



BULB LOG 02.....14th January 2015



This week in the Bulb Log I am publishing the first chapter of my online book –

“ERYTHRONIUM IN CULTIVATION”.

I will continue this project through this year publishing chapters, in no particular order, when I have them ready.

The Chapters I plan are:-

Seeds

Bulbs

Flowers

Leaves

Growing in containers

Growing in the garden

Species, individual chapters on each of the following species of Erythronium:

dens canis, caucasicum, sibiricum, japonicum, americanum, albidum, revolutum, oregonum, tuolumnense, grandiflorum, montanum, californicum, hendersonii, helenae, howelleii, citrinum, klamanthense, purpurascens, pluriflorum, sp nova, multiscapoideum, taylorii, elegans.

Hybrids

All that I write is from my own experience and this book will be the same so I can only write about the plants that I have grown. Like the Bulb Log it will be fully illustrated and I will try to detail everything with clear photographs.

Once I have published all the chapters I will then combine them into a single PDF which can be downloaded.

One of the advantages of doing it this way is that I can continually add to and modify the chapters with new material before I combine them into the single PDF and even further I can add to or amend that in future years.

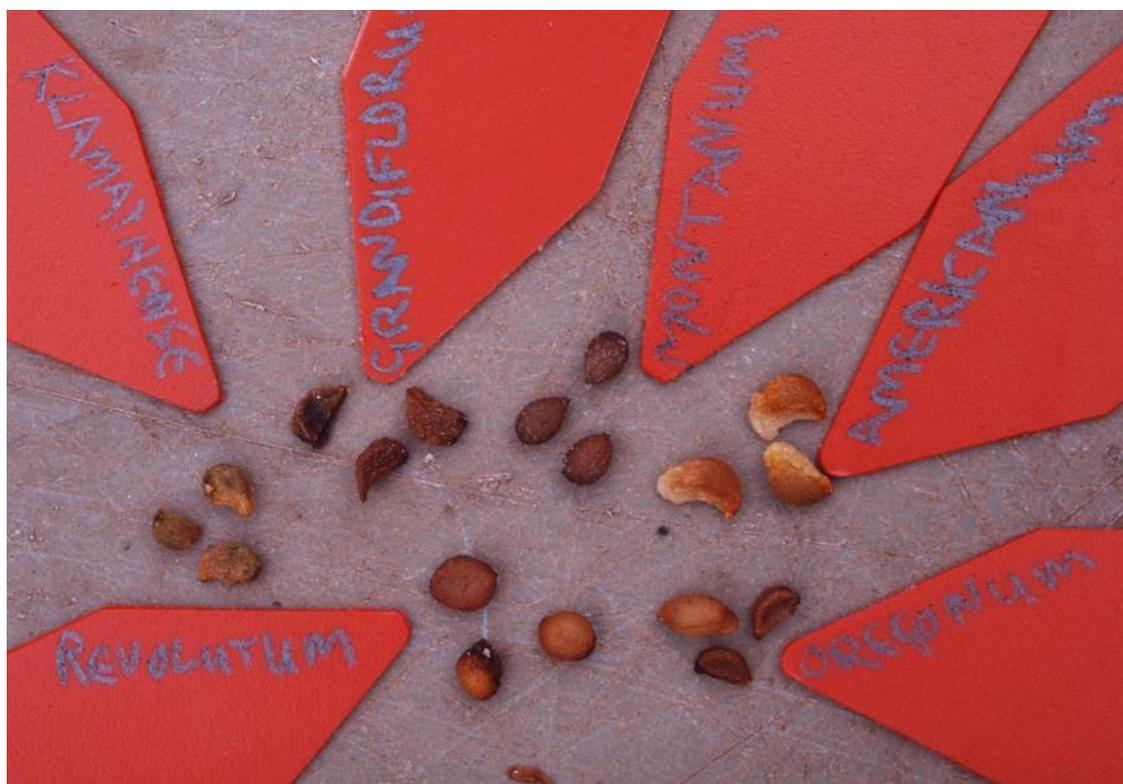
You can all also take part by offering suggestions or making comments – all comments good or bad will be helpful to me as I try and make this work as complete and helpful as I can.

I hope you enjoy the first chapter on Seeds, please do give me feedback.....

Chapter 1 SEEDS



Erythronium sibiricum seed



SEEDS

Erythronium seeds are fascinating structures in their own right - they all show variations and from my observations I am certain that you could identify the species from a detailed morphological study of the seeds alone. There are two main types of Erythronium seeds, separated by their distribution strategy. **Type 1** - the Western North American species are mechanically distributed.



Type 1 seeds and capsule

As the seed capsule ripens it opens from the top to less than a third of the way down so the top seeds fall out easily while the lower ones remain in place until the capsule is agitated in some way. Simultaneously the stem also dries becoming springy so that when it is shaken by the wind or other physical movement it acts like a not very efficient catapult releasing more seeds - this is a very inefficient form of seed distribution because some seed may even be retained for months until the capsule eventually disintegrates. I have measured the distance that the seed can be catapulted and 2 metres is the best distance I could achieve with a good pull on the ripe stem. If we take an optimistic five years for that seed to then germinate and reach flowering size before it can shed its seed another 2 metres we can work out, if all the conditions were favourable, that it would take at least 250 years for the plant to extend its range by 1km. Any geographical barriers such as rivers or rocky barren ground would restrict the distribution of a plant with such an inefficient method of spreading its seed. These factors go a long way to explaining why so many of the Western North American Erythronium species have very restricted distributions in the wild, before we even consider other factors such as habitat and climate.



Type 2 seed and capsules - *Erythronium japonicum*

Type 2 – the other dispersal strategy within *Erythronium* seed is shared by both the Eastern North American and the Eurasian species which have evolved an insect/ant aided strategy. The ripe seed capsule of this type opens much wider at the top allowing the seed to spill out very easily – the stem often bends placing the capsule on the ground.



***Erythronium japonicum*, *sibiricum* and *dens-canis* seeds**



The seed of all these species possess an elaiosome, a fleshy appendage attached to the seed, evolved to attract ants or other insects to gather the seed to enjoy this tasty morsel in exchange for distributing the seeds over a wide area. With the possibility of flying insects also taking these seeds, the distance the seeds could achieve away from the parent could be considerable and so this is a much more efficient distribution method than Type 1 seeds possess.

There is no question in my mind that the best way to acquire any plants is to raise them from seed and this includes *Erythroniums*: in fact for a number of species the only way you will get the chance to grow them is from seed. Of course, to retain their given name, cultivars need to be propagated vegetatively but we need to be aware that if we receive a bulb raised in this way what you are getting is not a young bulb but an offset of a bulb that may be tens of years old which comes with all the health issues passed on from the parent plant. I only revert to buying bulbs when I want a particular cultivar or if I get the chance of a species that I do not have and then my first task is always to get it into flower with the aim of getting a crop of seed.

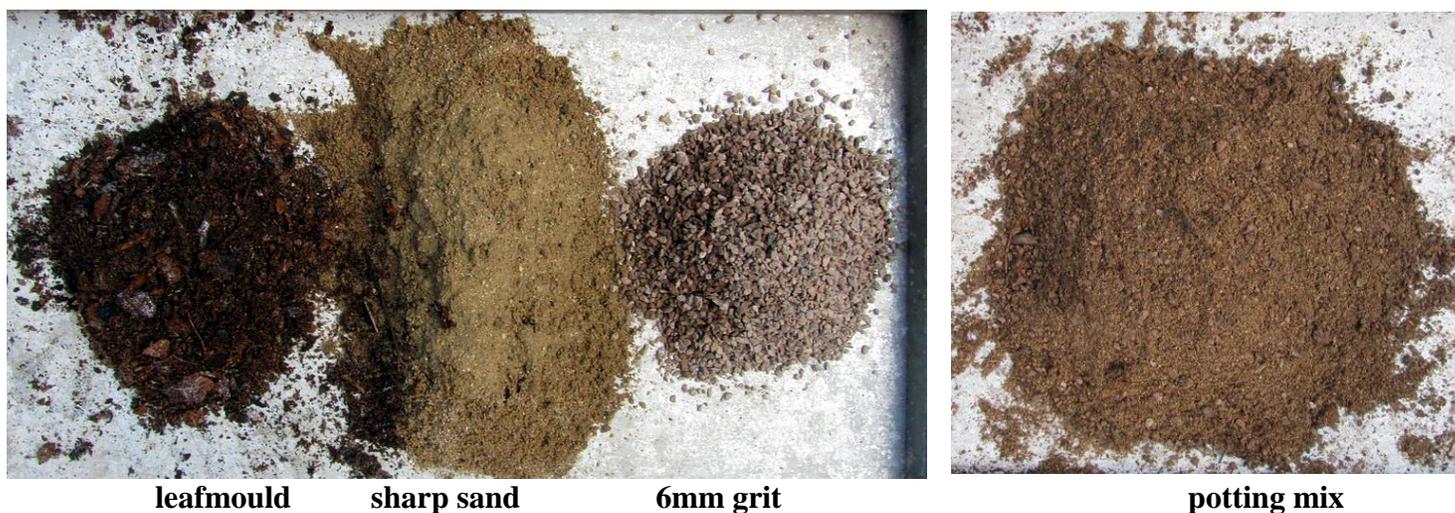
TOLERANCE SHIFT

Raising plants from seed not only gives us young, healthy, vigorous plants but also provides many individual clones that not only display visual variation but can also have different tolerances to environmental conditions and disease resistance. To have a large planting of a single clone of any plant brings the risk of total loss as has been proved where large-scale growers have lost thousands of plants when a particular disease or rot sweeps through the entire mono-planting, as the clone they grow has no resistance. If they had the same number of plants made up of many clones some would likely prove resistant to the pathogen and survive.

As growers we can take advantage of the tolerance shift that each individual seedling will have. As part of their evolution, plants have evolved a successful strategy where each individual will have a slightly different tolerance to environmental conditions. To put it simply some seedlings will tolerate hotter conditions while others grow best in cooler temperatures likewise there will be a variation in how they can survive wet or dry conditions. When we raise a group of seedlings some will die off in the first year – these are the ones that do not like your garden conditions. Others may die before they reach maturity however the survivors can obviously best tolerate your growing conditions. If you raise these to maturity and then sow their seeds these second generation seedlings will go through the same self-selection processes becoming even more tolerant of your conditions and so by natural selection each subsequent generation will become further adapted to your local conditions. In this way it is not the grower that selects the seedlings but the seedlings that select us as their tolerance shifts towards our garden. Using this method we have adapted some of the species that are considered more difficult to grow in our climate, such as *Erythronium montanum* and *Erythronium sibiricum*, to forms that will grow well.

GROWING FROM SEED

The potting mix



I use our standard recipe of potting mix which we prepare ourselves. Measured by volume it is two parts loam (which can be replaced by a sharp gritty sand) one part leafmould and two parts sharp 6mm grit to this we add some bone meal, which provides low levels of Nitrogen and Phosphorus, released slowly over many months. Years ago we had quite a lot of lawn grass areas in our garden: these were gradually lifted as we realized that the most boring plant in the garden required the most work so we gradually lifted it to extend the planting areas. As we lifted the turf we stacked it into large piles which over the years rotted down to provide us with a supply of fibrous loam which we used in our potting and seed composts. Since we have now used up all of that loam I have replaced the loam content of our potting mixes with a sharp gritty sand – this has proved just as successful for us.

The important thing about any potting mix is that it must remain “open” - able to hold both air and moisture while allowing excess water to drain away quickly. Depending on the loam/sand you have available you may need to adjust the amount of grit you add to achieve these properties. It is a good idea to test your mix by putting some into a pot and watering it until the pot floods to the rim then watch – the water should drain away in around 30seconds - if the water does not drain away quickly you will need to add more grit. This test will only work properly if your mix is moist to begin with. If your mix is completely dry it will resist the water so you will need to wet the test pot until it is just moistened this reduces the resistance of the surface tension - then you can apply the drainage test. We now have a steady supply of leafmould which has become our first choice for our potting mix because it helps retain moisture as well as adding some nutrients to feed the bulbs. You could use some of the other forms of humus if you cannot get leafmould. I have found that some Erythronium do not grow well if there is too much peat around them so I would recommend that you avoid this material if you can.

If you garden in a very warm dry area you may also have to further increase the amount of humus in the potting mix or water very frequently to help keep the bulbs moist.

Storing the Seed



I collect the seeds when the capsules are plump and there are signs that the plant is going into its summer rest – in our garden this is around June/July depending on the season. It does not matter if the seeds are green or brown when you collect



them - the only difference between the green and brown seeds is that the outside coat of the brown ones is drying out and hardening up.

What I do next depends on whether they are Type 1 or Type 2 seeds.

Type 1, those species from Western North America, I cut the stems complete with seed capsule and place them upside down into paper packets – these are placed on a shelf in a dry, shaded shed to sit for the summer. It is a good idea to check the packets from time to time to ensure there are no small grubs or insects feeding on the seeds. **I ought to point out that on no account should you place any fresh bulb seeds into a fridge.** The seed continues to develop for some six or eight weeks after it parts company from the parent and placing these seeds into the cold environment of a fridge can arrest this continuing development harming the seeds' viability.

I am often asked why I do not copy nature and sow the seeds immediately they are ripe to which I answer that you must consider all the facts before you draw conclusions. In nature the Type 1 Erythronium seed is shed into a climatic season that provides a generally warm dry environment. When the seed ripens in our garden the weather can be cold and wet and remain so all summer long which can cause fresh-sown seeds to rot, so by storing the seeds in paper packets, kept warm and dry for the summer, then sowing them in late August I am imitating, as closely as I can, the conditions that the seeds experience in nature.



Type 2 seeds are more of a woodland form and have evolved to be shed into a cooler moist ground conditions so when possible I do sow these immediately they are ripe. If they are to be stored this is best done by placing them in some just-moist medium such as moss, sand, vermiculite, or similar, to prevent them totally drying out. If they have been dried they will still germinate but that germination may take longer and be sporadic over a number of years.

Soaking the seed

All Erythronium seed stores quite successfully and reasonable results can be achieved from even two and three year old seed however the seed is best sown around the end of August in its first year - this will always give a quicker and better germination. I always soak any dry stored seed overnight in some water to which I add the smallest amount of soap - just enough to break the surface tension. The method I use for soaking is to place the dry seed into a small plastic pouch to which I add a small amount of water - by the morning you should notice that the seeds have rehydrated, plumping up considerably.

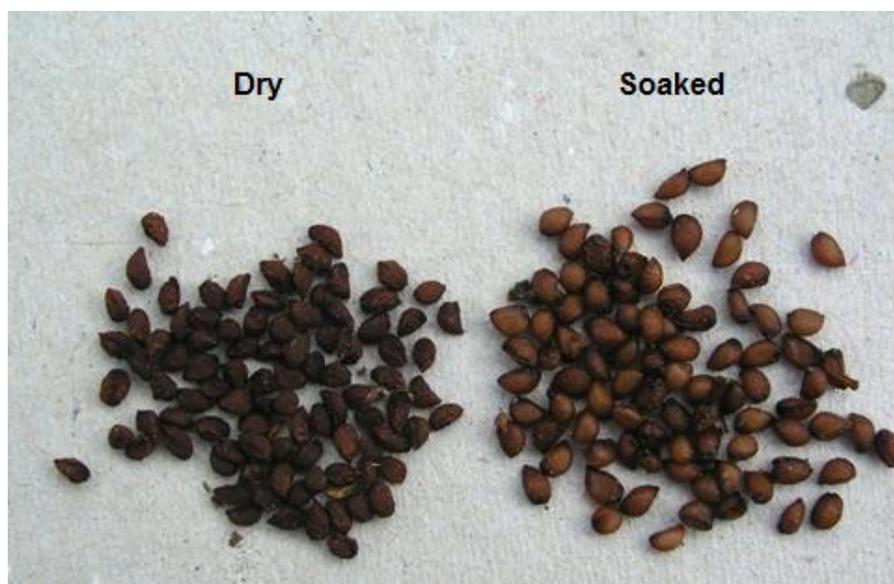


Dry seed

Seed soaked over night



Sectioned seed showing the white embryo, near the pointed end, surrounded by a starch food supply.



Using this method I get a near 100 percent germination in the first spring while non-soaked seeds germinate sporadically over two or three springs.

My choice of pots for sowing Erythronium seed are square, 12cm deep plastic pots of varying sizes from 9x9cms up to 13 x13cms - these sizes will easily accommodate fifty or more seedlings.

I have written a lot in the Bulb Log Diary about how I sow certain types of bulb seed at depth. Understanding how the seed is shed and distributed in the wild gives the biggest clue as to whether to surface sow or sow at depth.

Sowing the seed

Early in my seed sowing experiments my instinct was that because Erythronium bulbs seem to take themselves to great depth, the seeds would be best sown deep, however my trials led me to understand the link between the seed distribution strategies and the ideal sowing depth. I realised that the Western North American species, which are mechanically distributed, should be surface sown. However the seeds of the Eastern American and the Eurasian Erythronium all have elaiosomes and so my inclination was to sow them deeply. I have over many years conducted numerous trials to check this hypothesis



Erythronium sibiricum seedlings

Above is one such trial using Erythronium sibiricum where the seed in the large pot was surface sown and germinated well – I sowed the seed in the other pot deeply and like all my other trials I got no signs of germination. The failure of the deeply sown seed to germinate has puzzled me for years challenging my hypothesis- I had failed to take into account that all Erythronium seedlings come through the ground bent over, shepherd's crook fashion, and not pointed-end-up like those of Narcissus, Crocus, for instance, which also have elaiosomes.



I tipped out the pot, with no signs of growth, containing the deeply sown seeds and did find some seed had germinated but because of the way the new growth is bent over the blunt edge was unable to push its way to the surface. This confirmed what I have been thinking that we need to take both the method of seed distribution along with the way the seed germinates into

account when deciding how deep in the compost we should sow the seeds.

All Erythroniums should be surface sown for best results.

Type 1 Erythronium seed is mechanically shaken from the seed capsule and so I conclude it should be sown on the surface - only covered with a few centimetres of gravel. All my trials with other bulbous plants suggests to me that Type 2 seeds, because they have elaiosomes and are ant distributed, might be best sown deep : however all my trials to date sowing Erythronium Type 2 seeds deeply have been failures - as explained above – **so these should also be sown on the surface just as for Type 1 seeds.**



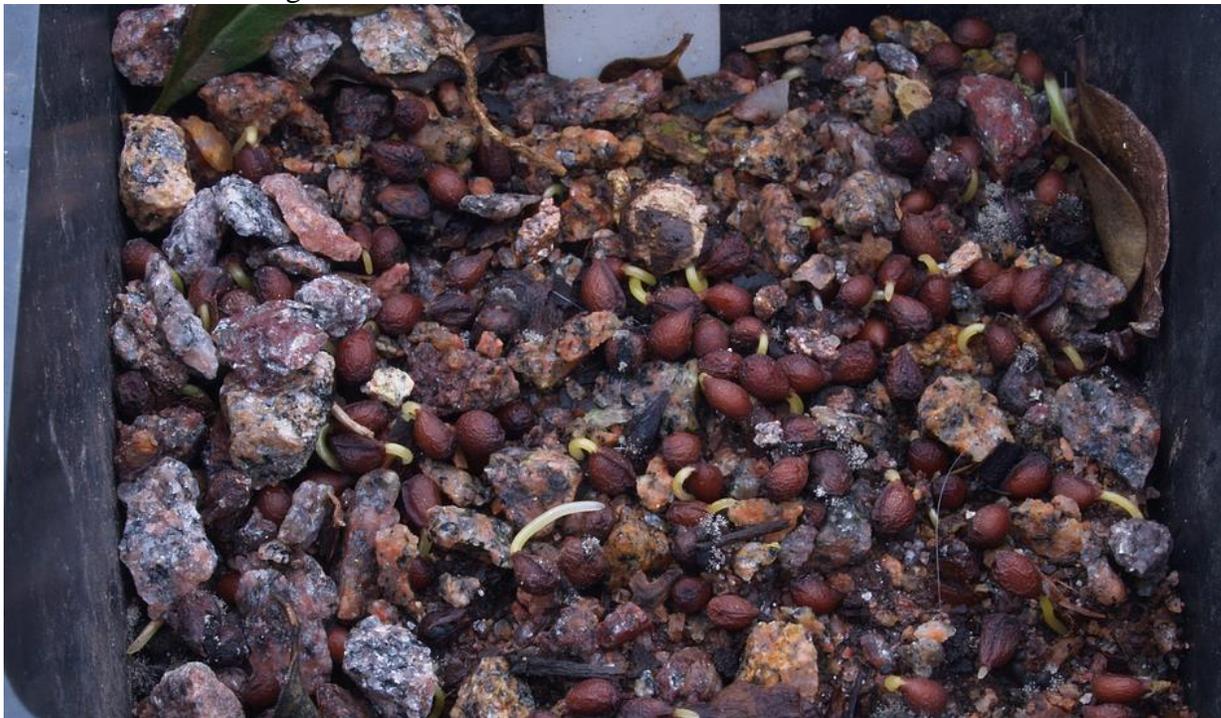
Fill the pot to around 1 - 2 cm of the top, tip your soaked seed out and spread it evenly then cover with a layer of 3mm to 6mm



gravel, water well and place in a sand plunge left open at all times, until germination.

Germination

A good proportion of freshly sown seed will normally germinate in the first spring but rarely 100%. The grass-like shoot will poke through the gravel, bent double at first before straightening out to its full height. The seed capsule is very often still attached to the end of the young leaf when it extends - do not be tempted to remove it you are liable to do more harm than good.



Seeds sown in late summer to early autumn can start to germinate as early as January.

Erythronium hendersonii is normally the first for us, the first growth is a root like structure that always emerges from the pointed end of the seeds.

Germinating seed

First year seedlings



Once the seed has put down the root it sends up its first thin grass-like leaf, at the same time a stem-like structure pushes down into the ground and the young bulb starts forming towards the bottom of this structure.



It bears repeating that the seed coat often remains on the top of the young leaf, do not be tempted to remove these as they do no harm and you are only likely to damage the leaf tip by trying.

If your seed was stored and not sown until early in the year, January/February, it may take two seasons to get any germination and a further three years to get maximum germination so it can be a slow process. You may wish to note the number of seeds that you sow on the label this will let you know what proportion have still to germinate. Once a pot has started to germinate some overhead protection is advisable, especially during periods of bad weather – I place an overhead cover that is open at all sides over the seed frame. We find that the seedlings are perfectly hardy as far as the cold is concerned but can suffer from the physical battering that rain, hail, snow and wind can inflict. Also watch out for slugs and snails which can devour an entire pot of fresh new seedlings overnight.



Unfortunately the manufacturer of one of my favourite deep plastic pots has designed a nice 'slug nest', indentation, into the bottom!





First year bulbs

Keep the seedlings growing as long as possible making sure that they never dry out while in growth. Apply quarter strength, tomato type (higher in K than N), liquid feeds at two week intervals to help build the young bulbs. You should find that seedlings can keep growing much longer than mature plants and will often grow until August if kept cool, moist and well fed. An extra few weeks' growing time now can save a year on the time it takes to get a flowering sized plant.



First year leaves



second year



third year

The thin grass-like leaf of the first year is replaced by a short but broader leaf in the second and then a bigger version appears in the third year. Markings on the leaves will only start to appear in the third year for those species that have such markings, the full extent of the markings will not be evident until the bulbs are at least five years old.

Second year seedling



In the second year of growth a single wider leaf appears and roots grow from the base of the young seedling bulb and once these are established a stem grows from the bottom of the young bulb pushing down into the ground. In this way, over the next few years, the bulb will gradually work its way down deeper into the ground. It is difficult to know what depth the bulb will ultimately reach if left to its own devices. It is not an optimum depth of soil above its head that the bulb is trying to achieve but an optimum condition relating to the ground temperature and moisture levels.

Pricking out

We never prick out Erythroniums in their first year as the bulbs are quite small and invariably there will be more seed to germinate in the second and third year. It is normal to get some new germination in the second year and this will occur before the leaves of your one year old seedlings appear so your pot will have a mixture of first and second year bulbs but the treatment for the seed pot is the same as for the first year with regular liquid feeds. I generally prick out at the end of the third growing season, usually in July or August.



Always be careful when you pick up the pot as Erythroniums have a habit of escaping through the drainage slots into the sand plunge below or more annoying half in the pot and half in the plunge this requires careful surgery to cut the pot away without damaging the bulb. If you do break a bulb in two do not fear that it is a total loss; just plant both the bits and at least one part, sometimes both, will still grow. [See more on this in the chapter on Bulbs.] Because we use the square plastic pots you can get a good idea of what you can expect to find by feeling the sides; if you detect a bulge then you should have a good crop, the fatter the bulge the better! It is

amazing just how much a plastic pot can be distorted by the growth of the bulbs inside, and I have to admit to being a compulsive pot feeler when it comes to bulbs.

The young bulbs are tipped out and carefully separated from the old potting mix. Constant shaking in a tray, like you would do if you were panning for gold, helps to bring the small bulbs to the surface.



Due to the erratic germination you may have bulbs of very different sizes, one, two and three years old.

The first year a bulb germinates it does not go very deep, in the second and the third year the bulb pushes further down into the ground often forming a very long, thin, brittle bulb that should be handled very carefully.

If there are a small number of bulbs they are repotted back into the same pot with fresh compost where they may stay until they flower. The 9cm x 9cm pot can accommodate ten bulbs up to flowering size quite satisfactorily. If we have sown the seed very thickly, which is our normal habit,

then we have to either split the contents through several pots when we prick out or use a suitable size of polystyrene fish box trough. At three years old the bulbs can also be planted straight into the garden.

This five year old pot of seedlings (right) has not been potted on and shows a range of seedlings from three to five years old. The nicely marked leaves are now in their fifth year



and are showing their true colours the others are not old enough to have developed their full patterns yet although you may just be able to detect some faint markings appearing on the three and four year old plants.



Mesh basket



Painted polystyrene (Styrofoam) box

Nowadays when we are sowing a large quantity of seed, 100 plus, we tend to sow straight into either a fish box trough or mesh plunge basket. Sowing them into these bigger sized containers can cut out the need for the pricking out stage. The trough is top dressed annually and liquid fed during the growing season and we do not need to repot until we have flowering sized bulbs. To do this it is essential that you have a good compost that will retain its structure for the five to seven years required, that is why we like to mix our own. We have found an ideal size of polystyrene box for growing bulbs it is 39cm x 30cm and is 29cm deep.



Bulb pushing into polystyrene base.

After five years you will find most of the bulbs have made their way to the bottom of the box, some even push through the polystyrene trying to get ever deeper – in extreme occasions I have to break the polystyrene box to recover the bulbs that are lodged in the base.

In good circumstances you may get the first flowers after five years from seed. Immature Erythronium bulbs with a single leaf will not flower - it is only when it produces two leaves that it will flower.