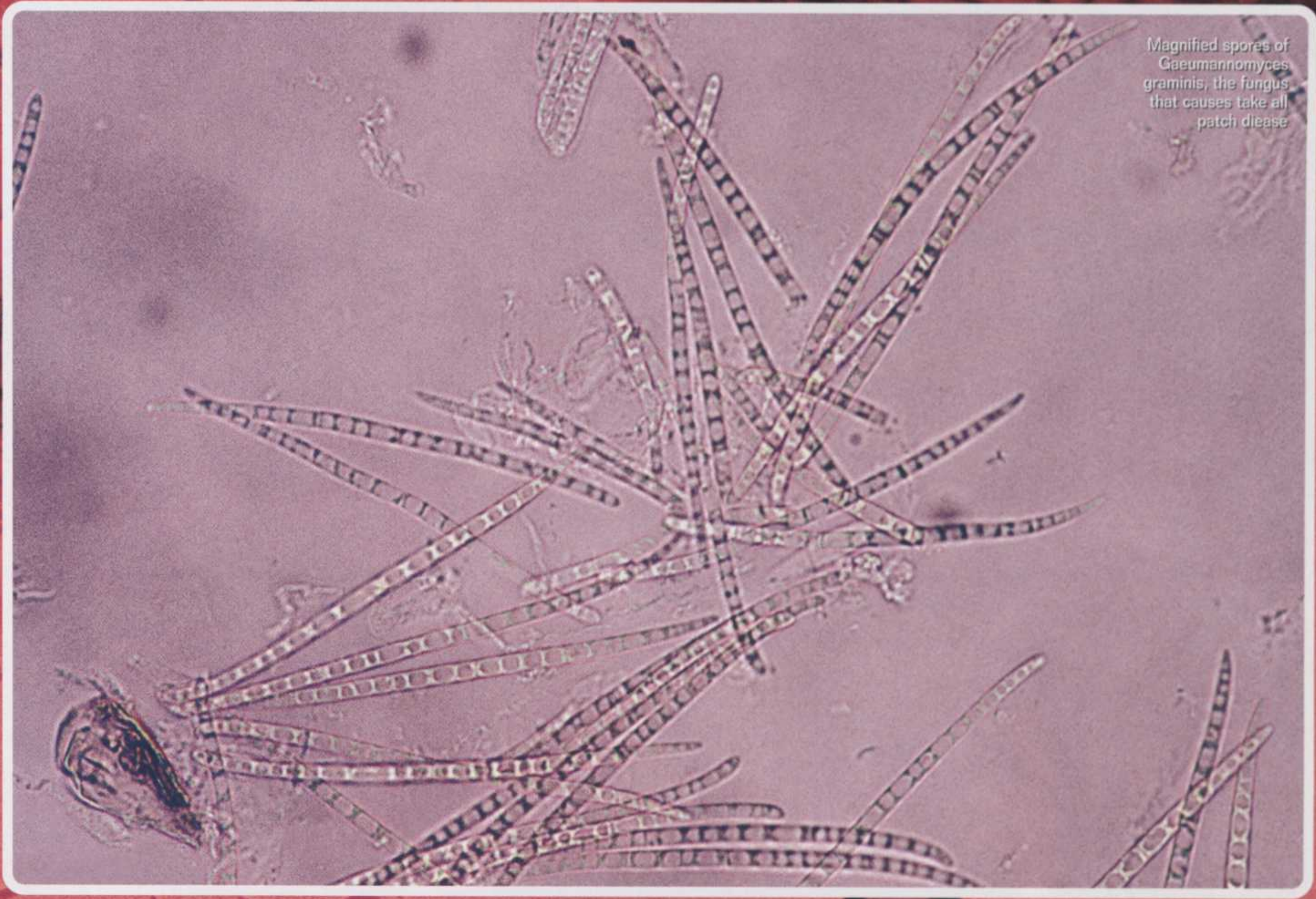

Magnified spores of Gaeumannomyces graminis, the fungus that causes take all patch diease

may be so minor or so restricted as to cause little or no concern to the turf manager. Conversely, they may develop into devastating outbreaks that could claim large areas of a sward in only a few hours. The extremes are uncommon, as extremes generally are in all aspects of life, but they are a real possibility. The ability of these fungal pathogens to cause disease should not be underestimated. At the end of the day, these fungi need to obtain nutrients from the turfgrass plant in order to survive. Some pathogens have evolved along with their hosts and their relationships are extremely complex. Many are less choosy and will cause disease on any susceptible sward.

There is one last but very important thing to remember. There are many physiological conditions and invertebrate problems that can develop on a sward and resemble the symptoms of turfgrass diseases, but which are not caused by the activity of a pathogen and will therefore not respond to fungicide application. Before you waste time and money in applying fungicides unnecessarily, get the problem checked and not just for fungal presence. Choose carefully where you get the analysis done because being told what fungi are present on your turf does not necessarily mean that you have found the cause of the symptoms that you see!

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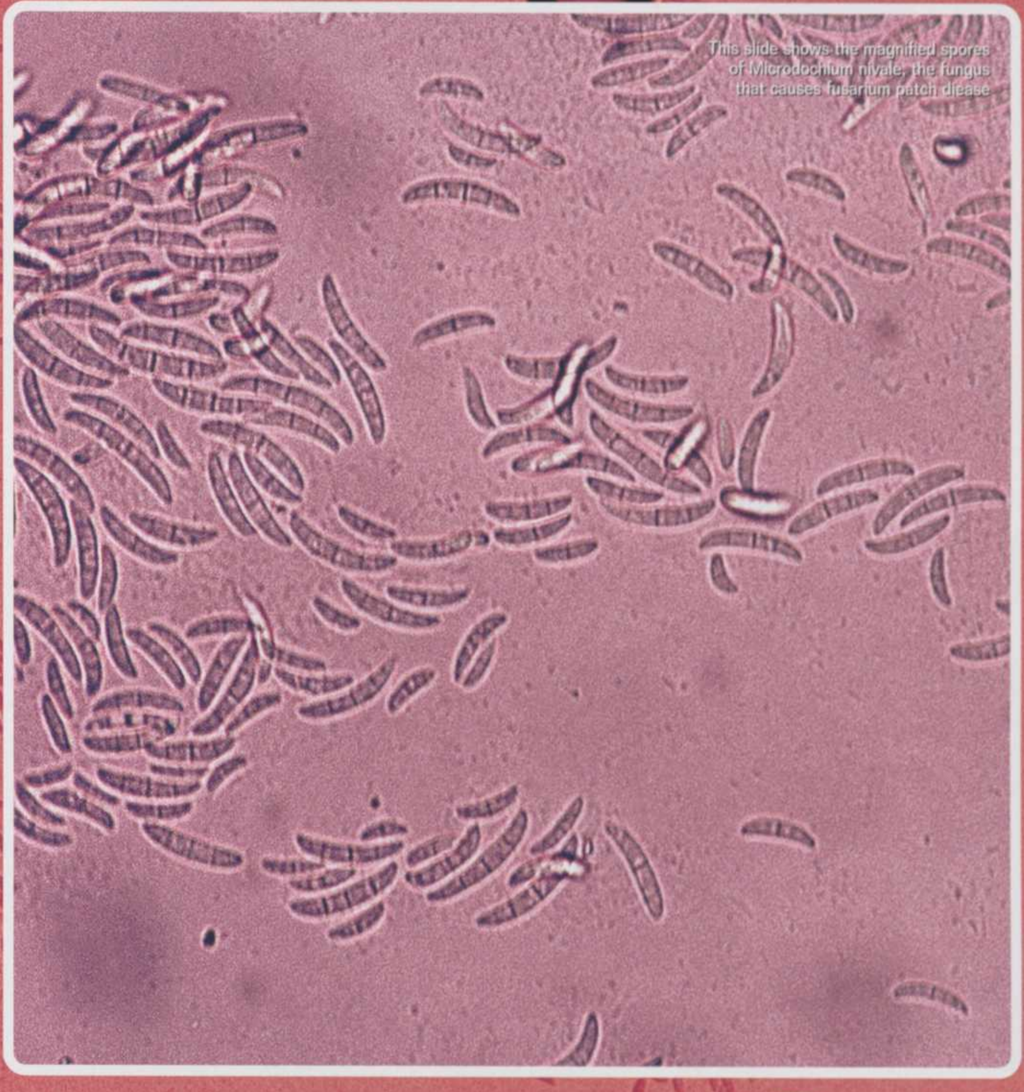

This slide shows the magnified spores of Microdochium nivale, the fungus that causes fusarium patch diease

Roland Taylor looks at the development of the tyre and how that has enabled the ATV to become a valuable greenkeeping tool

INFLATED IDEAS

While sitting in a traffic jam recently, I was pondering that we must spend a considerable amount of our lives sitting on air and rubber - tyres. This prompted the next question, do we really know a lot about this important transportation component or simply do not really care until it causes us aggravation by deflating? Unless you are one of those diligent people, how many times this year have you checked your car's tyre pressures? I cannot remember. My resolution is to do it more often.

Prior to the 1840's a vehicle's tyres were made from either wood or steel. It was thanks to two Scotsmen, that riding any type of vehicle was to become less painful to the rear end.

In 1845 R. W. Thompson, launched the first solid rubber tyre. Apart from being quieter it had no other benefits over its steel counterpart.

Grass played a significant part in Scottish vet, John Boyd Dunlop's invention. He was fed up with the deep grooves his son's tricycle made in his lawn. His solution to this was to fit lengths of hose filled with water to the wheels. An acquaintance suggested that using air instead of water might be better. This he did, and the resulting tyre was patented in 1888.

But Dunlop's invention proved to be impractical and never made him a rich man. However, the die was cast and over the next few years many names, that were to become well known in the future, introduced various forms of the pneumatic tyres.

From the beginning, rubber was seen to be the answer, but its properties posed some major problems. In hot weather the tyres melted and in the cold they froze and cracked. In addition, they stuck to everything. It was a man called Charles Goodyear

who eventually came up with the answer - a heat process, which he named vulcanisation. In 1937 signs of a natural rubber shortage were becoming evident. To counteract this, the Goodyear Tyre Company launched a man made substitute called 'Cherigum'. Today, it is estimated that over 60% of all tyres sold are synthetic.

Tyres come in a vast range of sizes and specification, and depending on the vehicles they are to be fitted on determines the method of construction and the materials used.

The recipe for tyres

Natural rubber is latex (sap), tapped from a tree's outer bark, it then coagulates to form solid slabs. Its synthetic counterpart is produced by the interaction of chemicals and processes. Another important compound is 'carbon black' - a substance for increasing the strength of the synthetic rubber. Burning crude oil in specially designed furnaces produces this product.

Fibreglass, nylon and polyester in the form of sheets of parallel textile cords are used in the construction of tyre casings. High tensile bronze or brass-coated steel wire is also used.

All the ingredients are weighed and mixed in a 'Banbury Mixer' to form a pliable material that is then rolled into sheets. One of three processes then takes place depending on the tyre's properties.

Extruding

The compound is heated and then forced under pressure into a die creating the tread, side wall and apex of the tyre.

Caldering

This involves the textile and steel cores being laid flat, both sides are given a thin coating of the mixture. These layers are cut and reassembled to form reinforced sheets that are used to create the casing ply and breaker belts, which give the final result, added strength, shock resistance and durability.

Coating

High tensile steel wire is given a rubber coating and wrapped into hoops to form the beads of the tyre. Having carried out one or more of these preliminaries it is time to build the tyre.

The first stage consists of an inner liner, that will retain the air, plus the components to form the basic structure being wrapped round a drum. The side walls are then placed in position. On another drum the tread and breaker belts are assembled. These moulded forms are brought together and the tyre is inflated. At this stage special attention is paid to ensure all the air is expelled from between the layers. The bald tyre casing is loaded into a mould where high-pressure steam is used to produce the tread and side wall markings. The heat generated also results in a chemical action that bonds everything together. Once the tyre has cooled down it is given a thorough inspection and is ready to be used.

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ly evident that reducing compaction is of paramount importance in producing a quality-playing surface.

Some tyre manufacturers have recognised this and are using their knowledge from other applications, such as agriculture, to produce a specifically designed range for the grasscare markets. The features of these introductions help towards maintaining an open soil structure and avoiding damage to the turf. By using a tyre with a wide surface contact area, plus low inflation, the equipment's weight is more evenly distributed, but this is only part of the picture. The tread pattern is also important in reducing slippage and increasing the machine's efficiency. Stability is another factor, especially on uneven or sloping terrain. With the right tyres fitted it is possible to work on soft, wet areas, with minimal marking or damage to the grass.

There are other spin-offs, these include; lower fuel consumption, longer life and more cost-effective operation.

To achieve all this requires buying the right tyres - this can be a minefield. Low ground pressures tyres are readily available, but the question that needs to be asked is - are they designed specially for your equipment? Unfortunately, this is not always the case and what looks like a bargain can become a liability. To get it right from the onset, it is best to contact companies who offer tyres specifically for working on grass. While the initial outlay might be slightly higher the benefits and technical support will save money and hassle in the end.

When it comes to tyre maintenance there is very little to do. Regular checking of pressures being the main one. For some applications changes in air pressure may be recommend by the equipment's manufacturer. In these cases if there are any doubts then a tyre specialist will be able to advise on the best course of action. Other things to watch out for are missing dust caps and any signs of damage, chaffing or excessive wear.

By looking after your tyres you will get a smoother ride all round.

Saving or making time is problem most of us are faced with in the modern workplace, as a result we are constantly having to be seeking ways of achieving this.

One aspect that can be overlooked is the time taken to travel around a course. With any large operating area, minutes and hours are guzzled up over a week, month and year. The shortest route between two points is a straight line, but unless the area is flat and devoid of any obstacles this is rarely possible. The type of machinery, and the on site work that is to be carried out, is generally the governing factor on which is the best possible route from A to B.

A range of equipment that can speed up travelling times are the "go anywhere" vehicles -the ATVs or Utilities.

When ATVs first appeared on the market they were predominately sold

to the leisure sector so, quickly established a reputation as fun machines. Some of the early models had a three-wheel configuration, but these could, if abused be unstable and dangerous. Four-wheels were found to be safer.

At first this form of transport was shunned by the commercial sector, but farmers, especially, in mountainous areas soon discovered the benefits of this means of transporting foodstuffs, fodder and sheep over difficult terrain. The crop growers also found they could use an ATV, with its low ground pressure properties, for fertilising or spraying when conditions were soft and wet. Using a conventional tractor in this situation was asking for trouble as considerable damage could be caused to both the soil's structure and the growing plants.

In the early days usually a trailer was towed behind but, recognising this as not being always ideal, manufacturers introduced integral transport boxes. They also launched purpose built units, which were given the name 'utilities'. These have the same low ground pressure and traction qualities of the ATVs. Most of today's models have the advantages of pto and hydraulic systems for operating a wide range of turfcare attachments, as well as transporting materials

Both these types of vehicles are now recognised in the grass maintenance sectors and are used throughout the world in a wide range of applications.

For golf course an ATV in the fleet can certainly cut down travelling times, especially for light work such as greens or tees maintenance. It is also a fast way of getting to a breakdown or puncture out on the course. The machine's ability to cover rough ground, soft wet areas without virtually any markings and handle steep slopes means they are able to travel across areas where other units cannot.

The utilities are for many, a substitute for the conventional tractor and trailer and there are some large carrying capacity units now available for transporting materials such as top dressing and sand.

Whilst these 'go-anywhere' vehicles are not everyone's cup-of-tea, for others they are ideally suited to the geographical location of the course.

If you were looking for ways of saving time getting round your course the possibilities of using an ATV or Utility vehicle are worth investigating.

IN AT THE DEEP END

Mike Spencer takes you to the murky depths of the lake and pond and gives some excellent advice on maintenance

Lakes and ponds, both man made and natural, have a life cycle. They start balanced, clean, fresh and clear. Eventually, with increasing levels of nutrient that overwhelm the natural clean up mechanisms, algae and weed growth appear, and without the correct supervision they pass into 'old age' as shallow bogs or marsh land.

This process used to take hundreds of years, but now can take only decades. Why? Because until recently, water was one of our least understood resources. This lack of understanding has led to some significant problems eg Algae blooms, aquatic vegetation growth, foul smelling odours, clogged sprinklers, valves and pumps. A better understanding of the causes of these problems leads to a clear long-term solution, which addresses the causes and is preventative in nature.

A pond in balance is a healthy, dynamic ecosystem that is ageing at a very slow rate. Fish and other aquatic life are present. There is an absence of odours, foul smell and algae blooms. As nutrients enter the ecosystem they are either absorbed by the plant life or metabolised by aerobic bacteria. There are safe levels of oxygen in the lake - at least 2-3 PPM or mg/l. Oxygen is added to the lake from wave and wind action, the light side of the photosynthesis process and rain. It's a healthy, balanced ecosystem. Mother Nature has provided the necessary clean up tools to deal with the problems.

Because this is a finely balanced situation it does not take much to throw it out of balance. Typically there is an influx of nutrients. The aerobic bacteria consume oxygen as they metabolise nutrient. Everything is fine until the first hot cloudy day when the planktonic algae doesn't photosynthesise and create oxygen or the first long hot night when oxygen demand soars.

It is in these scenarios when there are no oxygen producers and the demand for oxygen cannot be met. The result of this lack of oxygen appears in the form of algae, foul smells, insect infestation and eventually fish kills.

As any manager of water will tell you, the three most important factors that impact the balance of a lake or pond are temperature, nutrients and oxygen.

Thermal stratification or layers of temperature

The summer sun will warm the surface water. This water becomes less dense than the cooler waters that are trapped at the pond's bottom. As the summer progresses the surface water gets warmer and warmer in comparison with the cooler water at the bottom and the water eventually becomes stratified or separated into layers. The warmer water, which has a diminished capacity to hold oxygen - water at 40 degrees Fahrenheit can hold 40% more oxygen than water at 72 degrees Fahrenheit - encourages algae growth.

Nutrients

In pond ecology we talk specifically of those compounds that contain phosphorous and nitrogen. In fact, phosphorous has been identified as the single greatest contributor to aquatic plant growth. As the nutrient level in the pond increases, so does the plant and weed growth, which leads to severe problems from an environmental and aesthetic viewpoint.

The most common sources of nutrient are bottom silt; plant life and run off water from surrounding turf areas and inlet water.

Vegetative life in the pond and sediment are the number one source of nutrient. Blue green algae can divide as often as every 20 minutes with a two-week life cycle. At the end of the cycle the plants simply die and fall to the bottom adding to the biological material in the pond. This dead plant material acts as nutrient for future growths which in turn adds more demands on the little available oxygen.

'Run-off' is the second most common source of nutrient. Research shows that up to 4% of the fertilisers applied to areas adjacent to the ponds and lakes will eventually leach off into the water, placing additional burden on the lake's natural clean-up process.

Nutrient loading tends to be very high in waters adjacent to green areas or turf grass. Sludge build up can accumulate at 1-5 inches per year. This build up can rob your lake, or irriga-

IN AT THE DEEP END

tion basin of its capacity to store water. The pond will work to break down and get rid of this nutrient load. This is a process called organic digestion. There are 2 types of digestion, aerobic and anaerobic. Aerobic bacteria are the most effective. They metabolise or break down the nutrients, respiring or consuming oxygen, much like we do. They are efficient, breaking down organic nutrients into elemental form, creating no noxious by-products.

The second type is anaerobic bacteria. They exist in water that is oxygen deficient. They are not as efficient and allow soluble organic nutrients to recycle into the water column. By products such as methane. Ammonia and hydrogen sulphide are created by anaerobic decomposition. Aerobic bacteria work roughly 7 times faster than anaerobic bacteria.

Oxygen

The third role is oxygen. Oxygen is important to both the life in the pond and is used by the pond itself to clean itself of excess nutrient. Oxygen supports the food chain. A healthy ecosystem in a pond is not just a nice thing to have. It provides for a natural way to consume organic nutrients.

The bottom of the food chain are the microscopic algae which are consumed by the slightly larger zooplankton. Each level of consumers transfers only a small fraction of the energy it receives up the chain to the next level. This means that a few sports fish depend on a much larger base of plants and algae. Therefore a healthy food chain can pull a tremendous amount of nutrient out of the water. Oxygen supports this entire system.

Putting it all together

As a pond gets older the level of nutrient rises. This is due to an increase in run off, organic bottom sediment or fertiliser use in the surrounding area, and in the amount of algae and aquatic weed growth. As these weeds die they sink to the bottom. This will result in a sudden increase of aerobic bacteria due to the large food supply. This bacteria will use large amounts of oxygen as they digest organic waste. Due to thermal stratification, the top and bottom layers of the pond will not mix which means that the oxygen cannot get to the bottom to support the aerobic digestion.

Balance is critical to the aquatic ecosystem. A healthy lake contains balanced amounts of oxygen, nutrients and temperature.

Solutions

Several methods are available to help solve the problems.

Mechanical control - This is the oldest method of management. Dredges, weed harvesters, rakes, are used to remove algae and aquatic plants. These methods can be an effective short to medium term solution - treating the symptoms of poor water quality rather that treating the causes. Disposal of aquatic plant material and dredged materials is quickly becoming more regulated and expensive

Chemical control - This is probably the most popular method. Herbicides are applied to the pond to kill the algae and plants. They are fairly quick, however since herbicides kill the plants and algae which then sink to the bottom, oxygen depletion, odours and fish kills can be a by product. Chemical control does not improve water quality, but the symptom of poor water quality; algae and aquatic weed blooms.

Biological control - The most popular of these is the introduction of weed eating fish or grass carp. These fish can be quite effective in keeping excessive weed growth under control, are inexpensive and require no labour, however they are indiscriminate feeders with their preferred food being aquatic plants and they will only eat algae if their preferred plants are not available.

Aeration - This is the addition of oxygen to the water. it is still used today as a vital part of the treatment of industrial and domestic waste. By putting large amounts of oxygen into the water, an aerator encourages aerobic bacteria which, in turn, work to clean the pond of organic nutrients and waste. The high pumping rate of an aerator also prevents thermal stratification, distributing oxygen to all parts.

Aeration helps to keep the three contributing factors, temperature, nutrients and oxygen in balance.

For more information on 'Aeration' and Otterbine aeration units please contact Mike Spencer, of Aquatic Control Ltd, Tel: 01342 325389, H/o 01477 500406, or email mike.spencer@ukf.net

TALKING

Six of the country's top men give their views on Trees

Trees

Compiled by Malcolm Huntington MBE

1. What do you consider to be good golf course trees and why?

Name: Stuart Cruickshank
Course: Deere Park G&CC, Livingston
Region: Scotland
Course Type: Parkland (18 holes)
Staff: Course Manager, plus six, plus gardeners

1. In our case, pine and small leaf trees such as hornbeam, whitebeam and silver birch because they are native to the area. Large leaf trees cause more problems.

Name: David Leach MG
Course: Lancaster GC
Region: Northern
Course Type: Parkland (18 holes)
Staff: Course Manager, plus seven

1. Anything indigenous to the area, in our case oak, beech and ash with a few cherry, apple and rowan. Deer play havoc with our trees particularly the ash.

Name: Mark Ellis
Course: Stocks Hotel and Golf, Albury, near Tring
Region: Midland
Course Type: Downland
Staff: Course Manager, plus five

1. We need trees which are indigenous to the area such as oak, beech, ash, field maple and copper beech. They make a pleasant backdrop and re-inforce golfing strategy.

Name: Ian McMillan
Course: Queenwood GC, Ottenshaw, Surrey
Region: South East
Course Type: Heathland (18 holes)
Staff: Course Manager, plus 10, plus mechanic

1. The simple rule to remember where trees are concerned is always to use the indigenous species. For instance, on seaside links you would use no trees, heathland - no trees, parkland - majestic oaks.

Name: Rob Challacombe
Course: Mortehoe and Woolacombe GC
Region: North West and South Wales
Course Type: Coastal Parkland (9 holes)
Staff: Course Manager, plus two

1. Good trees on golf courses are those native to your area and preferably don't cause you problems - large leaf etc. We have ash, sycamore, oak and beech and a few Scots pine which provide shelter for young trees and will benefit those here in two generations time.

Name: Simon Briers
Course: Whitehead GC, McCreaf Bray, Whitehead
Region: Northern Ireland
Course Type: Parkland (18 holes)
Staff: Course Manager, plus four, plus three seasonal

1. We are on an exposed headland on high ground. Eleven years ago the Forestry Commission provided oak, ash sycamore and beech trees but they haven't grown because of the conditions so now we have planted a mixture of pines.