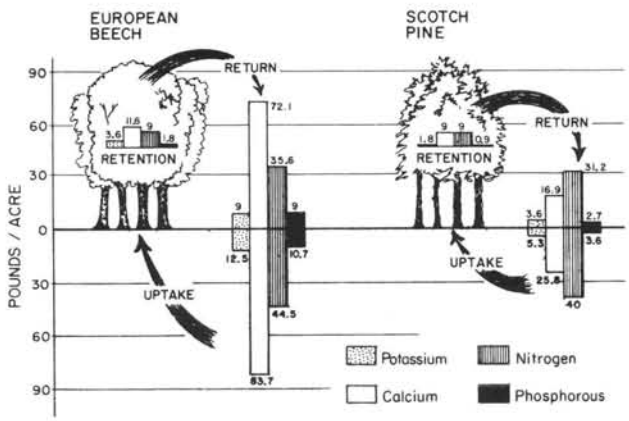
Photosynthesis: Sugar from Air, Water and Sun

The complex chemistry of photosynthesis goes on exclusively in the minute confines of the chloroplast like the one shown in the diagram below. Millions of chloroplasts are found in the cells of a single leaf, and within each chloroplast there are hundreds of layers of chlorophyll.

Photosynthesis proceeds in the chloroplast in a series of steps:

- Water molecules brought into the chloroplast from the plant's roots constantly come in contact with the layers of chlorophyll.
- Sunlight passing into the leaf strikes the chlorophyll, giving it the energy to break the water molecules apart.
- The oxygen from the broken water molecule is exhaled by the leaf and the hydrogen stays in the chloroplast — combined with a driver molecule that has absorbed the excess energy.
- The energy-laden drive molecule next causes the hydrogen to combine with simple carbon compounds already built up in the chloroplast by carbon dioxide taken from the air.
- With this last reaction, the change from light energy to chemical energy is complete — the complex stable energy-rich carbohydrate known as sugar has been formed.

Macronutrients: Rotating Capital for Forest Soil Fertility



Annual uptake (values below the soil line), retention (values in tree crowns) and return (values above soil line) of macronutrient elements in Scotch Pine and European Beech. Note the large fraction of nutrients returned to the soil in the form of litter.

"February Fantasy"

As We listen to what the Groundhog has to say,
About the length of Winter's stay,
And join Weatherwatch for hints of Spring,
Hoping Winter will soon lose It's sting,
With Spring fever rampant, in full bloom,
And that March Hare, looking for room,
To Strut around in anxious Spring style,
Knowing that in just a little while,
We will All have found good reason,
To turn loose a New Golf Season.

Kenneth R. Zanzig

Chemicals Losing Their Punch

According to biologist and entomologist, Robert L. Metcalf, "We may be rushing headlong back into the agricultural and medical dark age that existed before the discovery of modern insecticides and antibiotics. The outlook is dismal and getting worse," said Metcalf, a University of Illinois Professor at the annual meeting of the American Association for the Advancement of Science.

"Malaria, once thought to be eradicated, is coming back because carrier mosquitos have become immune to most common insecticides and the infectious protozoan itself has become immune to anti-malarial drugs. In 1976, the World Health Organization abandoned its 21 year-old malaria eradication program after spending nearly $2 billion in the attempt", said Metcalf. In 1938, there were only seven insects known to have developed resistance to a chemical. Now the list has increased to nearly 450.

Brian Croft, entomology professor at Oregon State University, says "what is required is a variety of chemical management strategies to keep the bugs off balance and prevent them from developing resistance. These include rotating crops, using less insecticide and avoiding compounds that have a long residual period, which encourages the bugs to adapt. Croft said, because prolonged exposure to a given pesticide encouraged resistance, using the same thing **over and over again is not in the interest of anybody**". (Columbus Dispatch, Ohio Pesticide Newsletter and Ga Pesticide Digest, July 1988).
Editor's Note: What is said about insects can also be said about the organisms which cause turfgrass disease.

Cool-Season Turfgrass Responses to Drought Stress

L. J. Aronson, A. J. Gold & R. J. Hull
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As the supply of water available for turf irrigation becomes limited, the importance of water-efficient and drought-tolerant turfgrasses increases. In order to establish the critical soil water potential at which cool season turfgrasses begin to experience drought stress, the growth and quality responses of Baron Kentucky bluegrass, Yorktown II perennial ryegrass, Jamestown Chewings fescue and Tournament hard fescue have been determined in research conducted at the University of Rhode Island.

Kentucky bluegrass and perennial ryegrass exhibited a more rapid decline in evapotranspiration rate, quality and leaf growth under moisture stress than the fine fescues which demonstrated a greater ability to thrive with limited soil moisture.

The rainfall pattern in southern New England can produce periods of summer drought even though annual precipitation exceeds annual evapotranspiration. Irrigation should be withheld until drought symptoms are imminent to utilize summer precipitation most efficiently. A delay of irrigation until the onset of temporary wilting results in a significant decrease in water consumption by turf. Clear indicators of impending drought stress must be identified to minimize unnecessary application of irrigation water. In addition, grass species need to be selected which can maintain acceptable visual quality during lengthy rain-free periods.