measures to reduce the rate of biodiversity loss at national and global levels as a high priority. Different measures have been proposed to this end, including the creation of plantation species mosaics, embedding monocultures in a matrix of intact or restored vegetation, using indigenous species rather than exotic species, or preserving micro-habitats such as dead wood that are known to be particularly species-rich. Now it is the time to update the policy in favour of deadwood to meet the obligations under the Convention on Biological Diversity.

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Waste reduction: A Japanese experience

Today, Nagoya citizens are required to sort their garbage into 16 categories for municipal garbage collection. Nagoya now has the lowest per capita waste generation, highest per capita recycling and the lowest per capita waste is going to landfill than other big cities in Japan

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NAGOYA the city of Toyota, with a population of approximately 2.2 million generated 1.251 kg/person/day of waste (40% organic waste) in 1998, exceeding the average in Japan (1.1 kg). At that time, the entire city generated 1.02 million tonnes of waste, of which 0.28 million tonnes were land filled. It may be mentioned that most of the waste is incinerated in Japan.

The city of Nagoya has very limited space suitable for waste landfill, so for years it used a landfill site in Tajimi city, in the neighbouring prefecture (state). Since the city's amount of waste had increased drastically, (by approx. 60 percent between 1980 and 1998), the Tajimi landfill site was expected to last only two more years. Meanwhile, the city of Nagoya had started 20 years ago to study the Fujimae tidal flat as its next landfill site candidate. But eventually due to strong public demands to conserve the Fujimae tidal flat, local mayor decided to cancel the plan in January 1999.

Abandonment of landfill site project made a realization to the city government as well as to the people that, if they do not reduce their emission they will lose their precious tideland. This sense of understanding helped the city government to take more substantive future action plan. Well, some might say that a crisis always helps to initiate dramatic action. The following month, the city declared a "Emergency Announcement for Waste Reduction" targeting 20% (200,000 tons) reduction of waste by the end of 20th century(in two years).

The waste volume in the year 1998 was 1,000,000 tons. Nagoya city achieved its goal of reducing generated waste by 200,000 tonnes in two years. The city's next goal is to reduce generated waste further from 2000 levels by approximately another 20 percent by the year 2010, to a total 0.62 million tonnes(0.750 kg/person/day). The city also aims to drastically cut the amount of waste sent to the landfill, with the ultimate future goal of zero waste sent to landfill.

The approach what adopted after emergency announcement is just "waste from household" and asked citizen's "to cooperate". The key initiatives that have been taken are, promotion of locally based resource collection activities, expansion of collection areas for used bottles and cans, introduction of designated plastic containers and packaging, abolishing the public dust bins in public spaces, increased subsidies for the voluntary collection of recyclables by citizens. They started collection of newly designated recyclables such as paper and plastic containers and packaging and PET bottle at waste collection stations.

Before inducting those activities the city government launched the awareness programme to disseminate newly adopted strategies to the people. Circulated the information and illustrated brochure in five languages to the citizens in advance, organized about 2,300 explanatory meetings in the local community(more than 210,000 people participated, representing 24% of households in Nagoya. To sensitize the community publicised the programme by TV, radio and newspapers.

Today, Nagoya citizens are required to sort their garbage into 16 categories for municipal garbage collection. Nagoya now has the lowest per capita waste generation, highest per capita recycling and the lowest per capita waste is going to landfill than other big cities in Japan. They remain committed and are keen to do more. New targets have been proposed to reduce waste to around 620,000 tons by 2010, which would put them back at 1976 levels. What is more they want to reduce the amount sent to landfill to as near to zero as possible. Nagoya city has shown how the effort to tackle local environmental issues can lead to the regeneration of a whole community.

In order to conserve the Fujimae tidal flat, the city government and citizens started close collaboration. These efforts have also created a wonderful byproduct: new dialogue and deeper bonds in the local community.

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A tribute to the father of Green Revolution

S K BHADRA

NORMAN Ernest Borlaug, the father of Green Revolution and a humanitarian scientist for the hungry people is no longer with us. At the age of ninety five he passed away on the 12th September last at his own residence in Dallas. His indefatigable and integrated research developed a new agricultural system that met up the food demand of the increased population and saved many people from hunger. For his outstanding contribution in the development of new high yielding wheat varieties and supporting agricultural management system he was honoured in 1970 with Nobel Peace Prize. He turned the then existing conventional agriculture into a mechanized modern system with the use of high yielding crop varieties and high inputs i.e. fertilizers, irrigation, fungicides, pesticides etc. This change was termed as Green Revolution by William Gaud, the Director of USAID and Dr Borlaug was regarded as the father of this Green Revolution.

As the beneficiary of Green Revolution let us pay tribute to this great scientist who throughout his life felt for the poor hungry people and devoted his life for research towards increased food production.

He was born on 25th March 1914 in a farm house near Cresco of Iowa state in USA. He completed his secondary and higher secondary education there and took admission in the University of Minnesota for undergraduate study. He completed his honors courses there in 1937 and jointed the Forestry Service for a very short period and came back again to the same University for MS and Ph.D study. He completed MS with credit in 1939 and then completed Ph.D research in 1942 in the field of Genetical Plant Pathology. From 1942 to 1944 he served the famous Du Pont de Nemours Foundation as Microbiologist and developed a wide knowledge in fungicides and insecticides. Here he could realize the importance of improving crop management system.

From the time of Second World War food shortage was becoming a burning question in many countries. High rate of population growth, occurrence of plant diseases in epidemic form, reduced crop production were some of the reasons of this trend. At that time Dr Borlaug started his research for developing a new agricultural system that could help the world to be free from food shortage.

At that time Mexican Government sought help from Rockefeller Foundation for planning and execution of higher crop production programme particularly for boosting the production of wheat. With the collaboration of Rockefeller Foundation Mexican Government started "Wheat Research and Production Cooperative" programme and Dr Borlaug was made the head of genetical and pathological research of this programme. Taking this charge he realized that isolated research would bring no benefit. One must take an integrated agricultural research programme that should take into consideration the different aspects of agricultural research such as genetics, breeding, pathology, entomology, agronomy, soil science, physiology and crop management. Thus he initiated a long tern coordinated research programme involving young scientists of different branches with the objective of development of high yielding disease and pest resistant crop varieties and their adaptation to high agricultural technology based environment.

Within a very short time his indefatigable research and leadership brought a successful achievement. He conducted hybridization experiments among the different varieties of wheat collected from various areas of the world. From a cross involving dwarf Norin - 10 variety collected from Japan he developed a semi-dwarf high yielding wheat variety that gave 2-3 fold yield than the existing ones under high irrigation and fertilized condition.

Borlaug distributed the seeds of this high yielding disease resistant wheat variety among the farmers of Mexico and developed a new agronomic condition with irrigation and chemical fertilizers. Following that wheat production in Mexico increased and it became self-sufficient in wheat production and soon became a wheat exporting country.

Borlaug for the first time proved that integrated research in agriculture could help increase the food grain production of a country several folds. Apart from his scientific devotion he was very kind to poor hungry people. He believed in the concept that food is the primary need of human being and it is every body's right to get sufficient food. Just after his success in Mexico he paid his attention to the food problem of third world countries. He became busy in spreading his experimental results and revolutionary agricultural concept in such countries.

In the beginning of 1960 when India was facing food problem, on Dr. M. Swaminathan's advice Indian government invited Dr. Borlaug. During his visit Dr. Borlaug gave some seeds of his semi-dwarf wheat variety and recommended to grow it under improved management system. He also suggested to improve the agricultural infrastructure of the country. Following Borlaug's suggestions Indian agriculture improved and within 1974 India became self sufficient in food grain production and soon after became an exporting country. Borlaug's collaboration with Pakistan helped to increase her wheat production 2-3 times and in this way many countries took part in Green Revolution.

Rockefeller Foundation realized the significance of Borlaug's research and in 1959 Borlaug's working institute turned into an international institute, which in 1963 became International Maize and Wheat Improvement Centre (CIMMYT). Realizing the success of Dr. Borlaug and his team Rockefeller Foundation in collaboration with Philippines Government built up another international institute (IRRI)= International Rice Research Institute) for improvement of another important food crop, rice. Dr. Borlaug helped in outlining the different improvement programmes of this research institute. Following the similar procedure a high yielding dwarf rice variety, IR 8 was developed from a cross between Indonesian, Dee-geo-woo-gen and Chinese, Peta varieties. This newly developed variety out-yielded the traditional varieties by 2-3 folds under high irrigation and fertilizer condition. This rice variety was introduced to different countries including Bangladesh and rice production in these countries increased 2-3 folds on an average.

Green Revolution saved millions of hungry people worldwide providing food grains. It was estimated that Borlaug's discoveries saved over 245 million lives worldwide. In addition to the Nobel Peace Prize, he was honoured with President Medal of Freedom and Congressional Gold Medal. Until his death he was associated with agricultural research particularly with extensive experimentation with triticale, a man-made species of grain derived from a cross between wheat and rye that shows promise of being superior to either wheat or rye in production and quality.

Dr Borlaug received extensive recognition from universities and organisations in six countries: Canada, India, Mexico, Norway, Pakistan, the United States. In 1968 he received an especially satisfying tribute when the people of Ciudad Obregon, Sonora of Mexico, where he did some of his first experiments, named a street in his honour. Remembering his contribution to Indian agriculture the Indian government honored Dr Borlaug with Padma Bhusan.

However, critics put some questions in front of him particularly those related to the erosion of biodiversity, bad effects of chemical fertilizers and insecticides. But Borlaug said at that time there was no other alternative to save millions of hungry people from shortage of food grain. He shattered Malthusian theory that relates to imbalance between population growth and food production. He of course always gave importance to population control plans.

Bangladesh is an agricultural country. Dr Borlaug's contribution to our agricultural development not too meagre.

We are also the beneficiary of Green Revolution. Today we are using high yielding wheat and rice varieties. Our cereal grain production now is 2-3 times higher than that of 1971. So let us also pay tribute to this great humanitarian agricultural scientist.

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