

A Personal Review of the Provision and Management of Deadwood



Tom McLellan

A Personal Review of the Provision of Deadwood

Introduction

I am not entirely sure how my interest in deadwood has developed. Possibly as a result of my 30 years as a forester in Argyll, where there remain areas of near pristine Atlantic Oak Woodland that have ancient trees (some possibly even remnants of the “Wildwood”), with associated deadwood and very rare lichens and bryophytes. Trips to the semi-natural forests of Estonia and Russia helped to cement this interest and without doubt the opportunity to visit the ancient Bristlecone pine forest in the White Mountains of California was one of the highlights of my forestry career and a must for anyone interested in ancient trees and the science of dendrochronology (more later).

I suppose the other reason may be that I am now entering the “twilight years” of my forestry career. Whatever, I am developing into somewhat of a fan for promoting deadwood within modern Scottish forestry.

What follows is primarily a pictorial review of the provision of deadwood that I have made within forests that I have managed over the last five years or so. I have interpreted the views expressed within the UK Forestry Standard, the UK Woodland Assurance Standard (UKWAS 2) and not least the UPM sponsored Aberdeen University publication, “The Role of Deadwood Within the Managed Forest”, which as one colleague commented is; ***“Quite simply the most practical guidance offered on the subject to date”***.

I start by showing some examples of natural deadwood within the forests that I manage and then move onto the creation of deadwood, majoring on the provision of standing deadwood which I feel is of particular importance, as generally there is adequate creation of lying deadwood as a result of windthrow and from harvesting operations.

Finally I take time to show some examples of deadwood from the semi-natural forests of Russia and the managed forests of the Catskill and Adirondack Mountains of New York State, to a photographic montage of the Bristlecone Pines, California – the oldest natural deadwood in the world.

Natural Deadwood Within Some of Scotland's Forests & Woodlands



Deadwood is found naturally within forests, both standing and fallen.



The Deadwood from some tree species last for a long number of years, such as this windblown tree.



Equally this Sitka spruce looks as if it will develop into the ultimate standing deadwood tree in Argyll. This tree has been grown from one of the original Sitka spruce seeds brought back by David Douglas from Canada, having been planted on Argyll Estates in 1888.

The Beech tree below is one of the first to be planted in Argyll, probably in the 1600's when this was a popular tree for planting in the area.



This tree is now beginning to show senescence and the development of associated fungi.





A natural Oak or Beech stem adjacent to a water course and showing the typical profusion of fungi, lichen and bryophyte that one can find on such standing deadwood within the high humidity, temperate forests and woodlands of west Scotland



Of equal importance are upturned root plates which also provide another dimension for the development of habitat diversity.



Standing or fallen, deadwood provides significant habitat diversity within the forests and woodlands of west Scotland.





Fungi on fallen Sycamore branch



Creating Deadwood

The creation of deadwood as part of the forest cycle is something that is new for forest owners and practicing foresters in Scotland, and as such views on the merits or otherwise of doing so are varied.

Concerns are raised about :-

- Untidiness
- Adverse visual impact
- Pests & diseases
- Problems with future restocking work
- Safety

The merits or otherwise of creating standing and fallen deadwood, are to some extent down to the individual forest owners and foresters and are fully addressed within the Aberdeen University paper Role of Deadwood Within the Managed Forest and within UKWAS 2. I therefore do not intend to debate them here.

What I would like to show pictorially are some of the ways of creating deadwood that might be considered by those owners and foresters who have an empathy with at least making some attempt in this direction.

The UK Woodland Assurance Standard was the first publication that set out a requirement for the creation of deadwood at 3 stems per hectare created during harvesting, as can be seen in the photograph below:



Under the Second Edition of the UK Woodland Assurance Standard (UKWAS 2), Section 6.2.2, there is a requirement that management practices should be contributing to the accumulation of standing and fallen deadwood, in equal proportions, to a minimum of 20m³ / Ha or 5% - 10% of the average stand volume across the whole woodland area.

In areas of high ecological value such as adjacent to ancient semi-natural woodland, next to natural reserves, long-term retentions, riparian zones etc., greater average volumes would generally be required.

In order to provide deadwood habitat throughout the woodland, in most hectares there should be a few dead standing and fallen stems contributing to the overall deadwood provision.

The following photographs give an impression of how this might be interpreted, but in reality the provision of deadwood should be considered in terms of landscape or forest scale and not necessarily coup by coup.



The first photograph above shows a simplistic approach to the requirements for deadwood provision under UKWAS 2 – leave all natural deadwood standing, which was achieved due to the particular condition of the growth of the stand at time of clear fell, that is until the owner complained at what he perceived was excessive deadwood provision both in terms of look and potential loss of biomass. The forester reverted to what was akin to the provision made under UKWAS 1 as shown in the second photograph. .

The other striking aspect of this deadwood provision is the small uniform diameter which will provide only a short “life” as deadwood and is the result of the age, silviculture and timing of felling of this stand.

Other Options

The photographs below show options for the creation of a diverse deadwood resource within productive forests



These photographs show a planned creation of standing deadwood on a 4 hectare clear felled site.

This was a 45 year old mixed conifer stand, which in parts had been thinned and other parts had significant windthrow.

Sample marking was carried out of stems from which standing deadwood was to be created, prior to harvesting commencing. This marking identified the provision of deadwood alongside watercourses, adjacent to wetland areas and areas of long-term retention, together with the identification of poorer stems of low or no timber value, particularly related to species such as Western Hemlock which exhibited marked fluting or multiple stemming.

Also of concern, was the creation of a diversity of standing deadwood in the shape of tall, short, thin and thick stems. In general, larger pieces of deadwood have more micro-habitats and support more species than small pieces.

Analysis of the standing deadwood provision indicates that :-

- An estimated 100 standing deadwood stems have been created.
- That the standing deadwood can be broken into broadly four categories:

<u>Approximate No of Stems</u>	<u>Created</u>	<u>Height (m)</u>	<u>DBH (cm)</u>	<u>Estimated Volume (m³)</u>
25	Yes	3 - 5	25 - 50	6
25	Yes	3 - 5	10 - 15	3.2
25	Yes	2 - 3	25 - 50	2.5
<u>25</u>	No	Various	Various	<u>1.5</u>
<u>100</u>				<u>13.2</u>

The volume harvested from this coup was 2,134 m³.

Under UKWAS 2, at a 5% level this would represent 107m³ of which half (54m³) would be standing deadwood, which would equate to 13.5m³ / Ha.

As can be seen, on this basis the standing deadwood which has been created or occurs naturally is a quarter of that required under UKWAS 2.

Interestingly, the owner took exception to the creation of this standing deadwood as viewed from his house which can be seen in the background in the bottom photograph, seeing it as being visually intrusive and promptly felled some 70% of the stems visible from the house !

This question of “look” or aesthetics is something which seems to be of concern to many people, from harvesting operators, some foresters, forest owners and the public.

Analysis of another coup gave the undernoted standing deadwood provision :-

- An estimated 620 standing deadwood stems have been created over 13.5 Hectares
- That the standing deadwood can be broken into broadly the same four categories as noted above
- Estimated total standing deadwood volume at 82 Metres³
- Equates to 6 Metres³ / Ha

The provision of standing deadwood was targeted as noted in each of the undernoted photographs :-

Standing deadwood was prioritised adjacent to retained conifers, with only scattered deadwood developed within the lower section of the coup. In both cases the deadwood retention focused on scattered windblown stems, poorly formed trees, multi-stemmed trees and species such as pine and larch, with any naturally occurring deadwood of conifers or broadleaves being retained.





The photographs above show examples of individual stems and groups of standing deadwood being left adjacent to retained conifers.

The photograph below shows more significant levels of standing deadwood as a result an extensive area of old windblow which increased the opportunity to develop deadwood.





And again, deadwood being created from a pocket of windblow.

And below more standing deadwood being created around a small mire site and watercourse, which will be left unplanted at restocking as part of the process of improving the biodiversity and habitat of the next generation of the forest. Deadwood in watercourses has considerable ecological value by creating and improving physical habitat structure for a range of different species.





Analysis of the above coup gave the undernoted standing deadwood provision :-

- An estimated 275 standing deadwood stems have been created over 2.8 Hectares
- That the standing deadwood can be broken into broadly same four categories as noted previously
- The volume harvested from this site was circa 1,100 Metres³ – UKWAS 2 requires minimum of 2.5% standing deadwood = 28 Metres³ or 10 Metres³ / Ha for this site
- Estimated total standing deadwood volume at 36 Metres³
- Actual standing deadwood equates to 13 Metres³ / Ha
- Again the deadwood has been developed from areas of windblow, poorly formed stems or in this case Norway spruce that had previously suffered from deer stripping
- The deadwood provision concentrated adjacent to a stand of long-term conifer retention, primarily for Red squirrel habitat and landscape, together with localised areas adjacent to watercourses

The quality of the deadwood habitat is increased most effectively by focusing the provision of deadwood adjacent to a network of permanently wooded areas of retention or natural reserves.

Other deadwood may form naturally, such as the areas of Inland Lodgepole pine in the photographs below, that seem to have a natural tendency to die off from age 30 - 40.



In other cases areas left due to a net cost for harvesting may be left as retention and either blow down or be managed into an area of standing deadwood by chemical stem injection, thereby making them more stable as long term standing deadwood.



Sometimes residual ‘wee heappies’ of forest products are left at roadside following harvesting, very often because there is insufficient quantity to make up a full load for delivery. These can become very useful ‘eco-piles’ of deadwood, as the photographs below illustrate.



An eco-pile of pulpwood of nearly 20 years of age showing the progress of decay - small pieces stacked into eco-piles have a similar effect to that of single large log sections.



An eco-pile of mixed quality produce of around 10 years of age. Larger pieces or stacks take longer to decay than smaller single pieces of deadwood, providing deadwood habitat over a longer period of time.

Following the flailing of rampant gorse invasion along a forest roadside, another ‘eco-pile’ of stacked deadwood was discovered. Possibly it would have been better if it had been left subsumed by the gorse, although in Argyll the relative humidity remains quite high !





Lodgepole pine deadwood helping to stem the flow of water through a mire site and showing the contribution that deadwood provides in terms of increased biodiversity.



The provision of both fallen and standing deadwood also occurs within the stands of commercial timber as can be seen in the following set of photographs taken in 2021. The first generation stand on this site was badly windblown in the 2011/12 gales and the stand was felled in 2012.



The standing deadwood is therefore 9 years old. The restock conifers were planted in 2014



Natural Deadwood

Russia

The deadwood that I have seen in Russia very much mirrored that which I have seen in Scotland.



Much of the Russian forest is semi-natural with a high level of deadwood.

A Russian forest, not dissimilar to what we might think of as a well thinned stand of mixed conifer in Scotland, with associated wetland and standing deadwood.





You will note the more open structure of the forest and great variety of tree size, together with many bryophytes and lichens. These photographs tend to show the less productive areas where the greatest proportion of dead and dying trees are found.

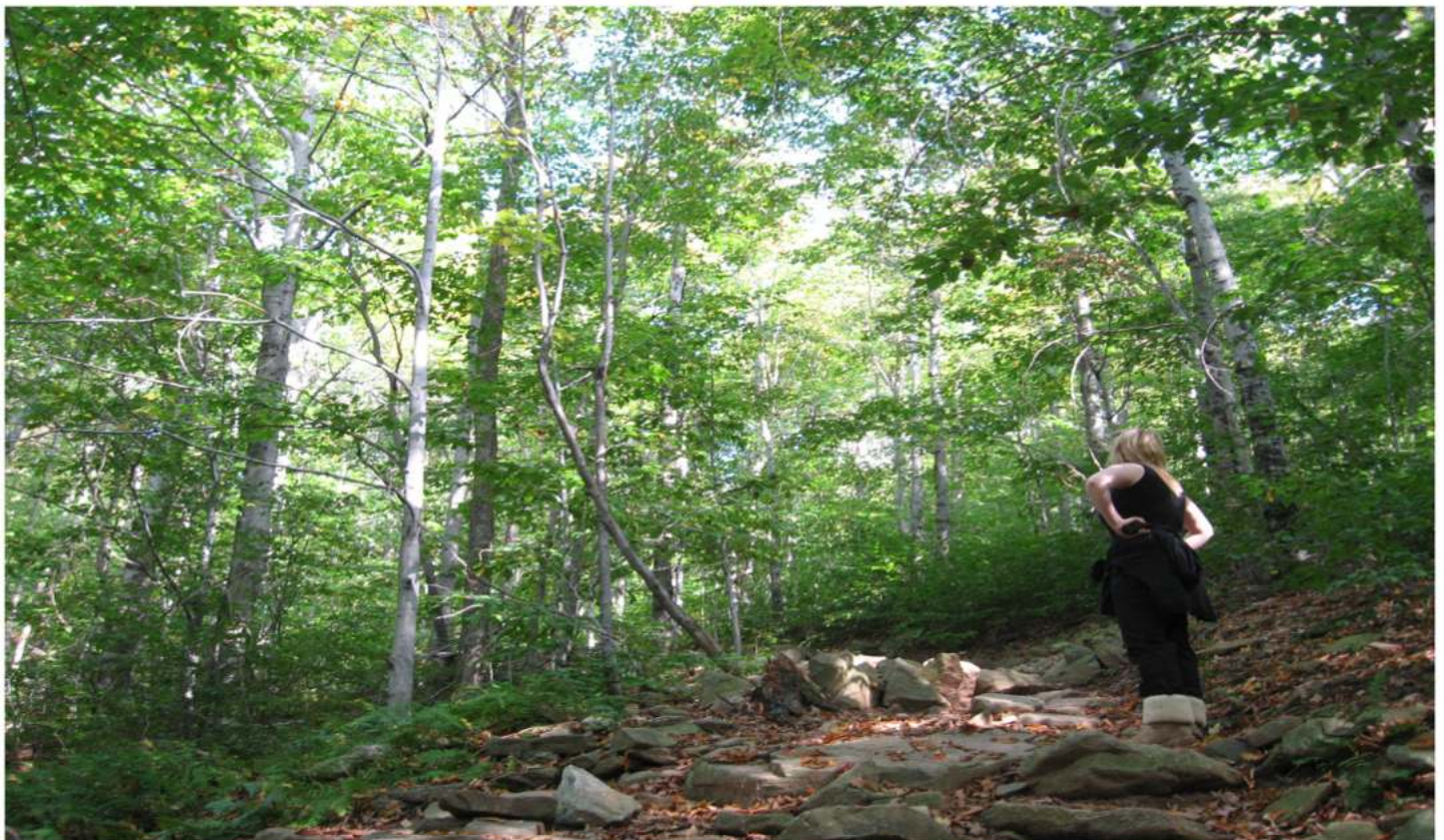
Essentially the managed provision of deadwood in the Scottish forests is intended to mimic the natural deadwood seen above, but the greatest benefit will not be seen until our restocking subsumes the retained deadwood and we re-establish the forest microclimate – it is then that we will see the real benefit and of course in order to reach that point we need to provide robust deadwood that will last the course of time.



The Catskill Mountains - eastern New York State on the west side of the Hudson River

There are many different kinds of trees in the Catskill Mountains such as pine, spruce, hemlock, balsam, birch, beech, chestnut, wild cherry and maple trees. As you would imagine, the chief and most important industry carried on in the Catskill Mountains is lumbering and most of the forest area has been cut at some time.

On just one trip through one section of the forest, it was noticeable how much natural deadwood occurred, as can be seen in the undernoted photographs.







What was noticeable was the apparent lack of bryophytes and lichens despite the relatively high rainfall, at over 70 inches per year.



The Adirondack Mountains – northern New York State west of Lake George

The Adirondack Mountains have a tremendous variety of trees combined with many lakes and high tops with no tree cover, together with a great variety of wildlife.

The trees of the Adirondack Mountains

speckled alder	slippery elm	Scots (Scotch) pine
bigtooth aspen	witch-hazel	eastern white pine
quaking aspen	balsam fir	balsam poplar
black ash	hackberry	Lombardy poplar
green (red) ash	eastern hemlock	white poplar
white ash	bitternut hickory	sassafras
American mountain-ash	red hickory	downy serviceberry
Showy mountain-ash	shagbark hickory	black spruce
American basswood	American hornbeam	Norway spruce
American beech	eastern hophornbeam	red spruce
gray birch	black locust	white spruce
mountain paper birch	black maple	sumac
paper birch	mountain maple	staghorn sumac
sweet birch	red maple	sweetgum
yellow birch	silver maple	American Sycamore
boxelder	striped maple	tamarack (eastern larch)
European buckthorn	sugar maple	black tupelo
butternut	black oak	black walnut
eastern red cedar	bur oak	Bebb willow
northern white-cedar	chestnut oak	black willow
black Cherry	northern red oak	crack willow
pin (fire) cherry	swamp white oak	peachleaf willow
common ChokeCherry	white oak	pussy willow
American chestnut	pear	shining willow

eastern cottonwood
American elm
rock elm

jack pine
red pine
pitch pine

weeping willow
white willow

There is a noticeable occurrence of standing deadwood within the forests of the Adirondacks, particularly associated with areas of wetland and the lakes.



There are of course beaver and they are creating deadwood as part of their habitat.



In riparian situations, evidence of deadwood and debris dams along water courses is sufficient to indicate the surrounding forest is of high value for deadwood.

New York

One would not imagine New York as being a place to find deadwood, but hidden away on Madison Square Park can be found two memorials to deadwood.



Roxy Paine

Defunct, 2004
Stainless steel

Courtesy private collection, Switzerland

Mad. Sq. Art is presented by the Madison Square Park Conservancy.



Defunct – complete with bracket fungi !



The real thing !

The Mother of All Deadwood – The Bristlecone Pine



The Great Basin Bristlecone pine (*Pinus longaeva*), found in the White Mountains of California, growing at a height of between 9,000 and 12,000 feet above sea level.



9,000 feet in the White Mountains looking towards the Sierra Nevada and Mt. Whitney, at 14,494 feet the highest peak in North America outwith Alaska.



Bristlecone pine country at 9,500 feet above sea level



The trees have a fascinating life cycle with many trees being over 3,000 years old and a few “Ancients” at over 4,000 years old, the oldest being Methuselah at 4,767 years – earths oldest living inhabitant !



The trees attain this great age because they are able to allow much of the bark to die back by producing partial growth rings instead of complete ones.



This bristlecone found along Methuselah Trail is vibrant and growing strong yet it is only supported by the strip of bark seen on the lower right side of the trunk.



These trees located in Methuselah Grove are on a steep slope and in an area where trees reach 3000 - 4000 years of age. Very old trees are typically squat and gnarled, with many dead branches and large areas of exposed wood.



Bristlecone pines have the ability to remain standing for centuries after death. Invasions from bacteria, fungus or insects that prey upon most plants, are unknown to the bristlecone due to their dense, highly resinous wood. The dry air common in the subalpine region can kill by desiccation, but also helps preserve the trees from rotting. When the tree eventually falls it is because the supporting roots finally decay or are undermined by erosion.

Scientists have found several pieces of deadwood lying on the ground for more than 7000 years!

Scientists have used the growth rings of living trees (to link in the current year), dead standing trees and dead preserved wood on the ground. Some pieces of wood have been found intact with tree growth rings that are 11,000+ years old !

Scientists have used this amazing longevity of both live and deadwood to recalibrate Carbon Dating !!

The following photographs give an impression of the way that the dead Bristlecone pine wood endures because of the harness produced by its very narrow rings. Wood durability is also increased by the amount of pitch or resin contained in the narrow rings. Windblown ice and sand carve the wood into beautiful textures and shapes.



So in a sense, the Bristlecone pine represents the ultimate in longevity of both the living and the dead and in so doing represent the wonder that is life and death on this planet.



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