Gorse: Woodland in Waiting

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The Plock of Kyle (mainland, ahead) and Skye Bridge roadsides infested with Gorse, which spread inexorably post-1995 on land disturbed during bridge construction. The intense yellow block left of the road is the subject of Figure 3. Kyle of Lochalsh.

Gorse can take over extensive tracts of land forming dense monotypic stands. It is quite usual for any pest to provoke a hostile and not particularly reflective response from humans. Conventional Gorse control methods tend to be unnecessarily aggressive, causing unacceptable ecological damage. Moreover, thanks to the obdurate tenacity of their target, such measures are at best only partially effective. The condition of land where total clearance has been implemented presents conservators with a poor starting point for the re-establishment of native plant communities, other than waiting while natural succession 'reboots' and catches up – which, given time, it will – or by kick-starting that succession by planting one of the UK's natural primary colonisers, Gorse! Locals recall that gorse was planted at the Skye Bridge site as it is at many new roadsides, such as by the Newbury bypass (personal observation).

Because the makings of desirable successor communities are already present – 'ready to roll' – within a Gorse stand (not to mention several bird species it would be a pity to evict violently), it is preferable that cutting back, winching out, bulldozing, fire and herbicide treatments should be avoided, particularly during site preparation beginning conservation projects.

An alternative method is proposed that exploits ecological processes already under way in any mature Gorse stand and requires no (or very little) intervention – just time, patient observation

and the informed confidence that nature will eventually prevail. As well as being environmentally considerate, the method also has the considerable advantage that labour and expense are minimised and could in a lot of circumstances be zero.

Taking this non-interventional approach, entire Gorse stands are forced by competition for light into gradual but irrevocable decline until extinct. This contrasts markedly with familiar scenes of sawn-off stumps and burnt bushes that consistently recover (Figures 2 & 3) requiring further and repeated attention if eradication is ever to be achieved, and land with disrupted soil devoid of vegetation. In addition, reinstatement of native vegetation is not hindered by its having to overcome waves of germination by Gorse and other weeds from seed banks. Most importantly, soil disturbance is nil, leaving established below-ground microbial communities intact: able to evolve progressively from the, albeit limited, complexity they have managed to attain as they concurrently facilitate recolonisation of land from adjacent above- and below-ground communities.

Trees already on the site (though perhaps invisible within the Gorse or simply not noticed) do the work of shading the Gorse into submission whilst a herb community, which is usually present having taken advantage of patchy ground illumination within the Gorse, flourishes as woodland develops.

The method is unlikely to provide the impatient with instantaneously obvious results, but time will be saved in the long run because recurrence of the problem is less likely than it would be in the wake of the usual time- and labour-intensive Gorse remedies; and money will also be saved.

Progress may be gradual but its starting need not be delayed by site preparation, and it will be continuous, not interrupted by a variety of predictable (therefore avoidable) setbacks inherent in conventional methodologies. Significant changes will be perceptible only on a several-year scale, but routine fixed location photography will accumulate evidence of progress to convince incredulous managers and funders that an apparently pointless project truly will succeed, given reasonable time.

The Problem

European Gorse (*Ulex europaeus* L.), also commonly known in Britain as Furze or Whin, is a leguminous shrub, native in the Atlantic regions of Europe and also scattered throughout central Europe where it is presumed to be naturalised. Gorse is found throughout Britain where over the past 50-60 years its density and frequency have increased greatly in some regions as a response to human activity: reduced grazing, land abandonment and the use of heavy machinery in the countryside; not to mention men's incorrigible propensity for chopping and burning undesirable vegetation whilst overlooking the obvious fact that the most intractable pest plants are also the most adept at regeneration.

Gorse is also a worldwide problem as an invasive non-native species, a particularly troublesome pest in New Zealand, Australia and the Americas including Hawaii. Gorse has been nominated as one of the "World's Worst one hundred invaders (IUCN, 2011).

Gorse is intolerant of shade, a characteristic that underpins the methodology introduced here. It is rarely found in mature forests other than at their margins. However, it can form monotypic stands in the open (title picture & Figure 3), often where land has been neglected after being cleared of vegetation and soil disrupted.

This is certainly the situation in Britain. Under natural conditions, Gorse may be a benign, indeed essential, primary coloniser, occupying and enriching (bacterial root symbionts of legumes such as Gorse sequester atmospheric nitrogen.) newly opened land until eliminated by a succession of other species. If presented with an artificial opportunity to proliferate, for instance cleared land, Gorse can rapidly form impenetrable thickets that might seem to be permanent – which they can

be, but only if subjected to serial ill-considered attempts at eradication. Such colonisations may be extensive, often considered unsightly or preventing access to otherwise potentially valuable land intended for agriculture or recreational pursuits.

Even after application of aggressive conventional control methods, Gorse is a tenacious regenerator which can make it seem difficult or impossible to control. This need not be the case.

Conventional Gorse Control

When a plant becomes a pest it is common practice to tackle it head on with destructive herbicidal or mechanical remedies. Chemical treatment can intoxicate an environment and often causes collateral damage to adjacent vegetation (a side effect not always clearly defined by manufacturers or noticed by herbicide users), both of which are better avoided if alternatives are available.

Troublesome plants such as Gorse are usually cut back with a hand- or chainsaw, winched out or burnt. Such methods can be so brutal as to cause new environmental problems worse than the ones they are intended to solve, and the most challenging pest species tend to respond to physical attack by regenerating from ground-level buds and seeds, often with extra vigour (Figure 1). Follow-up procedure is always required. The usual way is to kill newly sprouted shoots with a herbicide (side effects already mentioned). The many disadvantages of the entire operation seem to pass unnoticed when the target is Gorse or indeed Rhododendron, which is commonly treated in like manner with limited success accompanied by massive environmental damage. That need not be so.

The recent invention of a low-cost/reduced-effort technique that takes into account the target's anatomy and growth habits and the singular structure of each bush is 'Lever and Mulch' (L&M) applied to *Rhododendron ponticum*, a notorious example of a plant with the capacity to defeat control operators (Kennedy, 2009). L&M was devised after preliminary (promising) experiments with Gorse (Gordon French, pers. comm.).

Like Rhododendron, Gorse bushes may be dismantled methodically using L&M and thus killed. Levering of Gorse requires, in addition to L&M techniques, a deft twist. (Barbara Macritchie, pers. comm.). This is predominantly applicable to isolated bushes where the recovery of ground flora, which is likely to be in place already, close to or right up against the Gorse stems. In such situations, there will be little or no bare ground, a state which should be maintained so that competition from extant vegetation can prevent recolonisation by Gorse seedlings. If bushes are suitable for pulling out entirely, disruption of soil structure, soil organisms and ground flora can be minimised by first severing thick roots with a suitable saw, chisel-peen hammer or a light mattock. Effective though L&M can be with Gorse, protective clothing is more than just a safety precaution, as when dismantling Rhododendrons, but an urgent matter of protection against this viciously spiny bush.

L&M might also be applied to dense stands of Gorse, but this should be discouraged. Even if extant bushes are totally eradicated, vigorous regeneration on the resulting bare ground from a persistent seed bank (up to 28 years) will complicate the process and will likely delay project success. Colonisation of newly opened ground is Gorse's ecological speciality, best discouraged by maintaining and encouraging desirable plants already *in situ* rather than battling with remorseless germinations of Gorse seedlings.

Burning Gorse is a haphazard as well as hazardous process. Of course, fires often get out of control – Gorse burns extremely well, cultivated in the past as valuable source of domestic and industrial fuel, sometimes even fought over (Rotherham, 2007) – but there are also ecological and practical reasons why fire is an inadvisable strategy. Ground flora and soil biodiversity, which are essential to habitat integrity and in consequence site recovery can be severely compromised by incineration, either where fire passes through a stand or beneath brash bonfires.

Importantly, if Gorse control is to be effective, burning is usually unsatisfactory anyway because of regrowth from dormant buds clustered at each stem base, many of which are unaffected by fire passing through a gorse-burn area. Observations of bushes after burning indicate that bush recovery by bud regeneration is the rule rather than the exception (Figure 2) necessitating laborious follow-up.

Not only does burning give inadequate control, but the resulting nutrient-rich ash bed, cleared of competitive vegetation, provides enhanced conditions for germination of Gorse from its long-lived seed bank, much of which survives firing.

Clearing a Gorse stand can produce great heaps of brash that require much time and labour to shift it for destruction, all of which can be expensive. Gorse burns at so high a temperature it was used historically for fuelling bread ovens (Rotherham, 2007). Devotees of *Time Team* will know that evidence of hearth, furnace and kiln can take millennia to disappear completely; indeed they are much sought after by archaeologists. Obviously, therefore, bonfires cause severe damage to soils which take a very long time to revegetate, so brash bonfires should be discouraged, particularly on conservation sites.

A Natural Solution

This alternative Gorse control method relies heavily on two factors:

1. Gorse's fatal intolerance of low light conditions.
2. People's patience and confidence that the method will work, given time.

Whilst Gorse thrives in open sunlight, it slowly but surely dwindles and dies when shadow is unremittingly cast upon it. Thus, if a tree can struggle up to the light through dense Gorse, it can then spread its canopy and become an efficient parasol which will ultimately be fatal to the Gorse (Table 1). Trees are very adept at this behaviour, though they may have to grow very slowly for years until they emerge and flourish. Wherever dense Gorse, established for a decade or two, is examined critically, slender saplings can be seen to be growing within it (Figure 4). Often, the presence of more mature trees nearby or at other Gorse sites attests to their ability to survive and prosper in this habitat (Figure 5).

Table 1. The sequence of naturally occurring changes from continuous gorse cover to mature woodland. All stages can be seen within a relatively small area at the Plock of Kyle, Lochalsh.

TREES	GORSE
Absent or Seedlings	Dense stand
Emergent Saplings	Dense stand
Individual Canopies	Locally Suppressed
Continuous Canopy	Universally Suppressed
Young Woodland	Etiolated, Moribund
Young Woodland	Dead
Mature Woodland	Absent

Gorse bushes trapped beneath trees with a well-developed canopy are clearly weak and of reduced stature when compared with adjacent unshaded bushes growing beyond the tree's light interception zone (Figure 6). In places where tree growth has continued to the point where the canopy has coalesced, etiolated, soft-spined Gorse with dead branches is a temporary (though often quite persistent) feature of the shrub layer (Figure 7). In vigorous young woodland, there

may still be places where the dead of remains Gorse linger, eventually collapsing and recycled in the litter decomposition system (Figure 8).

At the most intensively studied site, The Plock of Kyle (NG254276), it was noted that in young woodland where gorse was moribund (Figure 6), the ground flora was surprisingly diverse and well established. This area was compared with the understorey of the very dense Gorse stand shown in Figure 3, wherein it was possible to detect the presence of a surprisingly complex community that included a range of conventional woodland species – 'in waiting'. Therefore, indiscriminate Gorse clearance would not only remove numerous small trees that might otherwise displace the unwanted Gorse, but would also exterminate a pool of other species with the potential to populate the resulting woodland – a further reason not to apply interventional Gorse control techniques.

Limited Intervention

On the human timescale, a process of this sort might to seem to take too long. Predictable advantageous changes will be undetectable to casual observers who, if they cannot be persuaded to wait, might need to have their impatience satisfied by hurrying things along. If necessary, this can be accommodated. Since sapling trees are the main requirement to facilitate progress from Gorse to woodland, rather than wait for them to proliferate spontaneously, young trees taller than the Gorse can be added to the site to complement the effect of those that will inevitably be growing imperceptibly within the stand or in full view but unnoticed.

Planted trees should, of course, be of species relevant to the region, selected also to fit their ecological place in the early development of local woodland and grown from locally sourced stock. In the West Highlands of Scotland, for instance, where Gorse is a recognised menace despised by all but the stubbornly unobservant, Birch (*Betula pubescens*, *B. pendula*), Rowan (*Sorbus aucuparia*), Hawthorn (*Crategus monogyna*), Ash (*Faxinus excelsior*) and the occasional Sallow (*Salix capraea*) would be suitable choices for planting. Adding trees within impenetrable Gorse is guaranteed to be an unpleasant task, so planters should be encouraged to wear adequate 'armour'.

A Gorse stand is rarely so dense that it has no understorey flora that will eventually end its dominance in the fullness of ecological time, but if that is the case, then planting may be considered.

Conclusions

Gorse is a resilient plant that, when unwanted and attacked, eagerly regenerates from sawn-off or burnt stumps as well as from a persistent seed bank. These characteristics are best taken into account whilst control measures are being considered rather than after they have been implemented, paid for and regretted (or project failure overlooked).

The stand-back-wait-and-observe method described here will not necessarily be applicable if Gorse-infested land is to be turned to arable use *via* clearance, though it is hoped that, with due reference to the discussion above, aggressive methods will be limited where possible during restoration of grazings, both for the sake of beneficial below-ground organisms, which suffer if soil is treated abusively, and to avoid a lot of unnecessary hard work and expense followed by predictable re-establishment of the pest targeted for control. Should new habitats such as low heath or rough grassland be the desired outcome, it is hoped that ideas discussed here will encourage others to devise suitable novel, non- or constrained-intervention methodologies.

However, the method should be the ideal starting point for conservation measures such as woodland creation. Labour and costs will be minimal unless the tree planting option is chosen, but even that should be easier and cheaper to apply than conventional approaches.

It is acknowledged that the sites in the Scottish Highlands that informed the author might be better placed to receive a steady influx of diverse tree seeds than Gorse infested places in other parts of the country. There, the painful process of tree planting within the Gorse matrix might be obligatory rather than an optional if this method is to work.

Afterthought

Bracken (*Pteridium aquilinum* L.), like Gorse, forms dense monotypic stands following moor burning (Fraser Darling, 1945) and abandonment of agricultural plots (personal observations, particularly of disused 'lazy beds' on the Isle of Skye, where the evidence of land previous use is clearly visible), and it like Gorse, is inhibited by tree shading. Young trees grow well if slowly beneath bracken cover but they eventually overtop and shade it (Figure 9), reducing the size and vigour of fronds, eventually (it is predicted – intermediate stages have yet to be persuasively observed) to the low stature and distant distribution that is usual in mature woodland. Once again, if the end result is to be woodland, then encouraging tree growth in problem bracken ought, given time, to result in effective control if not eradication, which in the case of this native woodland species would be unnatural.

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Figure 1. Stems of Gorse re-sprouting from ground level buds a few months after sawing. Also, thousands of minute seedlings, relieved of competition and fully illuminated, have germinated in the surrounding litter. Near Plockton, Lochalsh.

Figure 2. Resilience of an incinerated Gorse bush (one among many). Stapeley Hill, Shropshire.

Figure 3. Dense and extensive monotypic Gorse growing on foundation infill of the Skye Bridge, Lochalsh (2006). Five years later this stand is now much more open with an understorey of little trees, herbs and bryophytes, and several saplings are already overtopping the Gorse.

Figure 4. Emergent Rowan sapling (*Sorbus aucuparia*) growing within dense Gorse. Plock of Kyle, Lochalsh.

Figure 5. Intermediate phase in the natural succession from dense Gorse to new woodland with continuous tree cover. Near Avernish, Lochalsh.

Figure 6. Gorse bushes in decline when shaded by the expanding canopy of a self-seeded Downy Birch (*Betula pubescens*). Near Balmacara, Lochalsh.

Figure 7. Moribund Gorse beneath a closed canopy of downy birch (*Betula pubescens*) following natural replacement by woodland. Note the already well-established ground layer and moss-covered decomposing Gorse stems. Plock of Kyle, Lochalsh.

Figure 8. Decomposing remains of Gorse beneath trees in newly established woodland. Plock of Kyle, Lochalsh.

Figure 9. Saplings of Ash (*Fraxinus excelsior* – centre), Hazel (*Corylus avelana*) and Sallow (*Salix capraea*) emerging and overtopping dense Bracken (2006). By 2010 this scene was virtually unrecognisable and now is a rapidly evolving copse with trees up to 4 m tall. Auchtertyre Hill, Lochalsh.