ERYTHRONIUMS IN CULTIVATION

My aim with this book is to use my photographs to fully illustrate the plants and methods I use to grow Erythroniums so sharing my knowledge with other gardeners. Because it is based entirely on my own experiences and observations it is not a comprehensive list of all the known species but a record of the ones that we have grown and flowered in our garden.

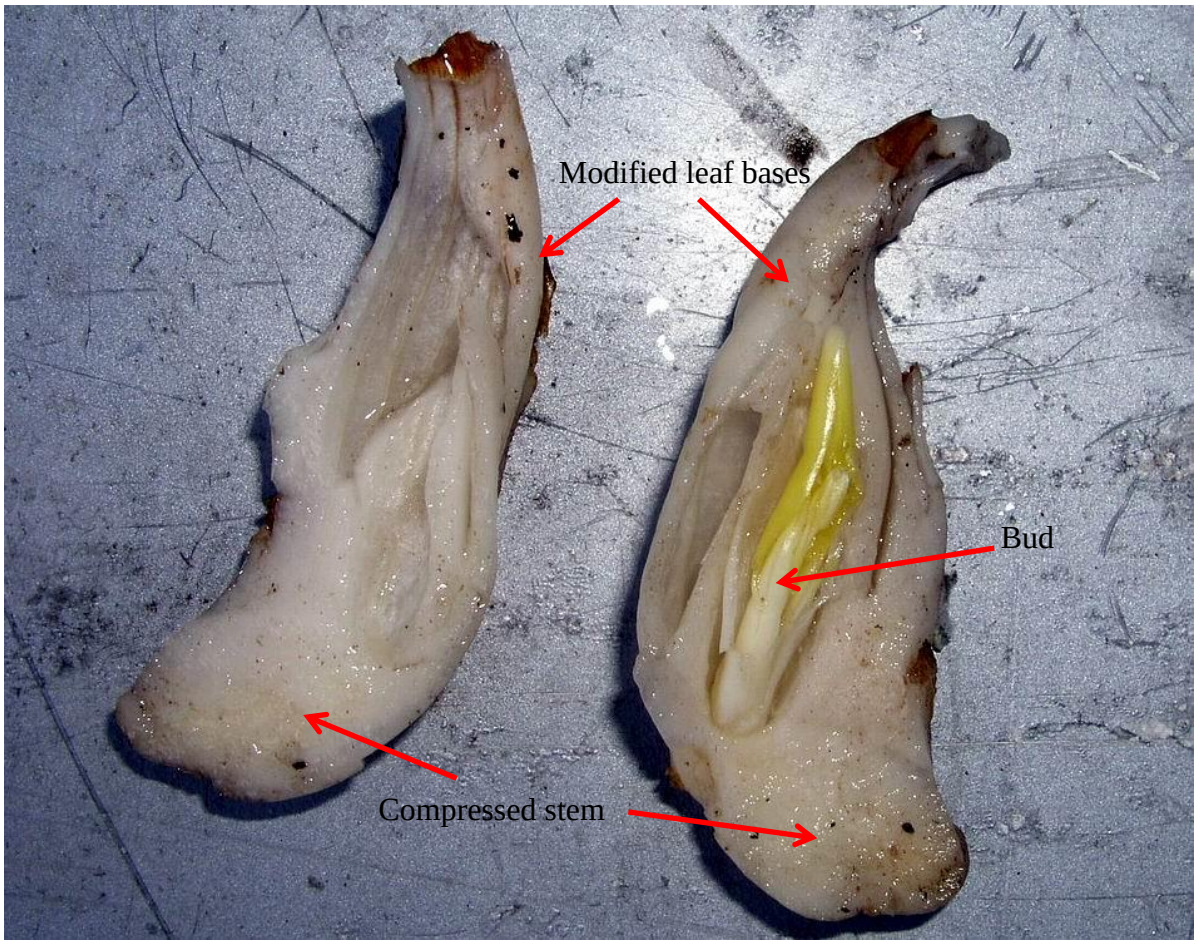
The first section of the book looks at the structure of the plant and the methods we use to grow and propagate them this is followed by a detailed look at the various species we grow as well as a range of the garden hybrids.

Thanks go to Margaret Young for her support and help with editing and correcting my words also to Carolyn McHale for additional proof reading.

THE BULB

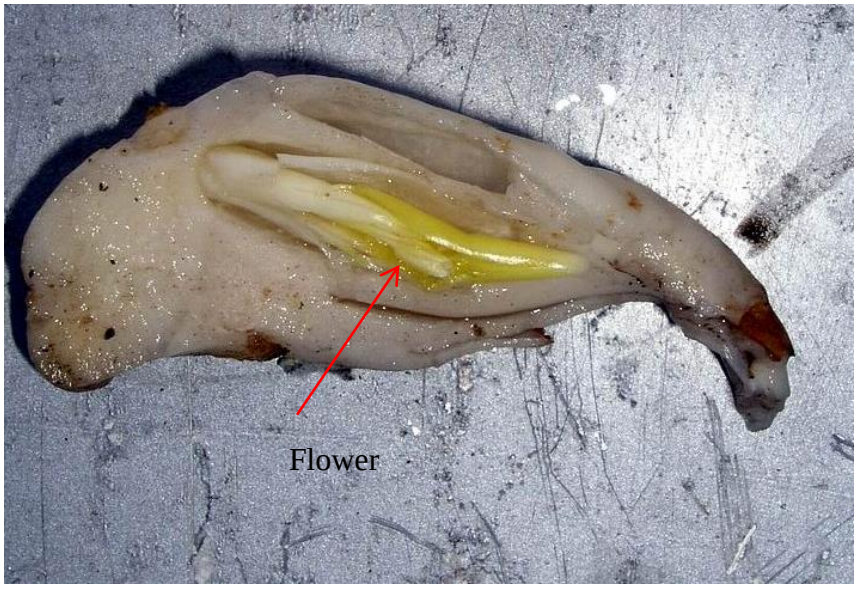
People tend to want to categorise bulbs into one of the botanically defined structures of being either a Bulb, a Corm or a Tuber. *Erythronium* are considered to be a Bulb however I believe they are fascinating structures that defy the simple term of being just a Bulb. To fully understand the structure of the *Erythronium* bulb it is necessary to dissect it to reveal the true nature of the different parts. This bulb was cut in July while it was in its summer state, or aestivation.

At the base is a compressed stem with the main bud, which will be next season's growth, sitting on top of it. This bud is surrounded and protected by a sheath of modified leaf bases.



Bulbs have evolved to respond very quickly to a short favourable growing season, usually in spring, followed by a long dry summer when conditions are not favourable to above ground growth, with growth in the form of the roots coinciding with the return of the rains in autumn.

In the spring Erythroniums rush into growth producing leaves, flowers and seeds, in a relatively short period before retreating back under ground for the summer.



That is what we see above ground but growth is also happening below.

As the spring flowering period peaks the new bulb is forming underground and will be fully formed before the plants become dormant. Fertilised plants, which are forming seeds, will grow on for longer than non fertilised ones. As the season progresses next spring's plant is formed in miniature, complete in every detail, within the bulb before the plant enters its summer rest. During aestivation the shoot grows very slowly, sustained and protected by the bulb, for up to ten months until favourable growing conditions return.

We often call this the dormant period but growth of the tiny new plant within the bulb continues very slowly through the summer - in late summer and autumn new roots will emerge responding to availability of moisture.

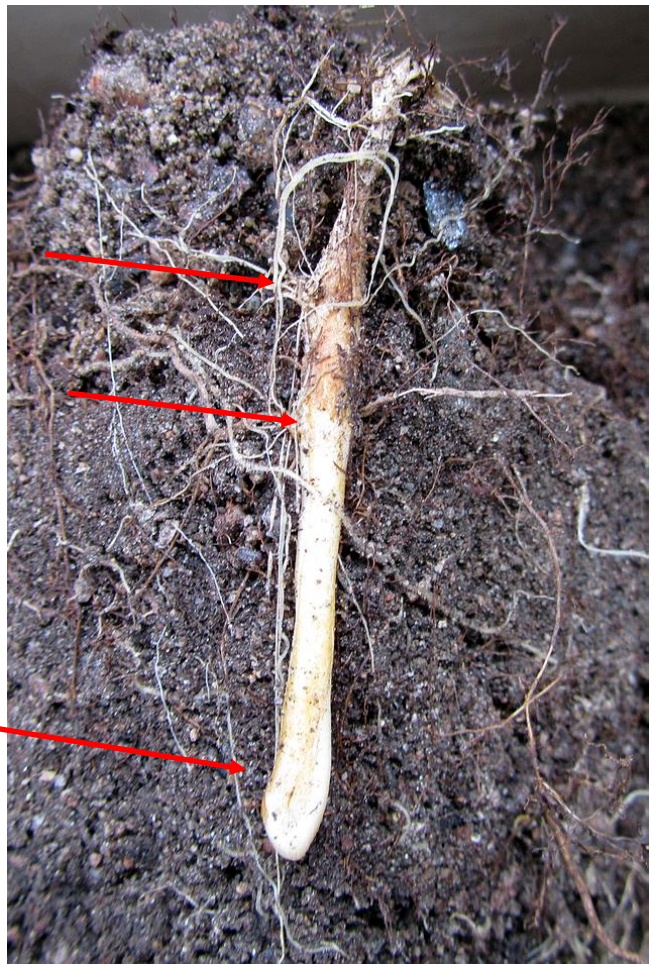
Erythronium bulbs replace themselves every year - the stem grows through the top of the bulb, left, then during the course of the growing season the current bulb shrinks away using most of its reserves, while a new bulb forms at the base of the stem. During this season most of the bulb's food store will be used up or passed on to the new growth except for that part of the bulb formed from compressed stem, which persists to varying degrees attached to the base of the new bulb. The annual roots can be seen attached to the base of what remains of the old bulb.

Bulbs start taking themselves down into the ground starting in the first year of germination. The bulb (lower left) is a first year *Erythronium sibiricum* bulb and you can see the depth it has gone to from the colour of the leaf. The white parts were underground and away from the light: the young bulb forms at the base of the radicle stem, note also the root emerges separately. Above that is a second year bulb showing how it continues its progress down into the ground by again pushing a stem down below the root base.

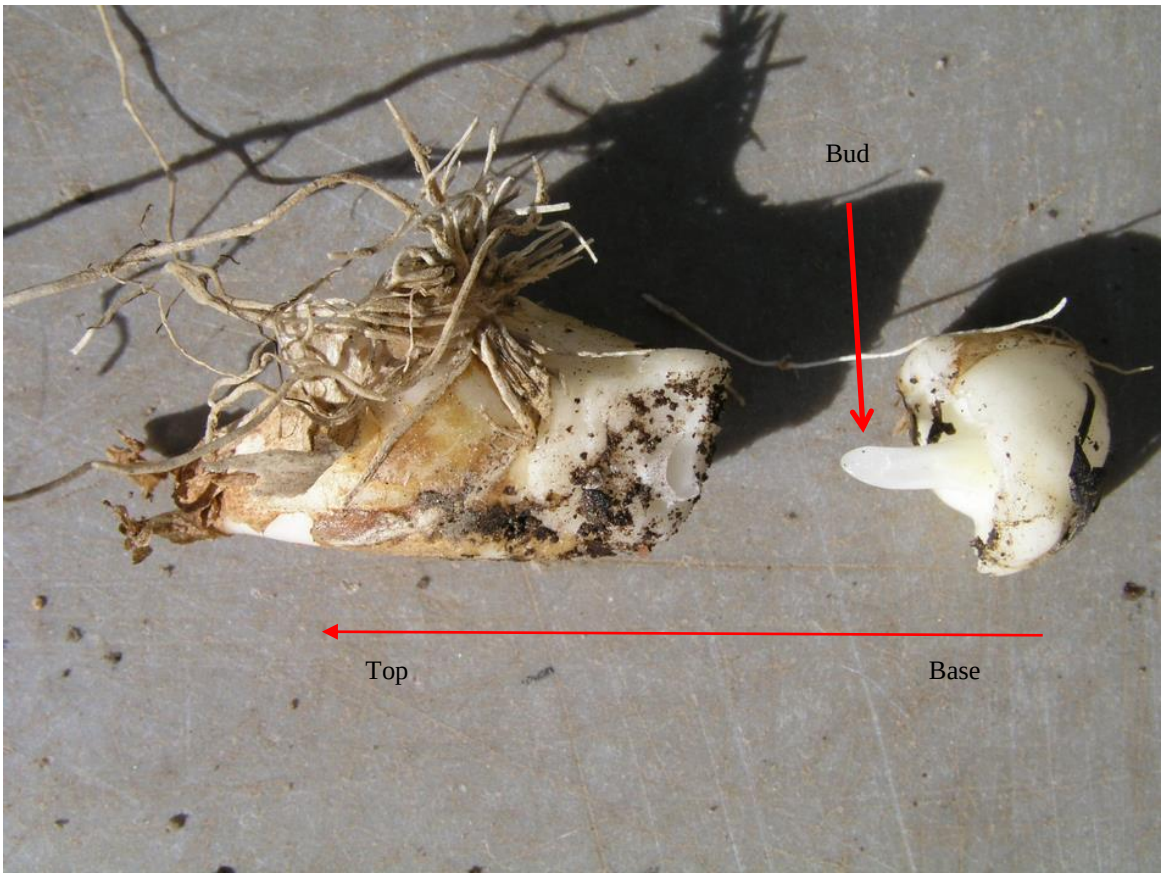
Non-flowering bulbs grow in the same way with just a single leaf growing from the top of the bulb - when the bulb is mature two leaves and a flower will appear. It is only when a bulb produces two leaves that you will get a flower: single leaved plants never flower.

We can learn so much by observing bulbs whenever we get the opportunity to handle them. The smaller of these two bulbs is one year younger and we can tell from the white pointed end that projects below the roots that it is still making its way down into the ground while the larger bulb, with a more rounded base, has achieved a suitable depth. It is not an **ultimate depth** that the bulbs are seeking but a suitable environment probably related to moisture and temperature so depth can vary from garden to garden.

Sometimes the bulbs become extremely long and thin as they push down into the ground. You can clearly see the remains of previous year's root bases along the length of these bulbs.



The next season's roots will emerge towards the base.



If you should accidently break an *Erythronium* bulb do not worry as not all is lost.
Provided the growing conditions are good the part with the bud will grow and could still flower.
The other part or parts of the broken bulb may also produce growths from dormant buds.
Under normal growing conditions these additional buds are supressed but with the removal of the dominant bud these additional buds may now grow.

Erythronium bulbs only have a thin partial skin, remnants of last season's leaf bases, which offers little protection to the drying out of the bulb – this is why the bulbs should not be out of the ground for any length of time and, if they are, they should be stored in moist sand, moss, or similar medium.
The persistent stem bases can be seen forming chains at the base of these bulbs.

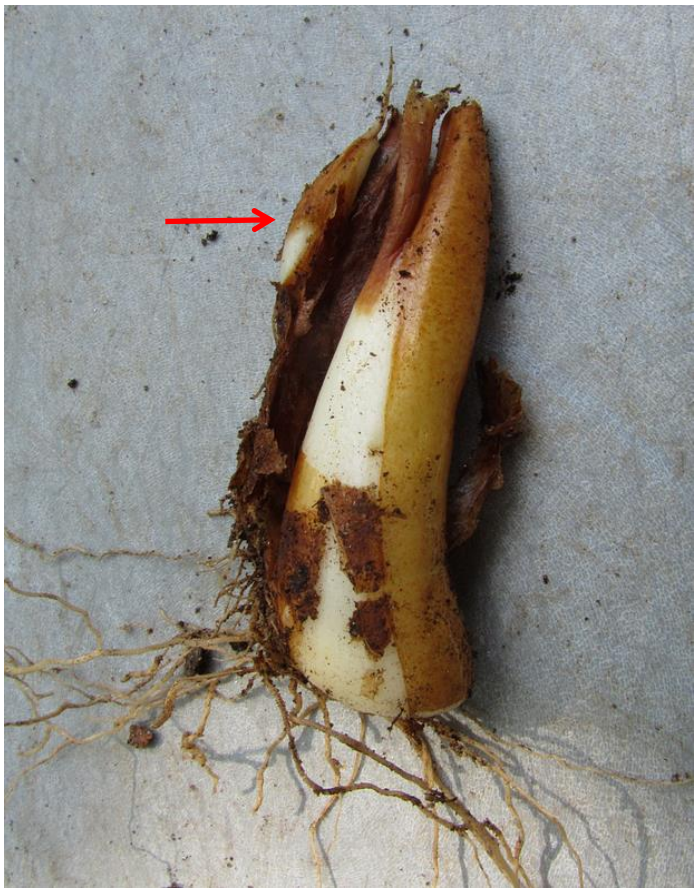
***Erythronium revolutum* bulbs**

The dried remains of the roots may also persist for a few years but are completely dead. Some bulbs will produce secondary shoots from the stem base adjacent to the chains.

Some bulbs take many years before even a tiny extra bud appears while others readily produce offsets (left). These are the forms (such as *Erythronium* 'White Beauty') that will quickly clump up making them excellent garden cultivars.

Even within a species you will find some clones that increase while others do not.

Bulb in autumn with new roots emerging.

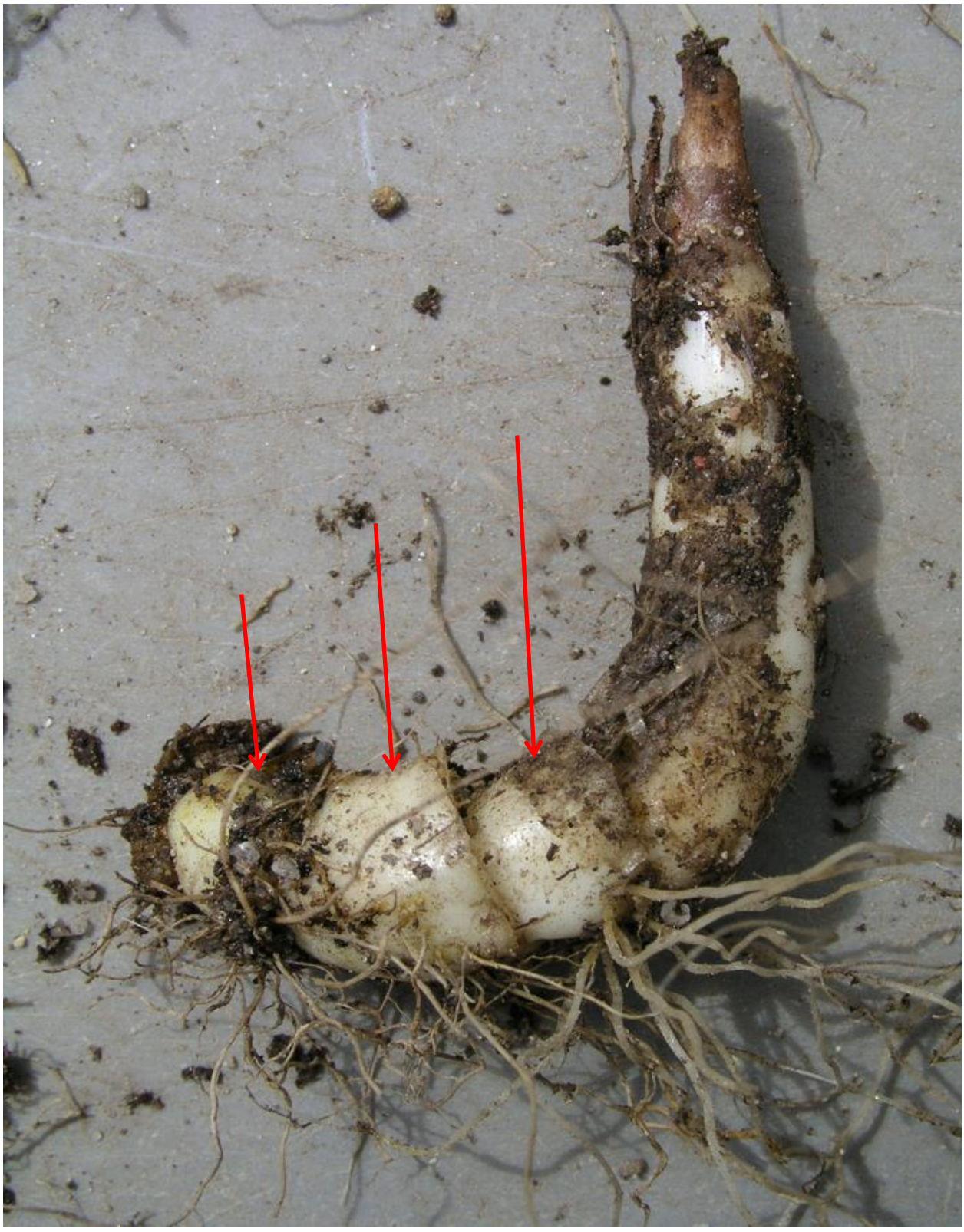


Bulb in late spring roots dying back.

In addition to the secondary growth buds at the base of the stem some forms may go on to produce extra growth buds higher up the stem. The picture (above left) shows an additional growth, complete with its own roots, still attached towards the top of the new bulb: on the photo (above right) this secondary growth has now become independent and is held in place only by the remains of the old bulb.

***Erythronium dens-canis* bulbs**

When the old bulbs do not die away completely they remain as an attachment at the base of the bulb forming a chain, much like a creeping rhizome.



Looking at the chains in more detail we will see the individual growths formed each year form the links in the chain. While the roots die after a year the links formed from the stem bases survive but will remain dormant as long as the dominant growth, the new bulb, remains attached. If we consider a normal plant stem, such as a Chrysanthemum, the terminal shoot/bud is always dominant often suppressing the side buds further down the stem from growing - removal of the main shoot will allow the secondary buds to develop and it is just the same with these *Erythronium* chains.

These perennial stem bases that form the chains are more prominent in some species than others and even within those species the size of the chains can vary considerably.

***Erythronium montanum* bulbs**

Erythronium dens-canis

***Erythronium* montanum**

I have experimented over many years, when repotting bulbs in the summer, by removing these chains then splitting them down into individual links - which is easy to do as they are only loosely joined together. These individual links are then potted up and grown on the same way as the other *Erythronium* bulbs. These chains are covered in dormant buds which will now burst into growth, sometimes one bud per link sometimes more - in some cases small leaves will appear above ground during the first year after splitting; other times no growth appears above ground until the second year however underground there are new bulbs forming.

New *Erythronium dens-canis* bulbs formed on chain links

Through the course of the year the old chain links will shrivel away as their reserves pass on to and support the formation of a new bulb. If these new bulbs are grown well they will reach flowering size in about three more years.

Breaking up a bulb can also result in dormant buds coming into growth. I originally discovered this when accidently breaking a fragile young bulb when repotting. Always replant all the parts and some if not all of them will grow on.

***Erythronium albidum* bulb**

The eastern North American *Erythronium* bulbs differ slightly in that their shape tends towards a more classical bulb shape rather than the elongated shapes of the other species; some are also known to produce stolons.

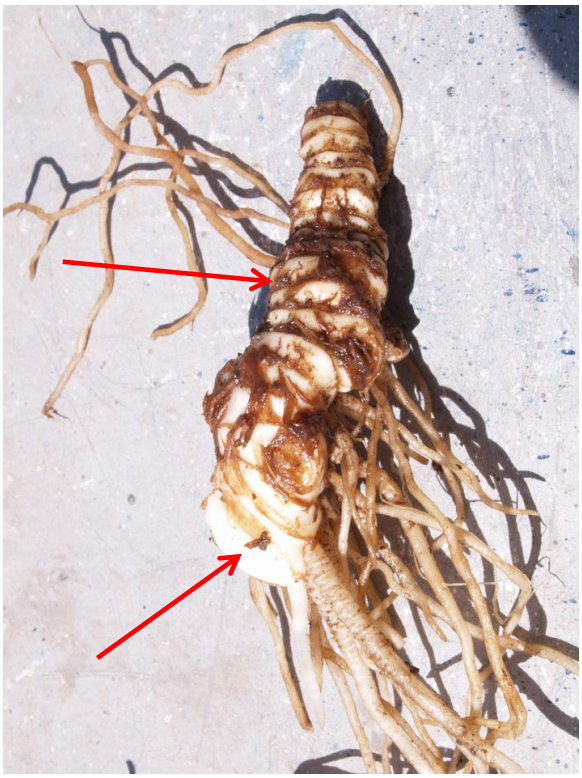
***Erythronium americanum* bulbs**

The form of *Erythronium americanum* which is perhaps the most commonly grown has a habit of sending out stolons, often a number from a single bulb, which results in a lot of small bulbs that never mature enough to produce a flower. In turn these small bulbs send out more stolons and so this cycle continues with lots of leaves and few flowers.

***Erythronium americanum* bulbs with stolons**

There are many stories of how to encourage the stoloniferous forms of *Erythronium americanum* to flower; most are myths but some forms will form mature bulbs and flower most years.

Mature flowering sized bubs of *Erythronium americanum*.



Studying the bulbs carefully we can see that rather than being a simple structure *Erythronium* combine elements of a bulb, a corm and a creeping rhizome. If we compare *Erythronium* (right) to *Trillium rivale*, (left) we can see there are similarities, both having the main bud at the front with the remains of previous years' growths attached. The previous growths in the *Trillium* are formed into a single structure, the annual links marked only by a slight scar on the rhizome, unlike the chains on the *Erythronium* which are minimally attached together –also the *Trillium* roots remain active for more than one year.

As well as being botanically fascinating they can also be very attractive - this *Erythronium tuloumnense* bulb grew down until it hit the bottom of the pot, turned sideways and ended up looking reminiscent of a reclining figure sculpture by the late Henry Moore.

THE FLOWER

THE FLOWER

Erythronium flowers are very elegant to look at especially when their petals reflex giving them their pagoda-like appearance.

They are instantly recognisable from the way they hang their heads and reflex the tepals in suitable conditions.

In many ways they are similar to tulip flowers and indeed these two genera are closely related.

Erythronium revolutum

Tulipa have evolved and adapted to growing in hot dry climates, allowing their flowers to face upwards without the threat of water damage while *Erythronium* populate regions that are cooler and wetter during the flowering season so they have evolved to protect their reproductive parts, like an umbrella, by holding their flowers in a downward facing manner when it is cold and wet.

Erythronium californicum

Erythronium flowers have evolved to respond to the changing weather conditions by opening when it is warm and dry then quickly closing when the temperatures fall and/or rain comes.

Erythronium oregonum

Occasionally you may find an *Erythronium* that has not inherited the nodding flowers but looks upward like a tulip – we have one *Erythronium oregonum* that does this every year (left).

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The flowers are borne singly or in multiples on a leafless stem - the maximum count of eleven flowers on a single stem of a hybrid in our garden was quite exceptional. The size of the flowers varies from quite small flowers, 2-3cms across in a few species, to large flowers of some 15cms across in others.

The flowers were fully formed in miniature within the bulb before it went into the summer rest.

In the spring when the stem first pushes through the ground the buds are still quite small and usually have a greenish tint but they quickly expand taking on their true colour by the time the flower opens.

Erythronium elegans

Erythronium grandiflorum

Erythronium revolutum

The flower colour is the first indicator to guide us in the identification of the species and there is a range of colours from white through yellow to pink and purple.

Erythronium hendersonii

Erythronium japonicum

Many *Erythronium* flowers also have contrasting colours towards the throat, including dark attractive zig-zag patterns in some species, all contributing to their alluring charm. These markings have obviously developed to help attract and guide insects to visit and pollinate the flowers.

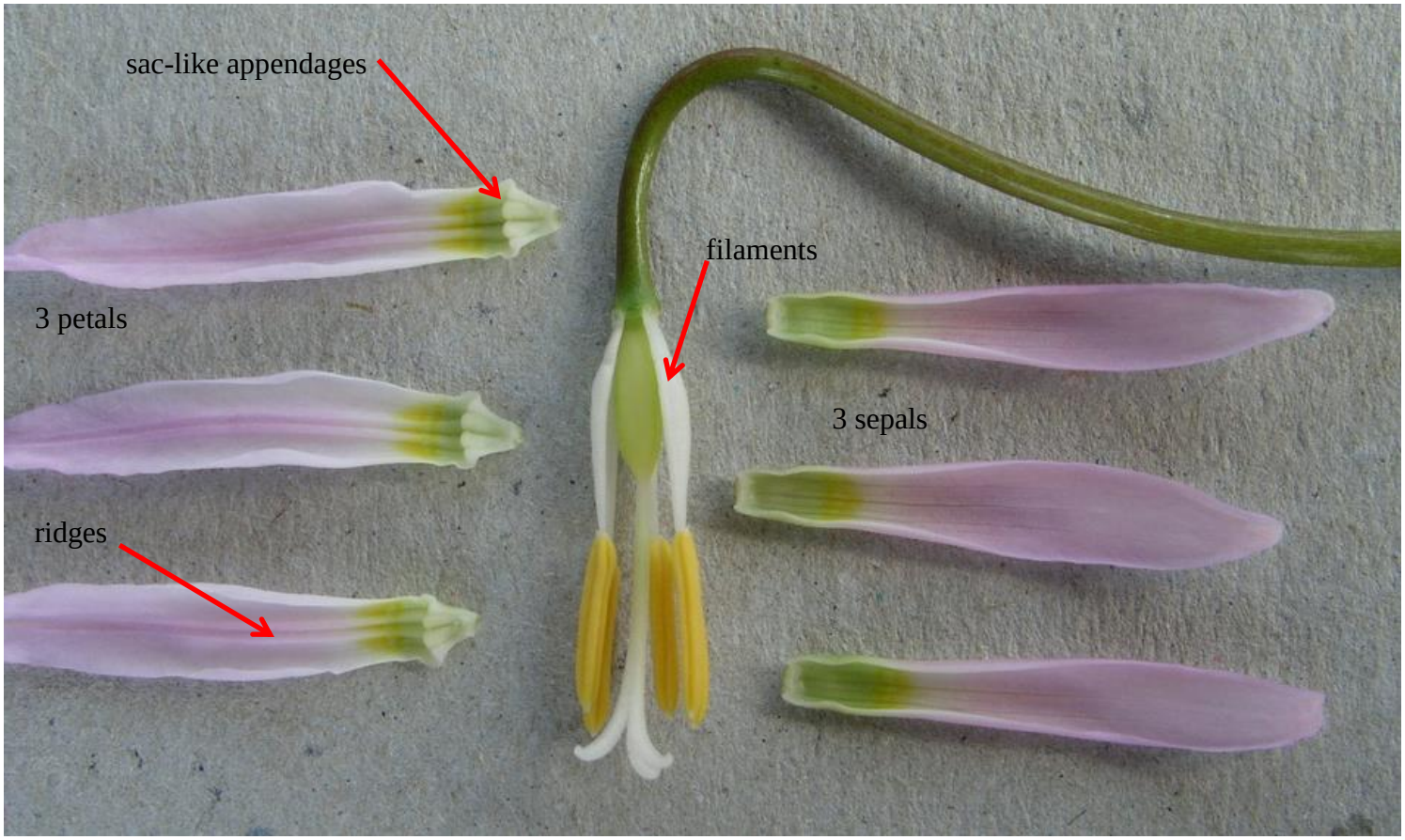
Erythronium oregonum

Erythronium elegans

The flowers of some white/cream, species can take on a pink tinge as the flower ages – this is due to the development of anthocyanins, which are red in colour, at this time.

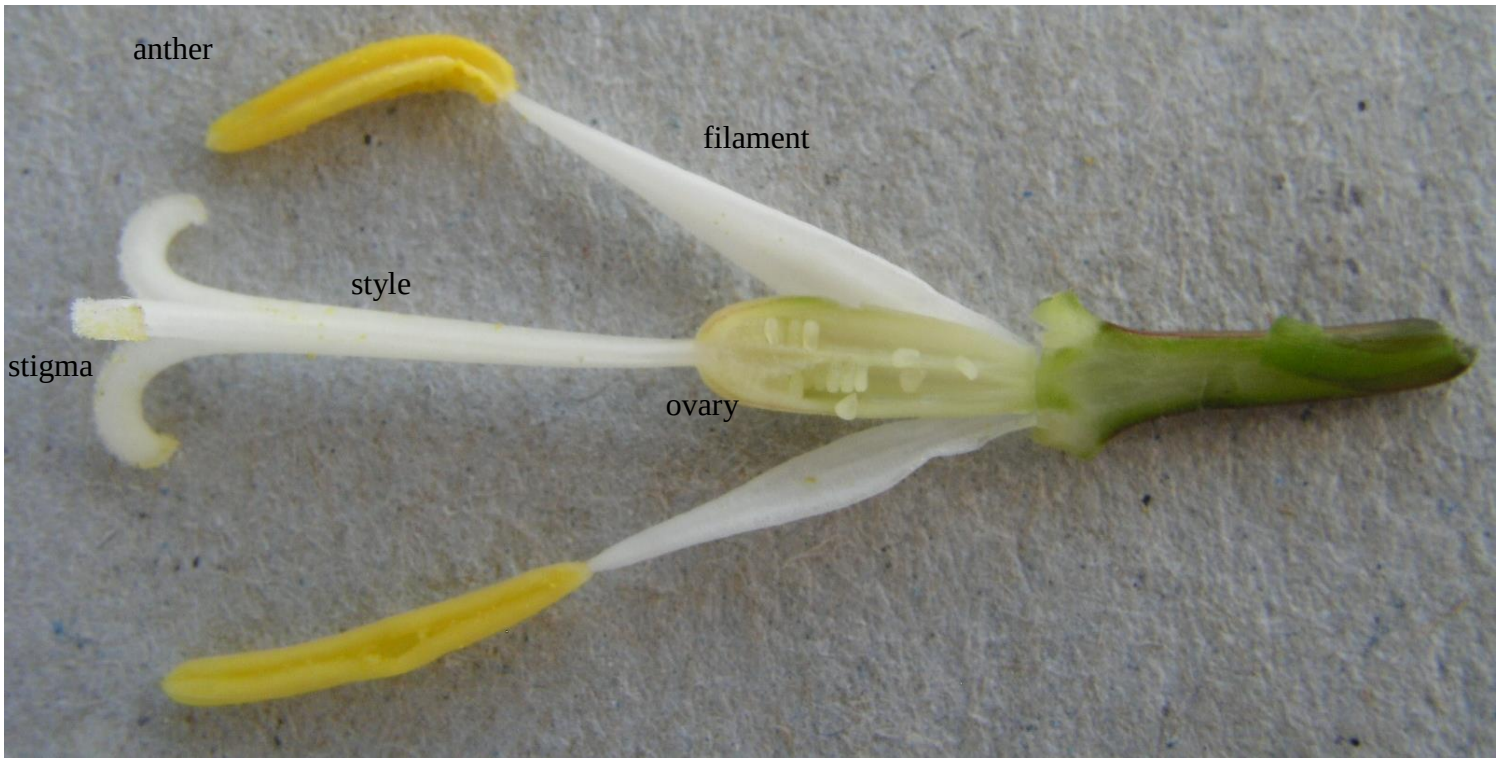
Tepals is the botanical term applied to the floral segments of a flower and *Erythronium*, being in the family Liliacaea, has flowers made up of six tepals - the outer three are sepals, these wrap around and protect the inner three, which are true petals, while the bud is closed.
In *Erythronium* all the sepals and petals look similar and in general gardening terms all these parts are usually simply known as the petals.

Erythronium revolutum



Erythronium revolutum

Along with colour the main features of the flower that are used as diagnostic for the identification of the species are the presence and shape of sac-like appendages found at the base of the inner three petals which are present in some species, the shape of the filaments that connect the anthers to the flower, the shape of the tip of the style. The colour of the pollen on the anthers is used in distinguishing species in the Eurasian plants but less so in the North American species where it is only used at a varietal level. Ridges run from the base to the tip of the outer three petals arising from the sac-like appendages - the purpose of these appendages is not fully understood.



The ovary and style, with the stigmatic surfaces at the tips, make up the female part of the plant while the male part, the stamens, consists of the filaments holding the pollen-bearing anther. The immature seeds, gametes, are already partially formed in the ovary just awaiting the pollen to grow down from the stigma through the style to fertilise them.

Erythronium helenae

The main purpose of a flower is to both protect the pollen and stigma from wet weather and to attract pollinators in to fertilise the plant.

The main pollinator of *Erythronium* in our garden (apart from me!) seems to be smaller flies (like hoverflies, left) and other insects.

The bumble bee is not aerodynamically designed to get inside a downward pointing *Erythronium* flower; this does not stop it being attracted to the sweet nectar reward so it breaks in through the back of the flower leaving a series of holes as evidence of its raid.

Bumble bee “breaking and entering” and a resulting hole.

SEEDS

Erythronium sibericum 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 the 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 if a particular disease or rot sweeps through the entire mono-planting, when 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 who 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

leafmould sharp sand 6mm grit

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.

For **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 from woodland forms 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.

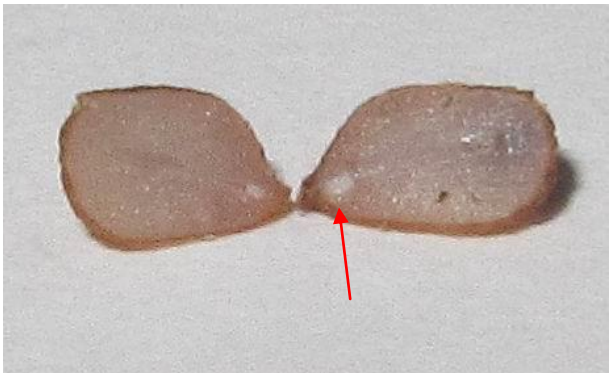
Soaking the seed

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 rich 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 are often taken underground by insects 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 to rake them off.
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 on the label the number of seeds that you sow, this will let you know what proportion have still to geminate.
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 annoyingly, being 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 form three to five years old .The nicely marked leaves are now in their fith 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.

GROWING IN CONTAINERS

Depending on your local weather *Erythronium* can be relatively easy to grow in containers – one thing they do not like is for their bulbs to beome too hot when they retreat underground during the summer. I grow them in containers of various types and for a number of reasons - from previous chapters you will see that I sow a lot of our seed into containers where the young plants will stay undisturbed for at least three years or more, mature plants are also grown in containers for my studies and to enable easy division of the bulbs on a regular basis - I like to try to repot these every second year.

The containers I use are square plastic pots, plastic mesh baskets, as used for planting aquatic plants in ponds, and polystyrene fish-boxes. The main criterium to understand when selecting containers in which to grow *Erythronium* is that they should be as deep as possible. I have never grown Erythroniums in clay pots but see no reason why you could not do so provided they were deeply plunged to keep them moist and cool during the critical growing season.

Plastic pots

Plastic pots are ideal for smaller amounts of bulbs as well as seed sowing - I use 9, 11 and 13cm square plastic pots that are 10 to 12cm deep. These are not surrounded by sand because when placed close together on a bed of sand in an open frame they become almost self plunging with the rims touching.

Escaping bulb

Newly repotted pots stacked waiting to be placed into the frame on the right which has been leveled to receive them. I should warn that when you lift pots of *Erythronium* out of frames always be aware that the bulbs may be escaping through the drainage holes into the sand plunge below - the longer you leave the plants between repotting the more likely this is to happen. I have even experienced a seed pot containing no bulbs five years after germination only to find a bunch of lovely bulbs growing happily in the sand plunge below the pot.

Once all the pots are labelled and placed in the frame I will sometimes mulch over the entire surface with some composted shredded prunings. I find this helps control the growth of weeds and liverworts better than the gravel which is traditionally used. A mulch also reduces the evaporation rate helping conserve the moisture.

The same frame of pots in full flower the following spring.

Two years on this same frame is almost ready for repotting - once I have collected the seeds.

MESH BASKETS

The mesh baskets that I use are intended for planting aquatic plants in ponds and have an all over mesh with holes of around 2mm in size. I use three sizes that are 30cms, 25cms and 20cms square and 18cms, 15cms and 9 cms deep - the sides and base are formed from a fine mesh of 2mm holes that help contain the bulbs while allowing roots to pass as well as the free exchange of moisture and nutrients with the plunge.

Most bulbs will be contained but there are always a few that will try and escape downwards by pushing through even the smallest of holes (2mm) in the mesh especially if they are not repotted often enough.
These baskets make it very easy to lift and repot the bulbs, preferably every two years but sometimes it may be three or four years between replanting.
The baskets are plunged into sharp sand - the deeper ones to the rim while the smallest shallow ones I will cover so there is approximately 3 to 5 cms of sand over the top of the rim.

You will be surprised how many bulbs you can grow in these baskets - all these bulbs came out of this 30cm basket after three years of growth.

Mesh Basket Plunges

Plunge in full flower.

The sand plunge for the baskets has around 15 to 20cms of sharp sand laid on our free draining ground. The sand is levelled then the planted baskets are laid out before being covered in approximately 3cms more sand, taking the time to work the sand down between the baskets leaving no air gaps, allowing a full exchange of moisture as well as allowing the roots to grow out freely.

Temporary cover during flowering period.

The plunges are open all year round but, because our weather can often be cold and wet when the *Erythronium* are in flower, I will sometimes put up a temporary cover over them during this period - I find this improves the seed set we get. Most of the watering is done by the rain but due to the density of the plants and the proximity of trees and shrubs I do provide additional watering during the peak growing period as they come into flower. When I do water it is always with a dilute tomato-type liquid fertiliser which provides extra potassium - an essential nutrient - when the bulbs and buds, that will provide next year's growth and flowers, are forming.

In an ideal world all my plunge frames would be well away from any trees and shrubs but this is not practical in a small garden and we have trees growing adjacent to the frames with a hedge running down the side.
It is not because of the shade they might cast but their roots that run through the sand, particularly attracted towards the leaf mould that I add to my mix, robbing both the nutrients and moisture intended for the bulbs.
If creating a new plunge bed you could lay a permeable landscape fabric between the ground and the sand as a preventative barrier to minimise the penetration of tree roots.

Repotting every two years means the roots are not a big problem but after four years the roots penetrating this basket are becoming larger and I think you can see that I would not want to be leaving them for any longer or the roots would get too large to extract without damaging the baskets.

I want the frames to blend in with the garden and not stand out like a nursery production area so they are often sited adjacent to beds. Here the back of this plunge has been raised up to form a rock garden bed integrating the plunge into the wider garden. I also recently reworked the side in the foreground by the path creating a small rock bed that is planted up with *Corydalis* and *Hepatica* which bring flowering interest before the *Erythronium* appear.

A few weeks later the *Erythronium* leaves are growing fast.

Plunge bed in full flower.

I am always looking for places to tuck in another plunge frame for mesh baskets. There are many ways to construct a frame - some of ours are simply constructed from cement castings, used as paving edges, these are 90cm long, 17cm high and 5cm thick. These are drilled so they can be wired or bolted in place to form the sides – a simple one like this can hold sixteen of the smaller sized mesh baskets plunged into sand.

The baskets are all plunged to the rim, covered with a further layer of sand then with composted shreddings.

This method is very adaptable: as you can see I wrapped this frame around the corner of the shed to provide space for several more baskets. As this is a relatively shallow plunge I use only the smallest of the three sizes of mesh baskets which are an ideal size for *Erythronium sibiricum* and similar bulbs that are less inclined to require being planted at depth.

***Erythronium sibiricum* growing in mesh baskets.**

Polystyrene Boxes

I have a number of polystyrene boxes, carved and painted to imitate stone, which are very good for growing larger numbers of mature bulbs like this large one filled with *Erythronium japonicum.*

My favoured size of box for the *Erythronium* is 39cm x 30cm and is 29cm deep, although I have used various others that are not so deep but which may be easier to acquire. These boxes stand on a free-drained gravel covered part of the garden and can be easily moved around.

Feeding

There is no doubt that you will get a better rate of increase from those bulbs that form offsets by repotting them every year into a fresh potting mix, however in reality, and with the number of bulbs we grow in containers, that is not possible. Ideally I aim to repot mature bulbs every two or three years, after three years you will start to notice a decline in the vigour of the plants. I repot during July and August when the bulbs are dormant but I can be hampered in wet seasons when the compost is simply too wet to handle and in such cool wet conditions some of the species can send out new roots as early as July so are best not disturbed. In the years when they are not repotted I will scatter some bone meal over them in the autumn then sulphate of potash, (Potassium) during the flowering period. The Erythroniums growing in plastic pots have a much smaller volume of compost so require more regular watering during the period of maximum growth in the spring – then I will water them with a tomato-type liquid fertiliser diluted to about half the recommended strength.

If you cannot get hold of bone meal or the potassium supplement then scattering a balanced NPK general fertiliser as the first signs of growth appears will also work.

Re-potting

Re-potting

The best time to repot is in summer when the compost has dried out and the bulbs are not in active growth - in our garden this can be from late June through July and into August. Ideally I would like to repot them every year – I have no doubt that the bulbs grow better if you do – however with the number of pots we have, time does not always allow for this so I aim to do them every second year. If they are left for a third year you will start to notice a decline in their vigour as both the growth and flowering decreases. Some years when we have had very wet weather through the summer it is impossible to get the compost dry enough to repot the bulbs.

If it is cool and there is moisture present the new roots of some species can start to appear as early as July making it difficult to repot without hampering the growth. On checking this basket of *Erythronium revolutum* bulbs in late July I found roots were already emerging so repotting was abandoned for the year.

Potting Mix (also called compost mix)

I would normally mix my composts in our cement mixer but when I just require a smaller amount I do it by hand in a tray and here is the mixture that I use now. A lot is spoken about the precise formula your mixture should consist of but it does not need to be complicated if you understand the conditions that you are trying to create for the plants. All that plants growing in pots require of a compost mix is something to hold them upright, with good air retention so the roots do not drown and an ability to retain moisture so the roots do not dry out too quickly. As well as this they need a source of essential nutrients.

Formula – My standard *Erythronium* mix is 2 parts sand, 2 parts grit and 2 parts leaf mould. This is an ideal very free draining mix for growing bulbs in plastic containers in our climate. Your own ideal mix will depend on various factors such as the nature of the ingredients, whether you use clay or plastic pots, your climate, etc. Using your own experience of your materials and climate you should adjust this formula to suit your own needs. For instance you may need to add more humus in drier regions or even use a soil based mixture – in very wet regions you may have to add more grit to improve the drainage. I measure the quantities for the mix by volume using in this case a plastic scoop but for the bigger quantities I mix in the cement mixer I would use a bucket.

I use **sharp sand** from a builders' supplier or quarry, you can see it has a range of particle size. Not what is called 'builders' sand' in the UK which is used for making a mortar mix with cement to lay bricks: that is too fine and has been graded through a smaller screen to remove the larger grains that we require to provide better drainage.

I like to know the proportion of particle size contained in my sharp sand mix before I start and to do that I pass some of the dried sand through a basic household sieve. This gives me two piles: the fine material that passes through the sieve, the pile on the right, this is what I referred to as 'builders sand' and on its own is too fine for our purpose, but is ideal when combined with the larger grit on the left. The material I want should contain a mixture of these two sizes combining around 35-50 per cent of larger particles up to a maximum size of 6mm - this keeps the sand open with plenty of gaps to allow air into the mix and my test shows that this sand meets my requirements. In the garden sand beds I use only this sand to grow plants in but for growing in plastic pots it is still not well enough drained for my liking so I need to add more grit.

I use 6mm granite grit from a local quarry. In Scotland this material is readily available as it is used to render the exterior of buildings – a process called 'harling' in these parts. There are many sources of this size of grit available such as horticultural grit or turkey, hen and chicken grit - these three are mostly a flint type material for feeding to poultry to aid their digestion. Some people advise that you should use washed grit as fine dust can prevent the mix from draining freely. You will see from the picture that I do not adhere to that advice - I like to keep the fine to dust-like particles as I believe they help supply some trace elements to the final product. In addition my mixture is so gritty there is no danger that this fine material will clog the drainage.

In many ways I could work with just those two ingredients - sharp sand and grit - as many bulbs grow in mineral based soils in nature.

However I like to add some humus content in the form of leaf mould. Not only does this humus help retain moisture but I believe that it also adds nutrients or more correctly feeds the microscopic soil flora and fauna that will in turn break down the minerals into soluble salts that can then be taken up by the plants.
The old saying 'feed the soil and the soil will feed the plants' is in my view a very wise one. I do not use peat because I have found that some *Erythronium* species seem to actively dislike peat when growing in containers.

Adding nutrients
So far, other than the leaf mould I have not added much in the way of food for the plants, so I add bone meal into the mix. I do not measure it out precisely but scatter a quantity over the ingredients before I thoroughly mix them together. Bone meal will slowly release nitrogen and phosphorus over a period of time and as long as you are sensible you are never likely to overdose your plants. You can also use any slow release balanced fertiliser where the nitrogen levels are not too high, my preference would be for one where there are equal levels of Nitrogen, Phosphorus and Potassium (NPK) - this can be added at potting time or scattered on to the surface in early spring when the plants come into active growth.

The final mixture meets all the plant's needs –the larger particles of sand and grit keep it open, allowing it to hold both the air and water essential to the plant's wellbeing. Without air around their roots plants cannot absorb moisture and so, in water-logged conditions where all the air is excluded and despite the abundance of water, the plants cannot take it up. This is why the symptoms of water- logging and drought shown by plants, such as the yellowing of leaves and the flopping of stems, are very similar.

I used to replace all of the compost every time I re-potted the Erythroniums but as the number I grow in containers increased and because of the high mineral content of my mixture I discovered that provided everything was healthy I could achieve good results just refreshing the compost by adding one fifth, by volume, of leaf mould and a small amount of bone meal ensuring it is well mixed through – I may also add additional grit or sharp sand if the drainage needs improving.

Work station

I work on a suitable surface on which I can turn the container upside down allowing me slip it off the compost - for the pots and smaller baskets this can be a tray on my lap or a work station set up near to the frames, while for the larger baskets and polystyrene boxes I will use a wheelbarrow.

When replanting the Erythroniums I turn the basket, pot or box upside down as invariably after a few years of growth most of the bulbs will have made their way down to the bottom of the container.
There is less chance of damage to the bulbs by revealing them from the underside.

Take care as you lift the containers as the bulbs may have escaped through the bottom and be growing in the sand below the pot, sometimes the bulbs break as you lift the container but do not worry, plant all the broken parts and at least one of the bits will survive.



Another common situation, especially with plastic pots, is when a bulb is growing part in the pot and part out of the drainage hole. In this situation I will try to enlarge the hole by cutting carefully with a craft knife to allow the bulb to be removed intact.


The top bulb is the one that was escaping – you can see the kink where it was deformed by the drainage hole; the other one was bent as it hit the bottom of the pot. Hopefully the bulbs will all be within the pot when you turn it upside down.

I am not sure what purpose the indentation in the base of some makes of plastic pots are designed for but, as I mentioned before, they do make an excellent place for slugs to hide and be near a nice tasty meal on a precious bulb!

Erythronium bulbs are very good at escaping and will even grow through the fine mesh of the pond baskets – here part of the bulb is inside and the other outside the mesh with a tiny slim waist only a few millimetres wide. I have found that it is impossible to remove these without breaking them apart so what I now do is plant both parts.

The bulbs are so efficent at burrowing down that they can even grow through the bottom of a polystyrene box – there was no drainage hole here, the bulb was simply forcing its way through the structure which I had to chip away to extract the bulb intact.

Turning the container out upside down also allows me to assess the stage of growth, this basket was turned out in a wet cold July and I could see that the bubs were already forming new roots – despite the fact that it has been two years since it was repotted I decided that it would harm the roots and growth to proceed so I carefully slipped the basket back on and repaced it in the plunge. I will supplement the feeding by adding a small amount of balanced fertiliser in the spring.

We also need to be aware of the fragile nature of the bulbs when handling them, especially young seed raised plants which can grow very long and thin in their first years as they work their way deeper into the ground.

Erythronium bulbs will descend until they find a stable environment that suits their needs and they do this by elongating the bulb so it forms a long slender shape that is very easily broken.

Once you get the bulbs out of the compost you can check how well they have grown, some bulbs take a very long time before they make any offsets while others, like this one shown, form dense clusters of bulbs of various sizes after just a few years' growth.

This form is extremely vigorous in multiplying itself.

I more commonly find a few offsets as shown, below right.

I split any bulbs that are forming clumps into individuals, removing loose offsets of any size (that are only connected by dried remains) so they can be better spaced when planted.
Additional bud growths that are firmly attached by living material should be left on the parent for another year.

Erythronium tuolumnense increase quickly by offsets – all of the bulbs above came out of this 30cm basket.
I add some potting mix to no more than a quarter of the depth of the container then I replant a suitable number of the bulbs back - in this case leaving plenty of left over to plant in the garden or pass around.
I like to space the bulbs out so that they are not touching and have some space into which they can grow.

Erythronium oregonum bulbs ready for replanting - below I have covered the bottom of the basket with potting mix and spaced the bulbs out ready to be topped off with the potting/compost mix.

The plunge frame area looks in total chaos as I work my way through re-potting but order does return once all the baskets are replanted and replaced - then I work more sand down between them so that they are all surrounded by sand.

Partially worked sand plunge with some replanted baskets showing a mulch of shredded prunings at the top left – this helps to retain moisture and inhibit weeds, moss and liverworts.

Erythroniums in the Garden

Erythroniums in the garden.

There is no doubt that, next to them growing in their natural habitat, the best place to grow *Erythronium* is in the open garden where they can combine with other spring flowering plants to create a very colourful spectacle.
While they are often described as woodland plants, depending on your local climate, they can grow in a wide range of conditions from full sun to full shade. I often explain that when growing in Scotland, or areas with a similar cool maritime climate, that 'Scotland is in Shade' meaning that we rarely get temperatures above the mid 20 degrees C even in full sun - even that is a rare occasion so the Erythroniums need no shade to keep them cool.

If your garden is likely to have hot sunshine when the *Erythronium* are in growth then some shade from the mid-day sun would be desirable to prevent the ones particularly with broad leaves from being scorched. Their relatively soft leaf structure indicates to us that they need some shelter from strong winds which at their worst can shred and snap the leaves and flowering stem – so those species with the larger leaves such as *Erythronium tuolumnense* and its hybrids need more shelter than smaller growing species.

Erythronium tuolumnense* growing under *Rhododendron thomsonii

ERYTHRONIUMS IN CULTIVATION © Ian Young

Our garden soil is a light sandy loam with a PH just to the acid side of neutral which has been enriched over many years by an annual mulch of organic matter in the form of shredded hedge trimmings, tree and shrub prunings which are composted then applied on the surface during frost free days in the winter. I do not believe that *Erythronium* are particularly fussy about the PH as long as your ground is around the mid-range and not extremely acid or alkaline. I was surprised to see *Erythronium hendersonii* growing in very heavy clay soils in Oregon as I had always thought they would prefer a woodsier type of soil but obviously they are more adaptable than I had realised. I should add that they were mostly growing very close to the native shrubbery so I wonder if the tree and shrub roots opened up the heavy soil allowing air to penetrate thus making the difference.

So even if you have a heavy clay soil that should not prevent you from growing some *Erythronium* provided you add plenty organic matter to improve the aeration just as you would require for most other plants to succeed.

The treatment for heavy or light soils, such as we have, is the addition of plenty of organic matter. Almost all our beds have been slightly raised above the ground level, initially by digging in organic matter which is then replenished by the annual mulching – exactly the same treatment would improve the growing conditions for bulbs in heavy soils.

The one thing that may prevent you from growing *Erythronium* well is if your garden gets very hot and dry in summer – Erythroniums can survive quite long dry periods during the summer, provided they are in the ground, but it seems that they suffer if the ground around them heats up too much – this is part of the explanation why their bulbs grow so deeply into the ground. I have been asked how deep you should plant bulbs. There is no definitive answer; it depends on your garden soil and weather because what the bulbs are seeking is not simply a definable depth of soil above them but the best environment, being a combination of moisture and temperature, they can tolerate.

If like us you garden in a region that has relatively cool summers then you do not need to worry too much about growing *Erythronium* in shade from the sun but you should consider shelter from excessive winds. If your garden gets a lot of heat and direct sun then planting them in shade would be desirable. Although it is not necessary to provide shade in our cool northern garden we do grow a lot of trees and shrubs that do cast shade where Erythroniums grow perfectly happily.

Planting depth

When planting *Erythronium* bulbs you should always ensure that Western North American species and cultivars have at least 7cms of soil over the top of the bulb, they will grow deeper year by year until they find the depth that suits them best for your garden. As a general rule the bulbs of the Eastern North American species along with the Eurasian complex do not tend to grow so deeply but I still plant them so they are covered by 7cms and they tend to stay at around that depth.

The first *Erythronium* I would recommend to anyone is ***Erythronium* 'White Beauty'**, a vigorous form of *Erythronium californicum*, that both increases well by offsets and thrives in most moderate garden conditions; along with this you should try *Erythronium tuolumnense* and its hybrids such as *Erythronium* 'Pagoda' which are commonly available.

Erythronium tuolumnense grows on sloping, wooded river banks hence it has evolved larger leaves to capture light; this means it will require shade from strong sunshine in many areas plus shelter in all areas from strong winds. We can grow it in the open in Aberdeen but it has the added advantage of also growing when well-shaded under the larger Rhododendrons.

If you can get these plants to grow then you stand a good chance of succeeding with some of the other species and cultivars. Initially you could try acquiring some of the *Erythronium* that are available as bulbs for sale or swap but I have no doubt that the best way to get *Erythronium* into your garden in quantity is by raising them from seed. Seed is available through a number of sources, primarily the SRGC Members' seed exchange (and the seed exchanges of other similar groups) then are various commercial seed lists run by both small specialist collectors and the larger seed companies.

When you first have *Erythronium* flowering in your garden you should always encourage them to set seed – it is often said and written that you should not let your bulbs set seed because it weakens the bulb. I have done many trials and that is simply not true. A bulb that is making seed will grow on for a further four or more weeks longer than one that has no seed forming - this additional period of growth more than makes up for the extra energy required to make seeds and I have often found that the largest bulbs were on plants that also produced seed.

Apart from this, seed is your insurance of keeping a good healthy stock of plants growing on in your garden and you should collect and sow some of your own seed every year.

One of the big advantages of raising from seed is that you can gradually acclimatise plants, especially as you collect and sow your own garden seed. The survivors of each successive generation become more selected to your garden conditions and weather – to put it the other way; those seedlings that cannot tolerate your conditions will die. *Erythronium sibiricum* is one of the plants that, after a number of generations, we have managed to establish in the garden. This one shown here was formerly ***Erythronium sibiricum*** but has recently been classified as ***Erythronium krylovii***.

Another success is with ***Erythronium montanum*** which is shown here growing in the rock garden bed.

Erythronium revolutum

To achieve maximum increase it is best to sow and raise them in pots for the first three years before planting them out into the garden but as you start to get large numbers of *Erythronium* flowering every year you can choose to leave them to shed their own seed naturally - I do sometimes improve the distribution by gathering a handful of seed and scattering it in other areas.

In this bed (above) Erythroniums are allowed to self-sow and on the left are a group of ***Erythronium revolutum*** seedlings that have self-sown into the edge of a gravel path.

Erythronium revolutum in one of the best species for self-seeding around in our garden and indeed many of the resulting offspring have hybridized, most often with *Erythronium californicum* forms.

An open-pollinated hybrid between *Erythronium revolutum* and 'White Beauty'

I much prefer to group plants in communities rather than having a clump of a single plant surrounded by bare ground. In nature plants rarely grow in isolation and this more natural style of planting looks much better. In addition the plants become a supportive community forming a beneficial environment by shading the ground, helping to retain moisture and suppress weeds.

Erythronium dens-canis

Erythronium dens-canis and the other Eurasian species tend to be lower growing and are best teamed up with plants of a similar stature – one combination we have is with *Trillium rivale* which flowers around the same time. The paler-coloured group, in the foreground, are self-sown seedlings from the main clump which is a single pink clone.

Erythronium dens-canis with other low-growing spring bulbs.

Erythronium japonicum

Erythronium japonicum **flowering with** ***Dicentra cucullaria***.

Erythronium japonicum is a very beautiful species which, since getting a few bulbs some years ago, we have been raising from seed, collected from these few plants, this both builds up our numbers as well as helping to acclimatise them to our growing conditions

The pink ***Erythronium revolutum*** greatly extends the flowering season in one of our early spring beds picking up the flowering interest from *Eranthis, Galanthus*, and flowering happily through *Corydalis solida* and *Anemone ranunculoides.*

The taller species and cultivars work well growing through a carpet of *Dicentra* or *Corydalis foliage* along with *Fritillaria*, Lilies and *Trillium*, etc. - they add great colour and interest to the spring garden. There are so many combinations of plants that can be enhanced by the addition of *Erythronium*. It is up to your own imagination what you might try out, the only limitation is that the plants must enjoy similar environmental conditions and be in scale so none will out-compete the others. They say a picture is worth a thousand words so the best way to share some of our plantings is to show you this series of pictures.

***Erythronium* 'Minnehaha'**

Many of the species are very slow to form clumps in the garden often staying as a single stem for many years while most of the cultivars and hybrids form clumps relatively quickly, such as the creamy white *Erythronium* 'Minnehaha' a superb garden hybrid of *Erythronium oregonum* raised by the late John Walker from Kent.

One of my own hybrids with *Erythronium helenae* as the seed parent is ***Erythronium* 'Craigton Cream':** the clump shown above has formed from a single bulb in just two years' of growth.

We can get snow when the Erythroniums are in flower but as you can see within a day or two the snow has melted and the plants sit back up, undamaged. A prolonged cold spell and/or wet conditions when the plants are in flower will greatly reduce the amount of seed we can get.

Erythronium hybrids growing up through the foliage of *Corydalis solida* and *Dicentra cucullaria* with *Trillium rivale* in the foreground.

Erythronium americanum, E. revolutum and *E. dens-canis* (flowers just gone over) are in perfect harmony with *Trillium rivale* and *Anemone* x *lipsiensis* – all growing under some dwarf Rhododendrons.

Erythronium californicum and *Erythronium revolutum* catch the light, standing out against the shaded background.

Pink and white *Erythronium* hybrids flowering along with *Fritillaria meleagris* rise above a carpet of low growing spring plants.

The taller growing ***Erythronium*** **'Susannah'** (above) - which in my opinion is the most beautiful of the yellow hybrids- was also raised by John Walker - combines well with some Trilliums.
Here mixed colours of *Erythronium* are growing through *Arum* leaves. Although large clumps of a single form are impressive I always prefer mixing up the colours when I get the opportunity.

A group of ***Erythronium hendersonii*** **seedlings**, above, shows how promiscuous this species can be as the largest flower is a hybrid.

On the right: ***Erythronium revolutum*** growing in the gravel area of our driveway. Along with all the other plants growing there it was introduced by me just scattering some seed. The seed of these plants is left to shed back into the gravel.

The same section of driveway photographed a few months later on shows the ripe and open *Erythronium* seed pods, I do sometimes take a handful of seed and help distribute it along the length of the gravel area. The other plants you see all grow in perfect harmony illustrating how you can grow suitable plants perfectly successfully in the same place as *Erythronium*.

Two views of the same bed taken around eight weeks apart show how well Erythroniums fit into planting schemes.

Even in our cool moist garden the *Erythronium* leaves will disappear by late June/ early July with just the stems holding the ripening seed capsule remaining so other plants such *as Arisaema, Dactylorhiza* and Lilies can share the same space and extend the flowering interest of a bed.

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When growing plants so intensely as we do we have to consider feeding– for the most part we do this the natural way by recycling all the seasonal growth, deciduous leaves, prunings, etc. even weeds, through the compost heap which is then returned to the soil with the annual mulch so we are not removing the goodness from the ground. I will only add fertiliser where I think there is evidence that the plants are suffering a deficiency of some sort. Weak growth or chlorotic leaves indicate that I should add some nitrogen which I will apply sparingly as a N-P-K, 7-7-7 granular , preferably one that also contains trace elements, just as the first signs of growth appears in the early spring. If the Erythroniums are not flowering well then you should apply a soluble form of Potassium (K) as the flowers fade.

Other reasons the plants can lose vigour is if they form congested clumps - the increased competition means that none of the bulbs can get sufficient moisture or nutrient to grow well- so it is then time to lift and divide the bulbs. The ideal time to lift and split most bulbs is as the foliage dies back at the end of the growing season. The old leaves act as a guide to where the bulbs are located but not at what depth they might be. It is best when digging up the clump that you assume the bulbs will be much deeper than you think, so dig carefully, in from the side where possible, until you locate the bulbs. Inevitably some bulbs will get damaged or broken when you lift them but do not discard them, plant all the bits back as some if not all of the broken pieces are capable of forming a new bulb.

Here a group of *Erythronium oregonum* seedlings are about to be overgrown by a shrub, *Vaccinium numularia*, so I decided to move them.
There are two ideal times to move a plant: the first is the ideal time for the plant, which is as it enters its dormant period, however the other 'ideal' is when it suits or when the gardener remembers. I had intended to move this clump as the leaves yellowed the previous year but forgot - now it is better to move them in full growth than risk leaving them to be overgrown.

I dug a hole adjacent to the clump and worked carefully in from the side until I located the bulbs - I could then remove them with minimum damage. *Erythronium* do not make extensive root systems - I suspect that they can absorb moisture and nutrients directly through the bulb as well as their roots.
In ideal circumstances I would not suggest that you lift *Erythronium* in full growth but **with care** they can be lifted and replanted at any time of year. With a bit of extra watering this group grew and flowered with no apparent ill effects.

Erythronium dens-canis

Erythronium dens-canis, a native to Europe, is among the most readily available species for our gardens: it has been cultivated for hundreds of years during which time many selections have been made.

***Erythronium dens-canis* flowers**

We have raised the majority of the plants in our garden from seed, resulting in a range of flower colours from dark violet through pink to white –this species is one that will naturalise in the garden if allowed to self-seed. The first characteristic we should note as a guide to distinguishing this species form the rest of the Eurasian complex is that the pollen is dark violet - the white forms of *Erythronium dens-canis* can sometimes be confused with the white flowered *Erythronium caucasicum* but it has yellow pollen.

Other details such as the shape of the filaments are among the characteristics that further separate this species from *Erythronium sibiricum* and *Erythronium japonicum* but once familiar with these species a good observant gardener will easily recognise their differences.

Above is a flower I have dissected, including the ovary, to reveal the finer details – this is something I do with all the plants we grow to better understand the wonderful structures that make up a flower. The dissection of the ovary clearly shows the seeds waiting to be fertilised when the pollen grows down the attached tube from the stigma.

Seeds

***Erythronium dens-canis* seed capsule and seed**.

The seeds of all the Eurasisan species, along with the Eastern North American species, have elaiosomes (fleshy appendages) a feature that is absent on the Western North American species.

It should be noted that the curled elaiosomes are on the opposite end from where the seed was connected in the ovary - this can be seen clearly in the picture of the dissected flower.

Leaf

The leaves are mostly a mixture of green and brown often appearing as a brown background with varying degrees of green blotches or washes; some may also have pale almost silver highlights. The blotches are always in a random pattern, very different from any of the Western North American species where the pattern is often bound by the veins of the leaves.

Generally but not exclusively it is the plants with the darkest flowers whose leaves are darker having more brown while the pale and white flowered forms tend to have more green than brown. The brown markings are strongest when the leaves first emerge, the colour fading as the season progresses.

Looking closely at the leaves you will see that lines of white pores cover the surface, this feature is shared with all the Eurasian species as well as with the Eastern North American species such as *Erythronium americanum*.

Bulbs

The bulbs are white, possessing little in the way of a tunic, and elongated in shape similar to the canine tooth of a dog as the specific name, *dens-canis*, indicates and indeed the common name of Dog's Tooth Violet. The main part of the bulb replaces itself every year leaving just a small amount behind, attached to the base of the new bulb like the links of a chain. Sometimes two bulbs will grow allowing plants to form clumps.

On the left is a typical bulb with three links of the chain being the remains of the previous three years' bulbs – the links start to lose moisture and shrink away after three years.
The links of the chains all have the ability to form new growth

buds but are inhibited from doing so as long as they remain attached to the dominant main bulb. Above: you can see that I have removed a chain from a bulb – this can be further broken down into individual links each of which will form a least one new bulb if planted and grown.

One year on from planting the old links have formed new bulbs supported by the food stored in the fleshy chains – these will take a further two years to reach flowering size.

Erythronium dens-canis is relatively easy in cultivation growing in a wide range of soil types from the sandy soil enriched with organic matter that we have, to heavy clays. Like all in this genus the flowers have evolved to react to the weather; closing to protect the anthers and stigma in cold wet conditions then reflexing pagoda style when it is sunny and mild. Peak flowering in our garden can be any time from mid-March to mid-April depending on the season. It is happy growing up through other early spring flowering plants such as *Anemone* x *seemanii* or standing alone before or as other plants emerge.

Raising plants from seed will give a wide selection of forms with different flower colours as can be seen in the group of self-sown seedlings above – these will also have variable leaf patterns.

This selected white seedling has formed a clump after about five years.
Note how the leaves of most white forms are also paler in colour, often with a silvery green wash.

Erythronium dens-canis is quite easily grown and when happy it will slowly form clumps; these are best lifted and divided every three to five years certainly before they become so congested that flowering diminishes. We once received some small bulbs described as a 'clumping form' which I never managed to get up to flowering size bulbs – no matter what I tried they just increased, forming more immature bulbs every year – eventually I got rid of them from the garden. It seemed as if they had got into a bad habit that could not be broken so it is always best to split clumps before the flowering diminishes.

It should not be difficult to acquire this plant as there are many cultivars of *Erythronium dens-canis* available commercially however I think it is best to raise all plants from seed and especially collecting and sowing any seed produced in your own garden. Raising them from seed will ensure that you have young vigorous healthy plants with each subsequent generation of garden collected seeds becoming more adapted to growing your garden conditions.

Erythronium caucasicum

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Erythronium caucasicum is one of the Eurasian complex that includes *E. dens-canis, E. sibiricum* and *E. japonicum*: it is always the first of the genus to flower in our garden with flowers appearing as early as February.

My experience of growing this species is limited to a small number of mature plants that flower every year but are extremely slow to increase, I have had seed on a few occasions from our own plants and these seedlings are growing on and will reach maturity in a year or two.

It is not difficult species to grow enjoying exactly the same conditions as *Erythronium dens-canis* in our garden - open situations as well as under deciduous trees and shrubs. Despite being relatively easy to grow this species is uncommon in cultivation - the reason for this I would speculate is that it is very slow to increase by offset or division at the bulb, leaving seed, which is not very often seen on offer, as the main way of increasing stocks. As a result the most difficult part of establishing this plant in our gardens is getting some material in the first place so my advice would be to acquire some whenever you see it offered either as bulbs or seed.

Erythronium caucasicum

Erythronium dens-canis

Erythronium sibiricum* subsp. *altaicum

Erythronium caucasicum flowers look superficially like a white form of *Erythronium dens-canis* but *E. caucasicum* can be quickly distinguished by its yellow anthers and pollen while *Erythronium dens-canis* always has dark brown/violet anthers and pollen – I know of no variation in this feature.

Erythronium sibiricum subsp. *altaicum* also has white flowers and yellow pollen but it is easily separated by the shape of the style which is not split into three sections at the tip as it is in both the other species.

***Erythronium caucasicum* seed**

Erythronium caucasicum seed is similar to all the other Eurasian species, all of which possess an elaiosome – a fleshy appendage that has evolved to attract ants and other insects which act as a valuable aid to the plant in distributing the seeds over a wide area. The elaiosomes form on the opposite end of the seed to where it is connected, inside the ovary, to the parent plant. This seed is best sown on the surface as soon as possible after it is ripe then covered over with just a light layer 1cm) of gravel. Our seed pots are kept in open frames where they never dry out completely and we get good germination the following spring - some sporadic germination can be expected with dried seed. Should you receive dried seeds then soaking them overnight in water (with the smallest amount of soap to break the surface tension) before sowing will help rehydrate them, greatly improving the germination rate.

First year seedlings

First year seed leaves are small and without any markings - the characteristic markings start to show in third year leaves.

Second and third year seedlings

Four and five year old seedling leaves will start to develop their full markings. The larger leaf on the right is broader than the typical leaf and is a good indicator that this bulb is almost mature and should flower next year.

Mature leaves

Mature leaves give the appearance of being brown, covered in an irregular series of green blotches and are very similar to those seen in many forms of *Erythronium dens-canis* – this makes it difficult to distinguish these species from the leaves alone with the exception that those of *Erythronium caucasicum* appear around four weeks earlier.

Erythroniums will only flower when they have two leaves - the flower is clasped in the middle of the two leaves as they push through the ground.

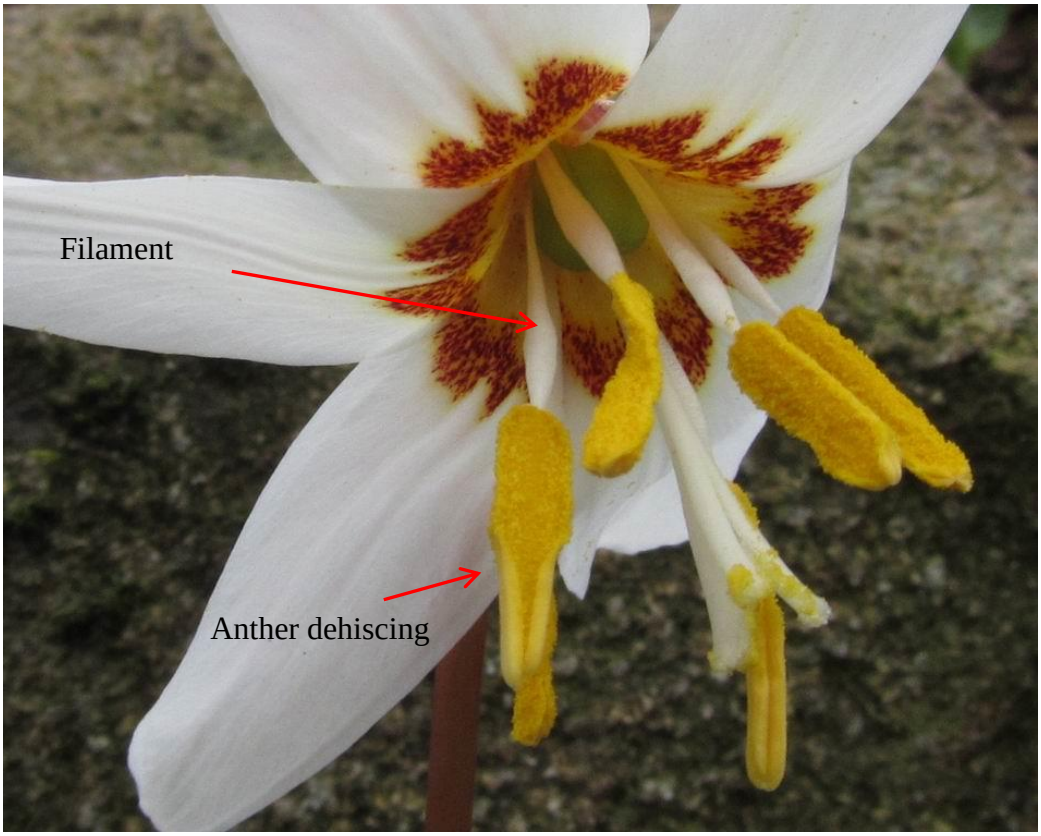
***Erythronium caucasicum* bulbs**

The bulbs look similar to those of the other members of the Eurasian species but unlike many forms of *Erythronium dens-canis* none of the *Erythronium caucasicum* that we grow will form clumps at any speed.

It took one bulb around five years to increase to two flowering bulbs so progress is slow – it may be that clump forming clones do exist in wild populations but have not been introduced into cultivation - certainly not into our garden. Hopefully as more are raised from seed clump forming clones may occur.

Closed anthers

Three anthers dehisced, exposing ripe pollen



When the flower first opens all six anthers are closed around the pollen and are of equal length. Three of the anthers will dehisce first and shrink in length as they do so, giving the flower three short and three long anthers – shortly after the other three will mature and also shrink in length as they release the pollen.

These pictures also show the shape of the filaments that connect the anther to the flower.

The flower is white with a central yellow zone that varies in size and the amount of red stippling – this colour is also visible from the back of the flower.

One form we grow has a pink flush to both the leaves and the outside of the flower bud but it fades to white as the flower opens, see below. This form has the most dramatic colour in the centre of all the forms we grow.

I have seen photographs of beautiful pink forms of *Erythronium caucasicum* growing in the wild and they would be a welcome introduction to cultivation. In one plant I have seen a picture of, the stunning red speckled yellow area normally confined to the central zone of the flower extends all the way up the petals.

The variety in the examples that I have seen photographs of show we have only a small selection from this species in cultivation and that there is tremendous potential for exciting new forms being introduced sometime in the future.

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Erythronium sibiricum

Erythronium sibiricum

I first received Erythronium sibiricum many years ago by way of a single bulb - I did not find it easy to grow to flower properly – the flower had a tendency to open underground before the scape (stem) pushed it above ground. When you consider the climate where it grows in the Altai Mountains and Siberia where long cold winters are followed by a sudden switch into spring it is easy to understand why it did not grow well in our maritime climate with poorly defined seasons. I kept the pot in the coldest plunge frame we had, fully shaded from any winter sunshine then in late February moved it into the glasshouse or even the kitchen to give it the rapid change from cold to warm that it was accustomed to in its native habitat.

Erythronium sibiricum

Using this method I did manage to flower it well enough to get a seed set one year, around the same time I was given a quantity of fresh seed by a friend in Tromsø where their climate allows them to grow Erythronium sibiricum well in the open garden, even to the extent that it seeds around becoming a ‘weed’ – a problem I would welcome! The seedlings from my sowings provided me with a good quantity of bulbs the majority of which flowered after five years many setting seed which I sowed as soon as it was ripe resulting in a second generation of seedlings. Each sowing of seeds will produce a range of forms - those seedlings that survive are those which can best tolerate our garden conditions so by collecting and sowing our garden seed every year each successive generation of plants becomes more acclimatised to our garden. We now have many plants growing both in plunge baskets and the open garden that come up flowering normally and producing seed most years. This process of acclimatising plants through generations of garden collected seeds has helped us introduce a few of the difficult species such as Erythronium sibiricum and Erythronium montanum – it is not a case of me selecting the plants rather they select me.

Flower

As well as the climatic tolerance range the seed raised plants also exhibited quite a variation in shape, form and colour of the flowers which was noticeable in bud before the flowers fully opened – also some had patterned leaves (right)while others have plain green leaves (below).

Erythronium sibiricum with patterned leaves

Erythronium sibiricum with plain green leaves.

The golden yellow anthers were the first thing I look for when separating this species from the others in the Eurasian group as all the forms that I have grown or seen in cultivation have yellow pollen however I have seen photographs of wild populations where the pollen colour varies between dark violet and yellow. The flower on the left comes from a bulb with patterned leaves - the one below from a plain green leaved form.

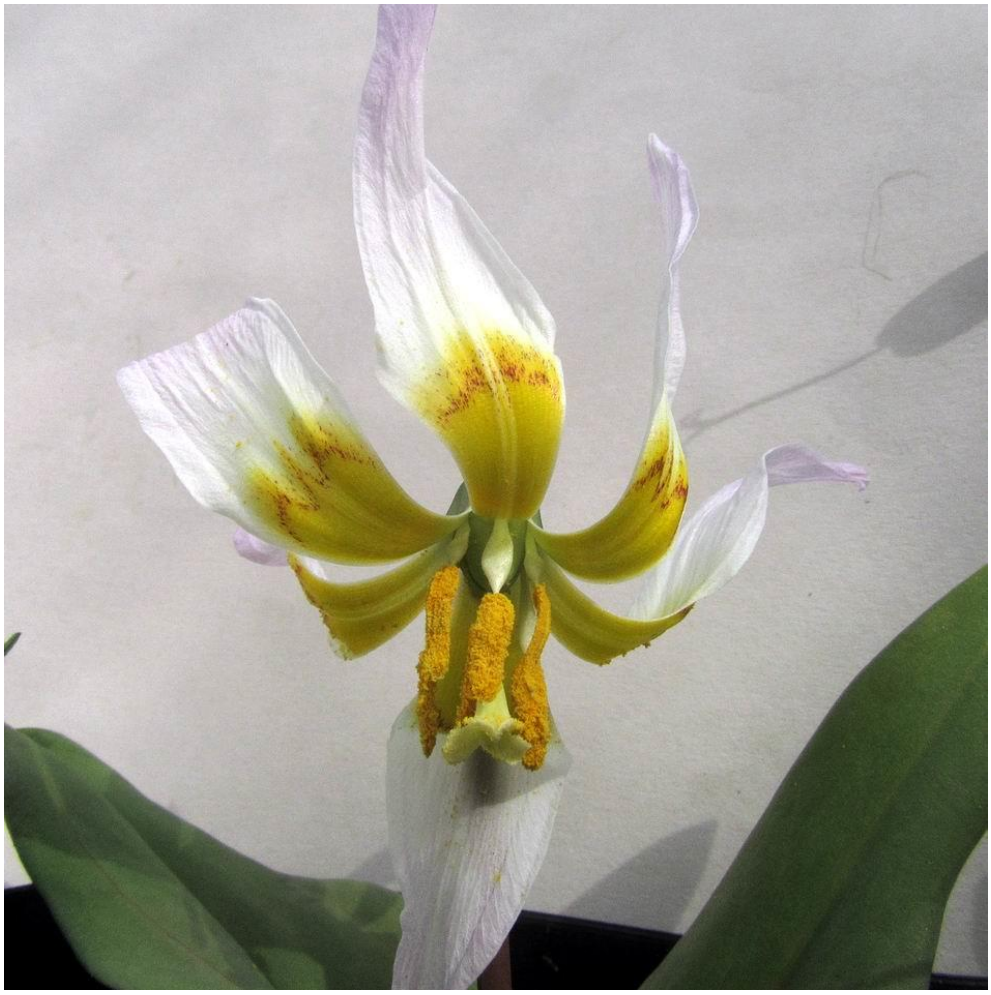
The colour variations are often also visible on the back of the flowers.

White forms also occur - Janis Ruksans offered a few named white forms one of which he went on to describe as **Erythronium sibiricum ssp. altaicum,** however much work has been carried out in an ongoing process of studying this group both in the field and by DNA resulting in a number of new species being described.

Erythronium sibiricum ssp. altaicum is now considered as a synonym of Erythronium krylovii and indeed I suspect that as well as this white plant some of the plain green-leaved forms that we grow are also Erytrhonium krylovii.

Another new species described is Erythronium sajanense - this was also formally known as Erythronium sibiricum and shows that this whole group requires more study.

I intend to do a much more detailed observation of all the plants we grow as Erythronium sibiricum next season and will update this chapter if necessary.



Erythronium krylovii

Erythronium sibiricum flowers.

This montage shows just some of the variations in the flowers of Erythronium sibiricum that we grow and I will be studying in greater detail in the coming seasons.

Detailed photographs of the dissected flowers, especially showing the shape of the filaments and style, will help in identifying the different species.

Seed

Seed is best harvested as soon as the capsules start to turn colour and to achieve the best germination results the fresh ripe seed should be sown immediately – in our garden this is usually around mid-June.

Fresh seed is white with curly elaiosomes on one end.

If not sown immediately the seed will first turn tan then brown and the elaiosomes wither but it is still viable.

If the seed is to be stored longer term it is best if it is kept moist by mixing it with sphagnum moss for instance. Dried seed should be soaked overnight before sowing.

Seed sown fresh will give a good germination with the seedlings appearing around the same time as the parent plants come into growth – this pot was pictured germinating in mid-April.

Leaves

I am always fascinated how many of the early flowering bulbs have a hardened tip to their leaves to help them force their way up through hard often frozen ground or snow. On the left you can see this hard tip with the second leaf tucked under and wrapped around protecting the flower bud – once through the ground the leaves can part allowing the flower to expand and grow.

You will notice that the leaves above are plain without the dark blotched pattern and these I think are **Erythronium krylovii**.

The plant on the right has patterned leaves and is **Erythronium sibiricum**.

Erythronium sibiricum

For all the years I have been growing Erythronium sibiricum I have suspected that we actually had a few different species masquerading under that name. The plant on the left with plain green leaves, broader petals, and different shaped filaments is what I believe to be Erythronium krylovii while the one below with patterned leaves and narrower petals is Erythronium sibiricum.

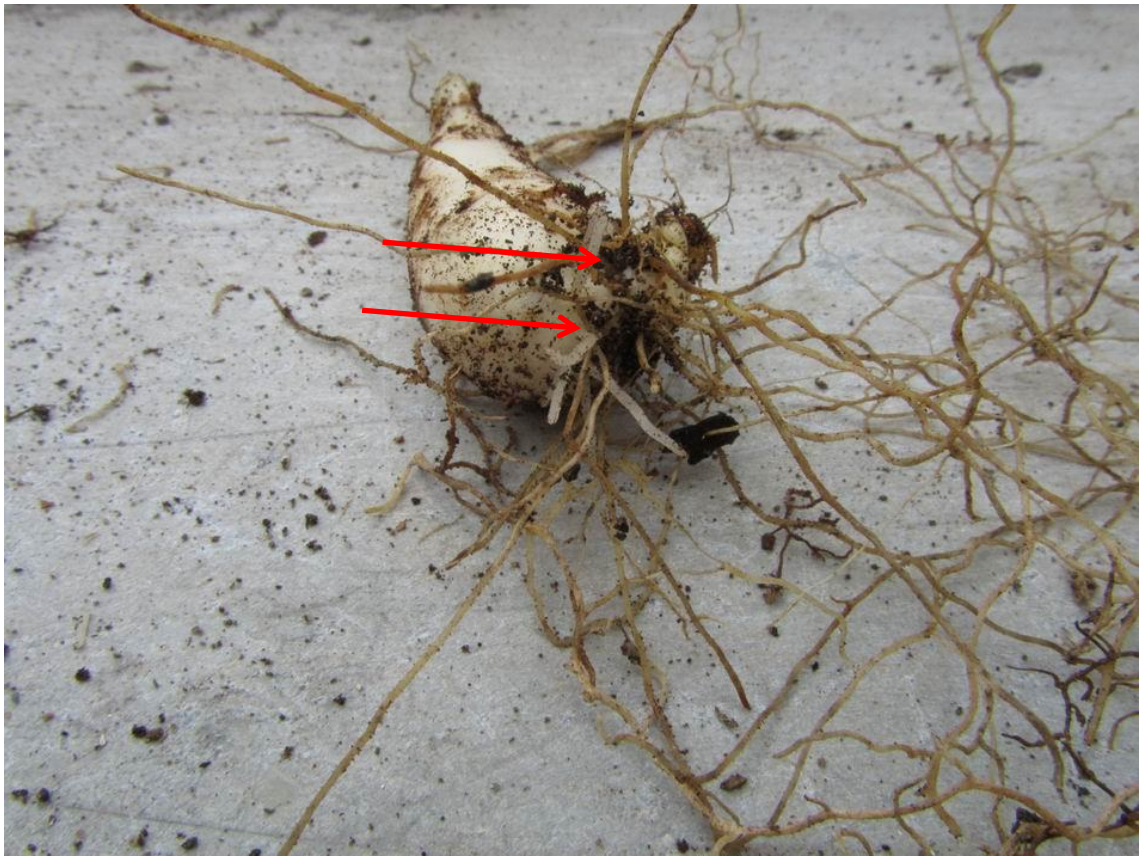
Erythronium krylovii

Erythronium sibiricum

Bulb

The bulbs of Erythronium sibiricum look much like the rest of the Eurasian group with the remains of previous years bulbs attached as chains to the base - a number of the bulbs we have raised do show a willingnesss to increase by forming offsets.

Bulbs from a plunge basket tipped out in August show that the previous years roots have not yet dried out fully.



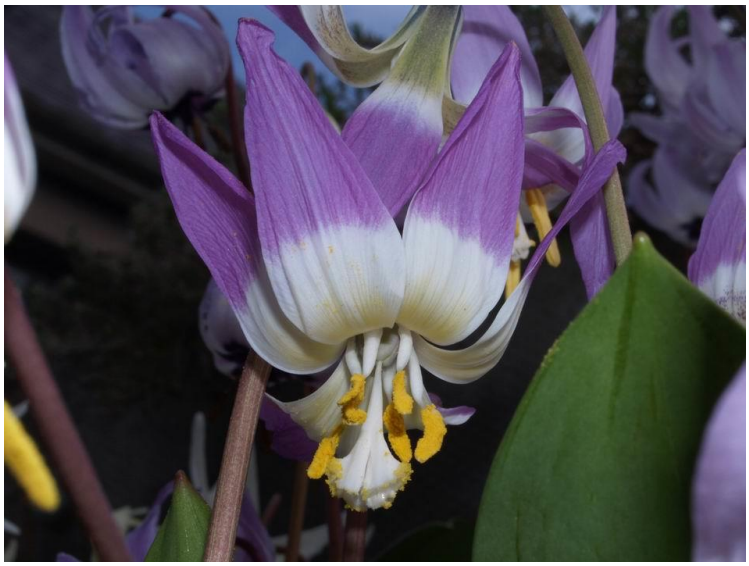
Bulb showing new roots emerging.

Even at this time (August) care must be taken when handling the bulbs because new roots are emerging even before the previous roots have died away.

When repotting I always ensure that the bulbs are kept shadded and moist then replanted as soon as possible into a damp potting mix so as not to damage the new roots.

Erythronium krylovii

Erythronium krylovii white form



Erythronium krylovii

Erythronium sibiricum

I continue to read the papers published while corresponding with friends who visit these plants in their habitat gathering information that will help me identify exactly what we grow under the name Erythronium sibiricum. I have named the pictures above according to my understanding of the information I have received.

Seed raised plants

Seed raised plants shows the mixture of plants we are growing as Erythronium sibiricum.

Both **Erythronium sibiricum** (with patterned leaves) and **Erythronium krylovii** (with plain leaves) are shown in this group.

With growing from seed over a few generations we can now have Erythronium sibiricum growing normally in our garden.

It seems that the form I now believe to be **Erythronium krylovii** is the best adapted to our growing conditions as you see from the plant on the left growing well in a raised garden bed.

There is no question that you stand the best chance of succeeding with Erythronium sibiricum and its related species by raising them from seed.

I look forward to learning how many plants known to us collectively as Erythronium sibiricum turn out to be related species.

Erythronium japonicum

Erythronium japonicum

I got my first bulb of *Erythronium japonicum* from Inschriach Nurseries many years ago and while it came up and flowered most years it never set any seed - that bulb has taken some twenty or more years to form the small group on the left.
Our next acquisition came about fifteen years ago when I saw bulbs being offered online from China so I ordered a small quantity. These bulbs eventually arrived at the end of December – they were in terrible condition, dried out with many also broken and I did not hold out much hope of growth. I soaked them in some water overnight to rehydrate them then planted all the parts into a pot. Three survived to flower and with careful pollination I got two seed capsules.

When I did some research I discovered that in Japan they are called Katakuri and the starch from the bulbs was used as a thickening agent in cooking. I have often wondered if that explains the poor condition of the bulbs that I received – were they originally intended to be sold for starch?

***Erythronium japonicum* stems and seed capsules**

I was determined to get the best results from these seeds so I sowed them in a polystyrene fish-box trough and we even went to the length of buying a temporary plastic greenhouse to house them when they came into flower to maximize the chance of good pollination and seed-set.

The flowers were all in shades of violet/pink with very attractive and variable dark purple zig-zag markings towards the centre of the flower.

While there was some variation in the colour and the markings, the filaments were all similar in shape with more or less parallel sides tapering towards the end by the anthers. The end of the style, the stigma, is divided to form three areas receptive to pollen.

While the anthers are dark violet the pollen colour can vary in hue, some appearing almost cream when fully ripe.

***Erythronium japonicum* flower detail**

Seed

Like the entire Eurasian group, ***Erythronium japonicum* seed** have elaiosomes, this time in the form of a blunt tip making it quite distinct from the others in this group.

***Erythronium japonicum* seed**

***E. caucasicum, sibiricum* and *japonicum* seeds**

I sow the seed as soon as it is ripe, placing the seed pots/containers into an open frame exposed to the weather so it never dries out - any dried seed should be soaked in water over night before sowing.

Germiation starts in the spring but in my experience the seed of this species, more than any of the others, always germinates sporadically. I do not know if this is down to my cultivation methods or if it is an evolutionary strategy for survival, spreading germination to more than one season – I suspect it is the latter .

Seedlings

This is a typical pot of seedlings pictured in spring of their second year – the narrow leaves are seeds just germinating having remained dormant for more than a year while the larger ones are the second year leaf of the bulbs that germinated during their first spring.

The markings on the leaves do not reveal themselves fully until the plants are mature, after around five years of growth.

Leaf

The two plain green leaves shown are on bulbs that are probably two years away from flowering while the unusually large leaf on the right in the picture is typical from a bulb that will flower next spring - note also how the markings have now developed on the most mature leaf.

This group of seedlings shows a range of ages: the narrow single leaves being the least mature, the broad leaves indicate that they are a year off flowering and the bulb with the flower has the typical two leaves of a mature plant. Flowering plants will always have two leaves; a single leafed plant will not flower.

These are typical markings of a mature plant, they are superficially similar to the other Eurasian species but with experience you will start to be able to recognise them – the contrast between the colours is less in *Erythronium japonicum* and they often appear as if they are covered by a transparent grey wash.

Erythronium japonicum leaf, showing colour variation.

Bulb

The bulbs are also typical of the Eurasian group with the attached chains being the remnants from previous years.

I find that *Erythronium japonicum* bulbs do not divide readily, however if left for long enough they will produce secondary growths. Removing the chains from the parent bulb and growing them on separately will stimulate the chains to produce new clonal bulbs - this does not harm the parent bulb.

It is hard to pick a favourite *Erythronium* out of all the species but the flower colour and dramatic markings makes *Erythronium japonicum* difficult to beat.

Above and below are pale and darker colour variations - all are equally desirable.
Note how the style and filaments of the dark form also reflect the deeper colour.

Erythronium japonicum grows well in our garden in exactly the same conditions as *Erythronium dens-canis*.
I have not yet raised a form that will form clumps at any speed so seed remains the main method of increasing our stocks.

Erythronium japonicum is becoming more readily available, it is offered by a number of specialist nurseries and bulb sellers.

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Erythronium americanum

Erythronium americanum

The yellow flowered *Erythronium americanum* is one of the Eastern North American species and shares more similarities with the Eurasian Erythroniums such as *Erythronium dens-canis*, than it does with those growing in Western North America.
I have long been confused by what I call the 'Eastern Yellows' of which there are at least three species, *E. americanum, E. umbilicatum* and *E. rostratum.* Many years ago I acquired bulbs of all three species growing them all up to flower but I could not see the difference between them. Eventually I realised that there was no difference between the ones I was growing as I had received the same plant under three different names – it was I believe, *Erythronium americanum*. Since that time I have seen these three species and can see the differences very clearly but there are a number of wrongly named plants still remaining in cultivation. I am only showing what I believe to be *Erythronium americanum* here as I have not as yet flowered the other yellow species to get my own images of them.

***Erythronium americanum* flower**

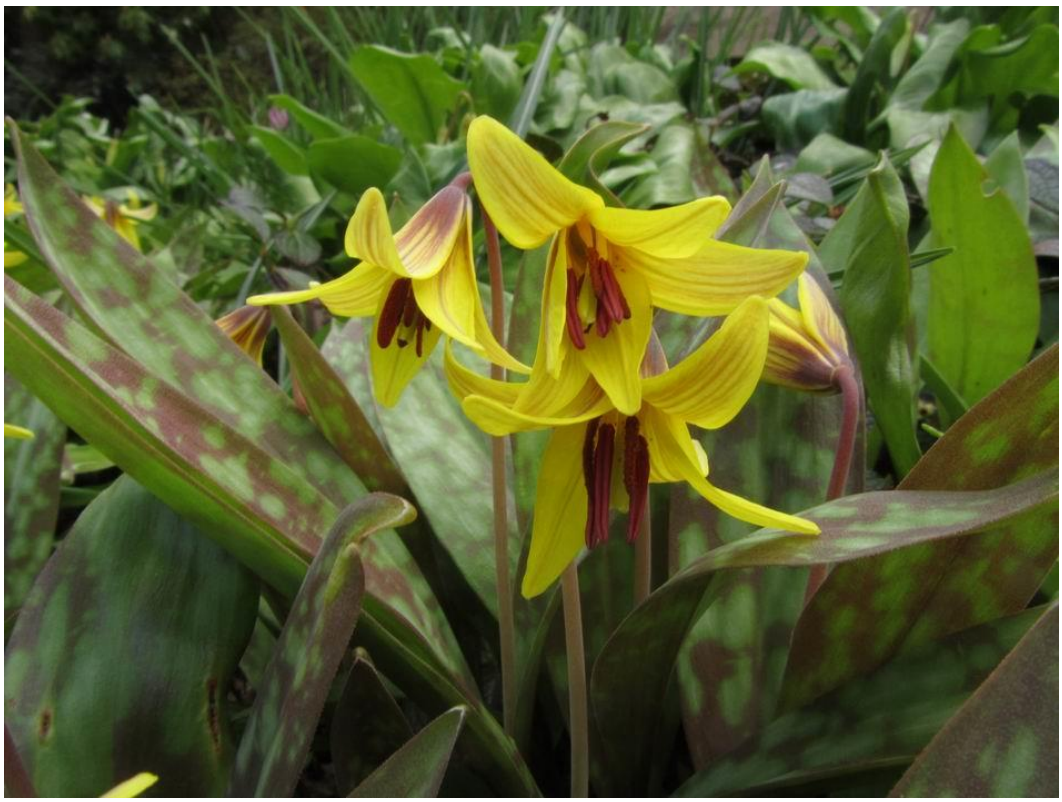
The flowers are yellow with brown spots mostly clustered around the centre of the flower but these can occasionally appear all the way up the petals.
Mostly the anthers are a lovely dark red, see below, before they dehisce - on ripening, pollen of varying colours from brown to yellow is exposed.

***Erythronium americanum* flowers**

To further aid my search to understand this group I am building up a series of pictures of all the forms we grow showing clearly all the diagnostic parts of the flowers.

Style

The style is club shaped with three ridges running for at least half the length ending in the stigma.



Erythronium americanum

The flowers are held singly on stems of up to about 10cms and the stems can vary in colour from green to red/brown.

Seed

We get some seed set on this species but not in great numbers; only the occasional flower has a ripe capsule.

Fresh seed, above and dried seed, below.

***Erythronium americanum* leaves**

Erythronium americanum leaves have similar patterns of random blotching as can be seen on the Eurasian complex making them very different from and easily separated from the Western North American species.

The degree of dark brown to green can vary with some forms having very dramatic colour effects.
As with all species the colour contrast is most dramatic when the leaves are fresh the dark colour tends to fade a bit as the season progresses.

Bulb

Mature flowering sized bulbs of *Erythronium americanum* are more of a classical bulb shape than the typical elongated Western Erythronium bulbs.

When growing well offsets can be formed forming nice clumps.

Unfortunately the most common form of *Erythronium americanum* found in cultivation, in the UK at least, is a form that proliferates without flowering. Each bulb sends out a number of stolons with new small bulbs forming at the tip. The next year each of these small, immature bulbs will also send out stolons and so the process continues without any of the bulbs growing on to mature enough to produce two leaves and so flower.

Here is a typical group of the proliferating form of *Erythronium americanum* showing plenty of single leaves growing from the juvenile bulbs - a bulb will only produce a flower when it grows to maturity producing two leaves. I have read many methods of how to make the proliferating form settle down and flower but none seem to work. What has happened in our garden is that eventually the group gets large enough or established enough then it does produce groups of flowers.

***Erythronium americanum* proliferating form.**

I have changed nothing in what I do so I can offer no explanation as to why we now get good groups of flowers on this large planting every year.
Perhaps it is because having spread out by stolons to colonise this bed up to the rock edges they can go no further with this method so some bulbs mature in the hope of setting seed.
It may also be that there has been some subtle change in our weather that stimulates the flowering.

Note how the contrast between the green and brown blotching is much more intense when the leaves first emerge.

Above and below are pictures showing stages of growths as one of our selected seed raised clones, growing in a plunge basket, progresses from bud into flower.

Erythronium americanum

On the left is another free-flowering seed-raised clone with lighter yellow/brown pollen.
Erythronium americanum is as easy to grow in cultivation as Erythronium dens-canis and is worth growing in our gardens for its lovely yellow flowers. It is best if you can get hold of one of the free-flowering forms but, failing that, plant the proliferating form in a restricted area and be patient. Below is my favourite form that I named *Erythronium* 'Craigton Flower'.

***Erythronium americanum* 'Craigton Flower'**

Erythronium albidum

Erythronium albidum

As the name suggests *Erythronium albidum* has white flowers many of which have a lovely dove grey sometimes red/grey reverse to the petals.

Erythronium albidum

Flower

There is a yellow zone in centre of the flowers and the pollen is yellow as are the filaments.

The style is split into three lobes at the tip.

Erythronium albidum

Erythronium albidum is one of the Eastern North American species, in many ways it is like a white version of *Erythronium americanum*: it is of a similar size and the leaves have the same dark blotched random patterns. I am not sure why this species is less common in cultivation than its yellow relative perhaps it is not so prolific in making offsets from the bulbs.

Seed

We have not had any seed from our garden plants yet but I am growing it from seed collected in habitat.

Bulb

The bulb is similar in shape to that of *Erythronium americanum* both having a more bulbous form than the elongated type of the Western species.

Erythronium albidum is a great plant that is not difficult to grow in woodland type soils.It will grow happily in semi shade but in our northern garden it flowers best in more open sites where it gets some sunshine.
I look forward to the seed maturing so we can increase the numbers of this lovely plant in our garden.

Erythronium albidum

Erythronium albidum

ERYTHRONIUMS IN CULTIVATION © Ian Young

Erythronium revolutum

Erythronium revolutum

Erythronium revolutum is the only pink species native to Western North America: it grows from Northern California to British Columbia, including Vancouver Island. While there is some variation in the colouration of the flowers and markings on the leaves it is unlikely to be confused with any other species in cultivation other than its own hybrids. I find it one of the best species to seed around and indeed it has made itself very much at home in our garden naturalizing and hybridizing with other species we grow. It grows well in our cool northern coastal garden where it thrives in both shade and full sun - however as with all Erythroniums it benefits from some shelter from strong winds which will damage the leaves.

Flower

Key diagnostic features in the flowers are the shape of the filaments which widen towards the base, often described as being like traditional Dutchman's breeches; the swollen sac-like appendages at the base of the petals; the stigma is divided deeply into three and the pollen is mostly deep yellow. In some of the deepest pink forms the pink colouration often extends into the style and filaments, as shown in the example above.

This dissected *Erythronium revolutum* flower shows clearly the diagnostic features.

Some years we get multiple flowers on a stem, typically two but three or more do also occur – this can vary from year to year - I think this is largely dependent on the weather and growing conditions of the previous year when the flower buds were forming. Hybrids of *Erythronium revolutum* will mostly have multiple flowers, as many as seven, so I always carefully check the key features of multiple flowered plants, especially the shape of the filaments, to determine whether it is the species or a hybrid.


While the majority of ***Erythronium revolutum*** flowers have yellow pollen (left) we have some that have creamy white pollen as shown here on the right and this feature carries through into the seedlings we have raised from these forms – they also have paler pink flowers. The form on the left is from Vancouver Island at the northern end of the range, it is easily spotted in our garden by its smaller stature, there is little in the way of markings on the leaves and the way the flower reflexes from much nearer the centre than most others.


For the last three years we have had a single pure white seedling that I believe is ***Erythronium revolutum,*** as all the diagnostics indicate that - and not a hybrid or another species as many of the so called white forms I have seen.

***Erythronium revolutum* hybrids** mostly have different shaped filaments as you can see in the two hybrids above whose filaments both have narrower almost parallel sides. In addition the, very attractive, dark red zig-zag markings are typical of *Erythronium revolutum* hybrids with *Erythronium californicum*.

Mutated flower

Occasionally we find mutations such as this one on the left where two flowers have fused into one giving two styles, extra stamens and some extra petals. This is a seasonal aberration probably caused by weather or damage to the bud and is unlikely to occur again in the same plant.
It is certainly not a desirable look in my view.

Seeds


The seed capsules are similar to all the Western North American species and can be harvested as soon as they are fully formed.

The seed is best stored in paper packets then sown in late August as described in the chapter on Seed.

Bulb

Mature bulbs of *Erythronium revolutum* showing the remains of previous years' growth attached as a chain. Off-sets can be seen on the two outside bulbs; a reasonably large one on the left and a small one on the right hand bulb. Some bulbs will increase this way forming reasonable clumps after around five years, others remain as single bulbs.

***Erythronium revolutum* bulbs**

A selection of bulbs of varying ages showing the range of shapes and sizes.

The longer narrow bulbs indicate these are still seeking a depth where they find such conditions of moisture and temperature that they can best tolerate.

Leaf

The markings on the leaves do not appear until the bulbs are three years old and they do not become fully developed until the bulbs reach five years of age.

On the left is a pot of seedlings of varying ages, those with the largest, best marked leaves are in their fifth year of growth while the youngest and plain green ones are just in their third year.
Some of the best forms are almost worth growing for the decorative quality of their leaf markings.

Erythronium revolutum with good leaf markings.

Leaf variation in *Erythronium revolutum*

Two self-sown seedlings displaying the variation that can be found in leaf markings – these are surrounded by more seedlings of varying ages – also notice that both these forms have the desirable feature for the garden of steadily forming clumps.

The form I raised from seed ex Vancouver Island has very slight markings on the leaves.

The flower stem also varies in colour from green to very dark red/brown and usually this reflects the markings on the leaves so those with good dark markings on their leaves are also more likely to have a dark flower stem and vice versa.

Erythronium revolutum grows happily with other spring flowering plants where it will gradually form clumps.
It is nice to have forms of different colours growing together so the contrast between the dark and pale flowers as well as the variation in the leaves can be enjoyed.

Erythronium revolutum forms that increase well are always welcome in the garden, the clumps above have increased from a single bulb in about five or six years. It is best to lift and divide clumps before they get so congested that the flowering reduces.

As well as clumps it is nice to have *Erythronium revolutum* seeding around like the group on the right which have all self-sown into the edge of a gravel path.

Erythronium hendersonii

Erythronium hendersonii flowers have the most attractive combination of colours of all the North American species – with pink to white petals combined with varying degrees of dark blackcurrant staining towards the centre they are highly appealing. The pollen colour can vary from violet through dark brown to yellow while the ovary and style are dark violet – at least in all the plants that I have seen. You are unlikely to confuse *Erythronium hendersonii* with any other apart from its own hybrids, of which there are a number around. These hybrids usually have some yellowy areas in the central zone.

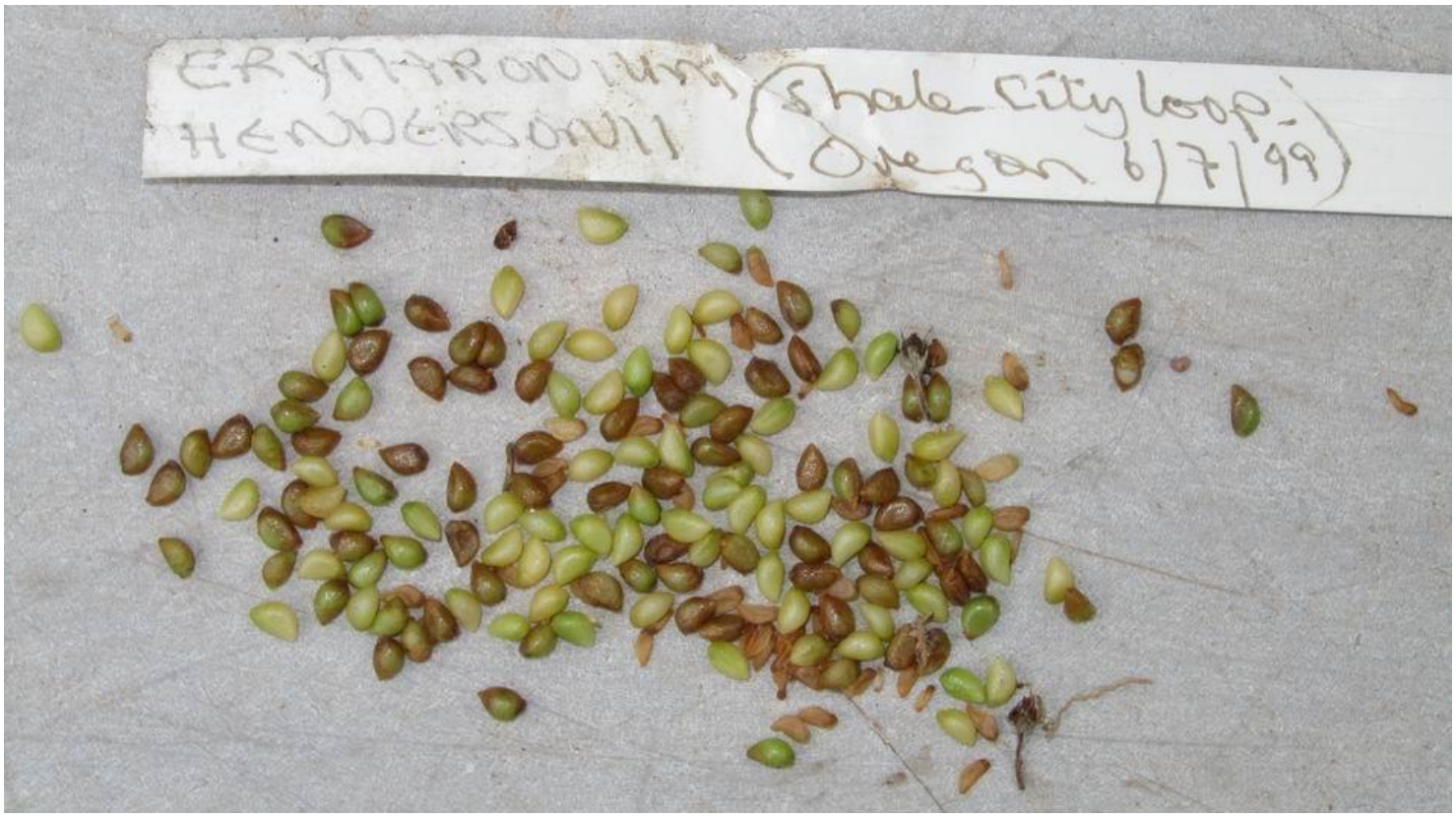
As with all the Erythroniums the anthers do not all dehisce at the same time they ripen in two lots of three with those attached to the outer three tepals maturing first.

***Erythronium hendersonii* flowers**

Erythronium hendersonii flower section showing the botanical details – note the style is club shaped or only slightly divided into three

Seed

Seed is produced most years in the garden and is the main way of increasing this species as it is most reluctant to form secondary bulbs.



***Erythronium hendersonii* seed**

The seed is collected and stored over the summer in paper bags.

The stored seed (left) is prepared in late August by soaking it overnight (right) before sowing.

Leaves

***Erythronium hendersonii* leaves**

Erythronium hendersonii has patterned leaves which, like other species, can vary from having only faint dark areas of markings to having a dramatic contrast between green and dark brown. In some leaves the pattern is formed between contrasting silver green and green (see below).

Bulb

***Erythronium hendersonii* bulbs**

There are no particular features that allow you to *distinguish Erythronium hendersonii* bulbs from other similar species.

Most bulbs remain as a single bulb and so this species is not inclined to bulk up and form clumps. The clump-forming plants I have seen here in the UK have always shown signs of being a hybrid of *Erythronium hendersonii* with the addition of some yellow colour around the central zone of the flower,

Mature plants *of Erythronium hendersoni*i can have multiple flowers per stem - in our garden we commonly see three sometimes five flowers on a single stem.

This species grows well in most situations in the garden and it is only the fact that it does not increase well by division that causes it not to be grown more widely.
This is where the hybrids that do form clumps can come into play as they retain all that makes this species so attractive with the added benefit of increasing.

Erythronium hendersonii

Erythronium hendersonii

Erythronium hendersonii

Erythronium hendersonii

Erythronium hendersonii

Erythronium oregonum

Erythronium oregonum

As the name suggests this plants grows in Oregon and other states of Western North America. While it is relatively easy to grow in our garden I find it slow to increase. None of the original plants raised from seed collected in the wild are inclined to form clumps – where offsets do form it takes many years before one bulb becomes two flowering sized bulbs - I have found the bulbs that do clump up quickly mostly turn out to have hybridised. Collecting our garden seed is the way we increase this plant but I find seed of this species is not so freely produced here as it is on the closely related *Erythronium revolutum.*

Flower

Erythronium oregonum

The filaments broaden out toward the base of the flower and are similar in shape to those of *Erythronium revolutum* however the flower colour is always white to cream, making it easy to distinguish these two species. It is much more likely that it will be confused with the other white species such as *Erythronium californicum*, (which has narrow thread-like filaments) so referring to the broad shape of the filaments of *Erythronium oregonum* helps aid identification. The shape of the swollen appendages towards the base of the petals can be used to further confirm the identity of this species.

Erythronium oregonum

Dissecting the flower shows clearly the shape of the filaments: these are widest in width towards the centre tapering at both ends - also of note is how the style divides into three at the tip.

If you look back at the first picture of the complete flower the filaments appear to be broad at the bottom – the narrow section of the filaments where it attaches to the flower is only revealed when you pull a flower apart revealing this taper.


Erythronium oregonum

Here are some variations of the flower colour which ranges from pure white to creamy shades of white. The markings in the centre also vary; those with the dark zig-zag markings are my favourite.


Erythronium oregonum

The pollen is mostly deep golden yellow although there are forms, usually those with creamy-coloured flowers, which have pale pollen.

Mature plants can have two or three flowers per stem and the following sequence of pictures illustrates some of the range and variations of the flower colours within the *Erythronium oregonum* that are growing in our garden.

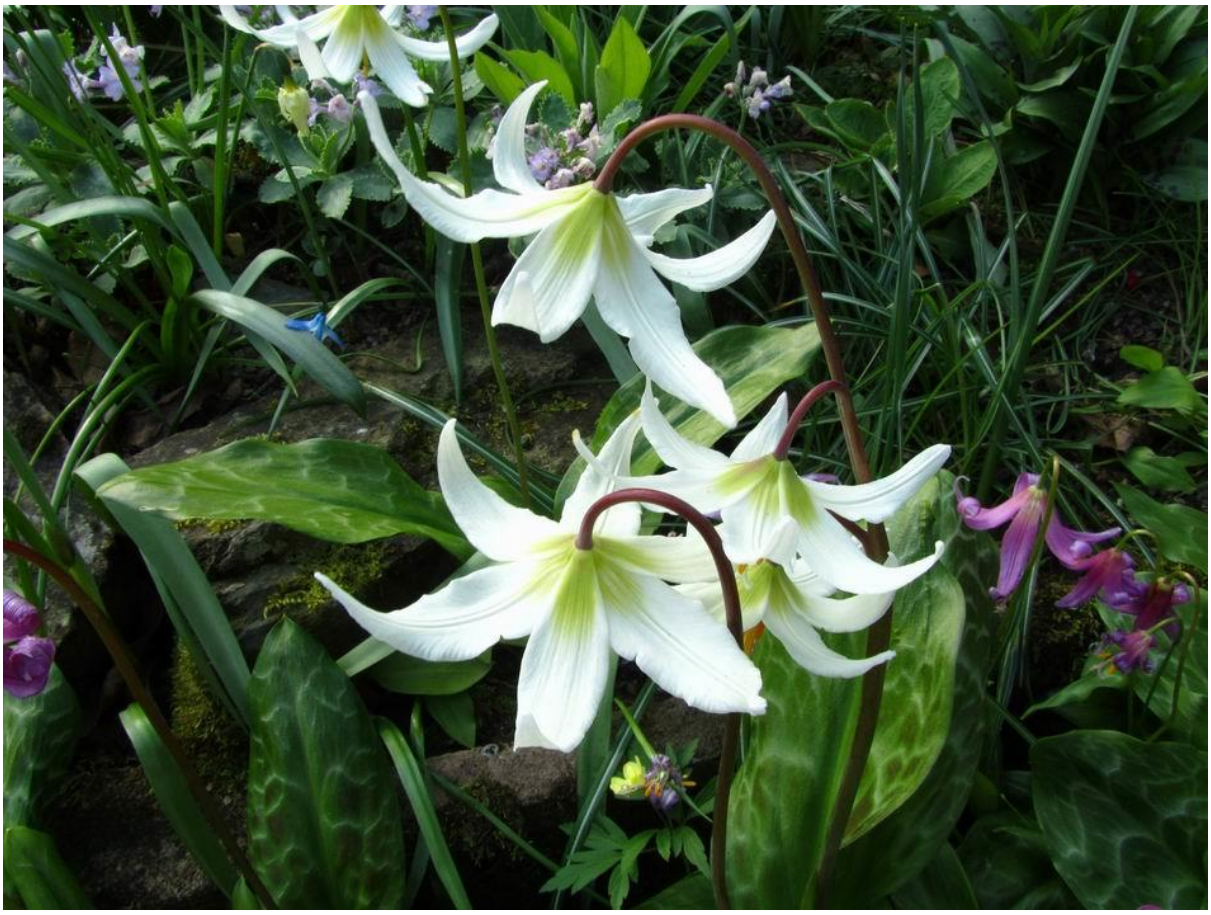
Erythronium oregonum

Erythronium oregonum

The flowers with the dark zig-zag markings mostly also have dark markings on the outside of the petals while the pale-centred ones sometimes display a green reverse.

Erythronium oregonum

Green reverse to the petals.



Creamy or yellowish petals on this form of *Erythronium oregonum* are often an indicator that it will also have pale coloured pollen; see below.

***Erythronium oregonum* with pale pollen**

Erythronium oregonum

Every year the flower on this one plant faces upwards, reminding us of the tulip relatives of *Erythronium*.

Seed

Seed pods and ripe seed.

I try to collect and sow some seed every year as this is the best way of building up numbers.

Bulb

***Erythronium oregonum* bulbs**

This selection of bulbs was raised from seed and you will see some small offsets that have mostly formed towards the top of the bulb: these will take a number of years to reach flowering size especially if they are left beside the parent in the garden.

This seed, collected in our garden, was open pollinated so I will have to check each plant for evidence of hybridisation.

Leaves

Some forms have beautifully marked leaves especially as they first emerge. As with all the *Erythronium* the contrast of the pattern reduces and the dark colour fades somewhat as the leaf ages.

Some of the most decorative leaves combine green, brown and silver.

Most *Erythronium* have a character to the leaves and with experience and familiarity it is almost possible to recognise the species from the pattern and colouration of their leaves but I will emphasise the ‘almost’.

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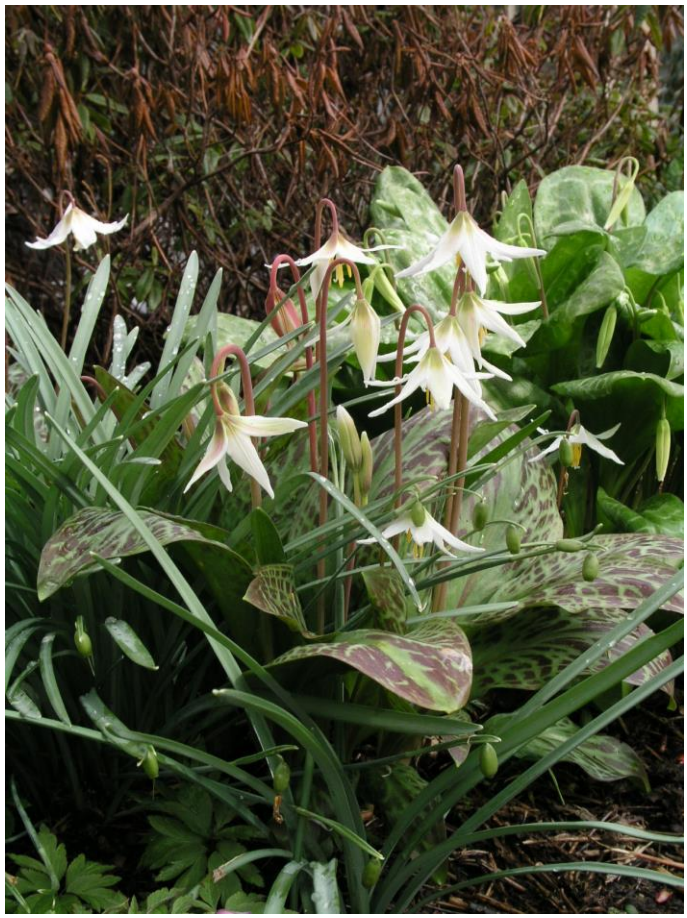
I plant out *Erythronium oregonum* in groups of seedlings as clutches of different clones can cross-pollinate giving a better chance of seed set.

The bulbs are planted out in July and August when they are dormant and when I am repotting the seed pots and plunge baskets.
Some groups of original bulbs from a known wild source, as shown on the left, I grow in mesh baskets plunged in sharp sand.

Erythronium oregonum grows in many aspects in our garden both in the open and under some light shade where its flowers can catch the light.

Erythronium oregonum



Erythronium oregonum

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Erythronium californicum

Erythronium californicum

Erythronium californicum filaments are narrow, ribbon-like with milky white pollen , the flowers are also creamy white with a yellow centre; some forms have dark red zig zag patterns around the centre.

Erythronium californicum is another excellent garden plant which is most often seen under the cultivar name of *Erythronium* 'White Beauty.' This is readily available.

I include 'White Beauty' here, rather than under *hybrids*, as there are no morphological indications that any other species is involved.

What makes this form such a good garden plant is its ability to tolerate a wide range of garden types and increase well by division: a healthy well-grown bulb can make two new flowering sized bulbs plus have several smaller offsets every year – it also regularly sets seed.

***Erythronium* 'White Beauty'**

Erythronium californicum

All forms are free-flowering, setting seed most years provided the weather conditions at flowering time are not too cold and wet. *Erythronium* 'White Beauty' has fewer seeds in the capsule compared to other forms; about one third of the number.

***Erythronium californicum* seeds**

Erythronium californicum

Bulb

On the left is a group of *Erythronium californicum* bulbs showing the typical shape – the longer thin ones are younger bulbs still taking themselves down into the ground seeking the best conditions.

Most forms will increase by offsets, soon forming clumps – forms such as 'White Beauty' form clumps quickly, see below, and are best lifted and divided every three to five years to maintain good flowering.

***Erythronium* 'White Beauty' bulbs with multiple offsets.**

***Erythronium* 'White Beauty'**

Leaves

The leaves are very similar to those of *Erythronium revolutum* and *Erythronium oregonum* with varying degrees of dark markings - the best of which can be very dramatic.

A group of seedlings showing variation in the leaf pattern, some with more dark areas than others.

Here is a clone selected from *Erythronium* 'White Beauty' seedlings which had darker marked leaves than the parent and was more vigorous perhaps as it was a much younger clone.
I distributed this form under the name *Erythronium* 'Craigton Beauty'.

Erythronium californicum is an excellent garden plant that is easy to grow, easy to get hold of plus it also increases well.

Erythronium californicum

It should be noted when raising *Erythronium californicum* from seed that you should check the resulting seedlings carefully when they first flower as it is a promiscuous species, hybridising readily with many other Western North American species.
Such hybrids can be very attractive, in fact many make very good garden plants as they can grow in an even wider range of garden and weather conditions than the pure species.

Erythronium californicum

Erythronium multiscapideum

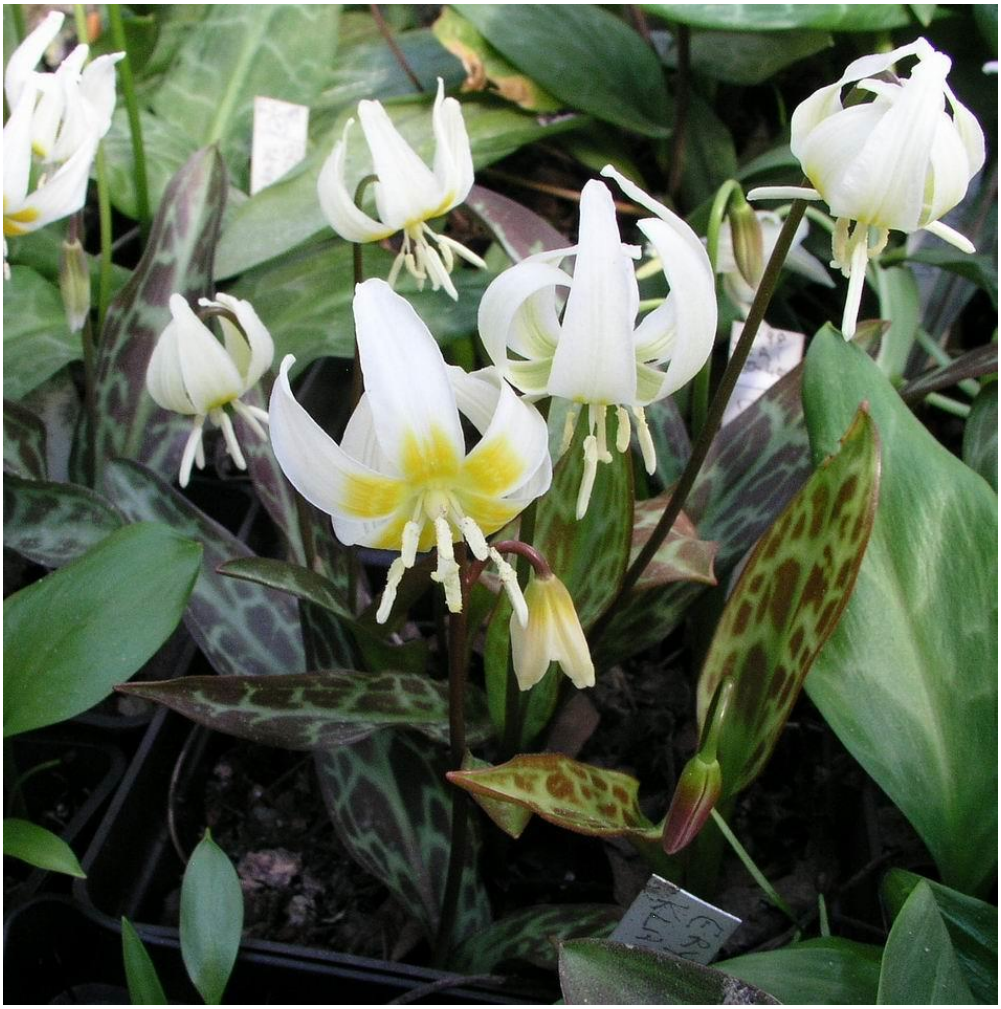
Erythronium multiscapideum is another species whose flowers are white with a yellow centre - some forms have additional darker zig-zag markings around the yellow zone. The pollen is milky white, the filaments are linear and the style is divided into three at the tip.

Flowers

Superficially this species looks very similar to, and could easily be mistaken for, *Erythronium californicum.* The clear difference is in the flower stems and this is where *Erythronium multiscapideum* gets its name. In botanical terms the main flower stem is called a scape and the stems that split off that to hold the individual flowers are pedicels. *Erythronium multiscapideum* has a truncated scape which does not extend much above the ground and is mostly hidden low down in the leaves: the individual flower stems, (pedicels) on the other hand, are long giving the impression that each bulb has many stems rising from it, hence the specific name.

This is one of the first species to break though the ground in the spring reaching peak flowering in mid to late April.

***Erythronium multiscapideum* seed**



Leaves

Erythronium multiscapideum leaves tend to be slightly narrower than those of *Erythronium californicum*. The pattern between the dark brown and green is also slightly different which with experience can help in separating out these two species.

Erythronium multiscapideum is not difficult in cultivation and we do get seed provided the weather at flowering time is reasonably warm and dry.
I have never seen any evidence to support the often mentioned stolons that are said to grow out from the bulb.

The bulbs are slow to increase in our garden leaving seed as the main way of increase.

Erythronium multiscapideum

Even though we have grown *Erythronium multiscapideum* for the same length of time as other species, such as *Erythronium californicum*, it has never increased as much as they have.

Erythronium helenae

Erythronium helenae

flowers

Erythronium helenae shares a similar colouring with many of the other Western North American Erythroniums, having white flowers with a yellow centre. It can be difficult for the gardener to distinguish which is which.

The yellow centre in *Erythronium helenae* tends to be deeper in colour and, unlike other species, the yellow does not fade away slowly as it spreads out but stops a bit like a fried egg! Another guide is that this species has yellow pollen but perhaps the best indicator is that the style does not project straight forward but bends sharply downwards, perhaps to aid a natural pollinator.

Seed

***Erythronium helenae* seed**

Seed is the main way we increase this species as it has not increased by splitting of the bulb at any speed – we have raised a hybrid from this species, *Erythronium* 'Craigton Cream' which does increase very well by division.

Leaves

The mature leaves are similar to many others with a pattern of dark brown on green - the dark colour sometimes fades out to silver as the season progresses. The flower stem may be green or red as illustrated in the two clones shown below.

While we do have some of this species planted in the open garden most of our plants are growing in pots or plunge baskets.

E. helenae has a restricted distribution in Northern California.

I have detected a lovely scent on some of the forms we have of this species.

Erythronium helenae

Erythronium howellii

Erythronium howellii

Erythronium howellii

Erythronium howellii has a white flower with a yellow central zone and is very similar to *Erythronium citrinum* – the key differences are that the swollen appendages on the petals are absent on this species and also in the way the flower opens, see under *Erythronium citrinum* for more details.

Erythronium howellii

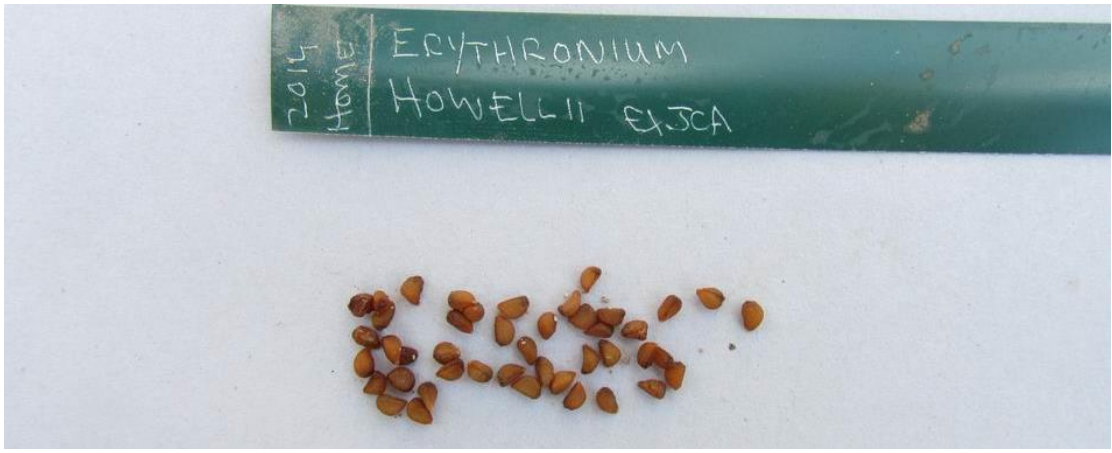
The flowers are white to creamy white as are the anthers and pollen - varying degrees of yellow in the throat give it an attractive appearance.

As with many white flowers they often take on a pink colour as they age and the anthocyanins develop.

Seed

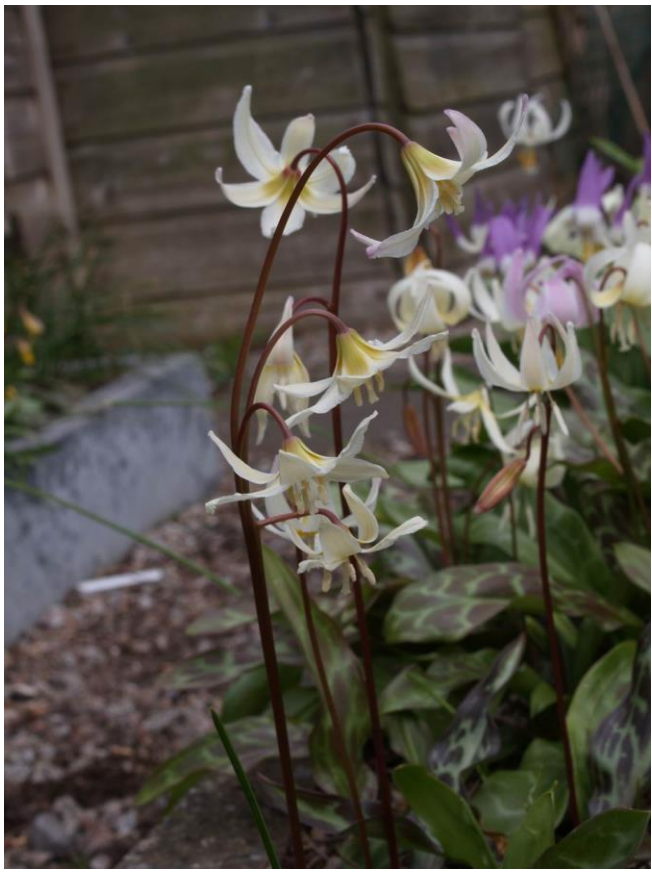
Seed freshly harvested from the garden will be stored in paper packets before it is soaked and sown towards the end of the summer.

The same seed is now soaked and ready for sowing and below are the seedlings germinating the following April.



***Erythronium howellii* seedlings**

Mature plants of *Erythronium howellii* will have multiple flowers on a stem; we mostly get four in our garden.
This is another species that offers no real difficulties growing in a number of beds in our garden but like *Erythronium citrinum* it is best suited to the beds containing smaller plants.



Erythronium howellii

Erythronium howellii

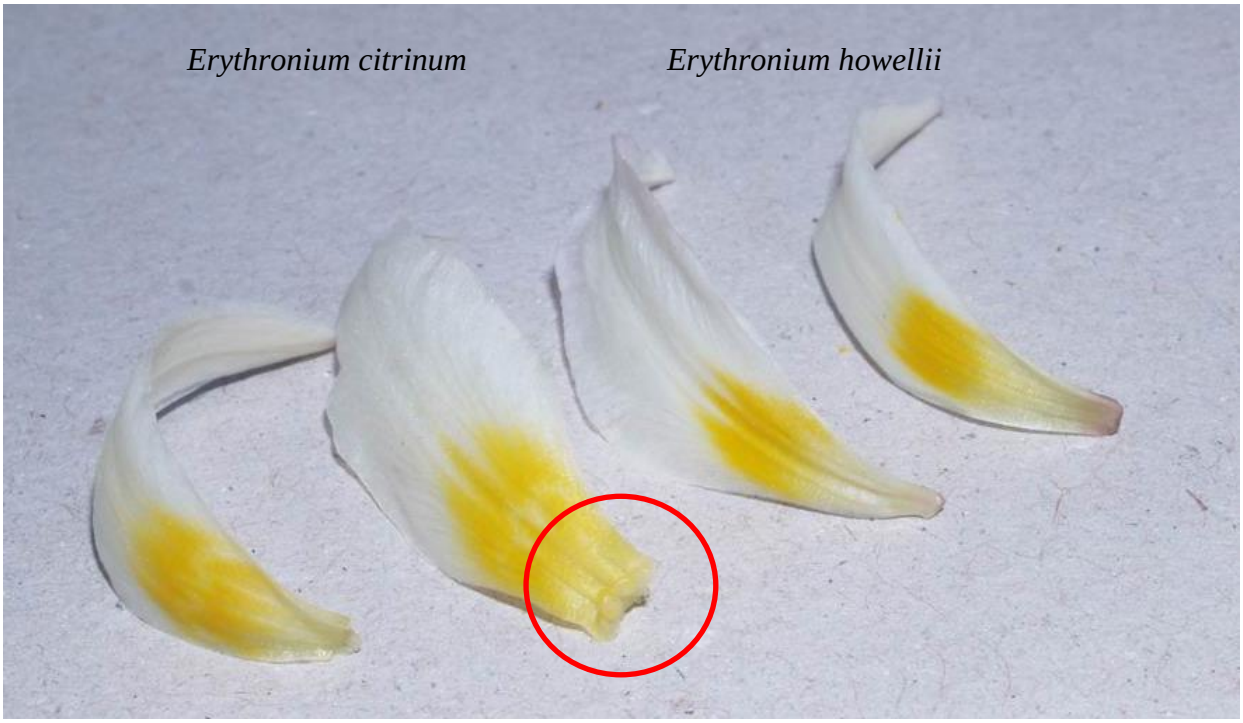
Erythronium citrinum

Erythronium citrinum

Erythronium citrinum is one of a number of Erythroniums that are basically white with a yellow centre.
This would not be among the first species I would recommend to the regular gardener: *Erythronium oregonum* and *Erythronium californicum* provide similar colours and are more robust garden plants; however for the enthusiastic growers *Erythronium citrinum* is a charming species.

Erythronium citrinum has white flowers, with some degree of citrus yellow colour towards the centre with matching white pollen – the filaments are narrow and there are swollen appendages at the base of the petals.
The species that it is most likely to be confused with is *Erythronium howellii* which shares most of the same features but does not possess the swollen appendages.

On the right are one inner and one outer floral segment from both *Erythronium citrinum* and *Erythronium howellii* with the swollen structure on the former circled.



Erythronium citrinum

Erythronium howellii

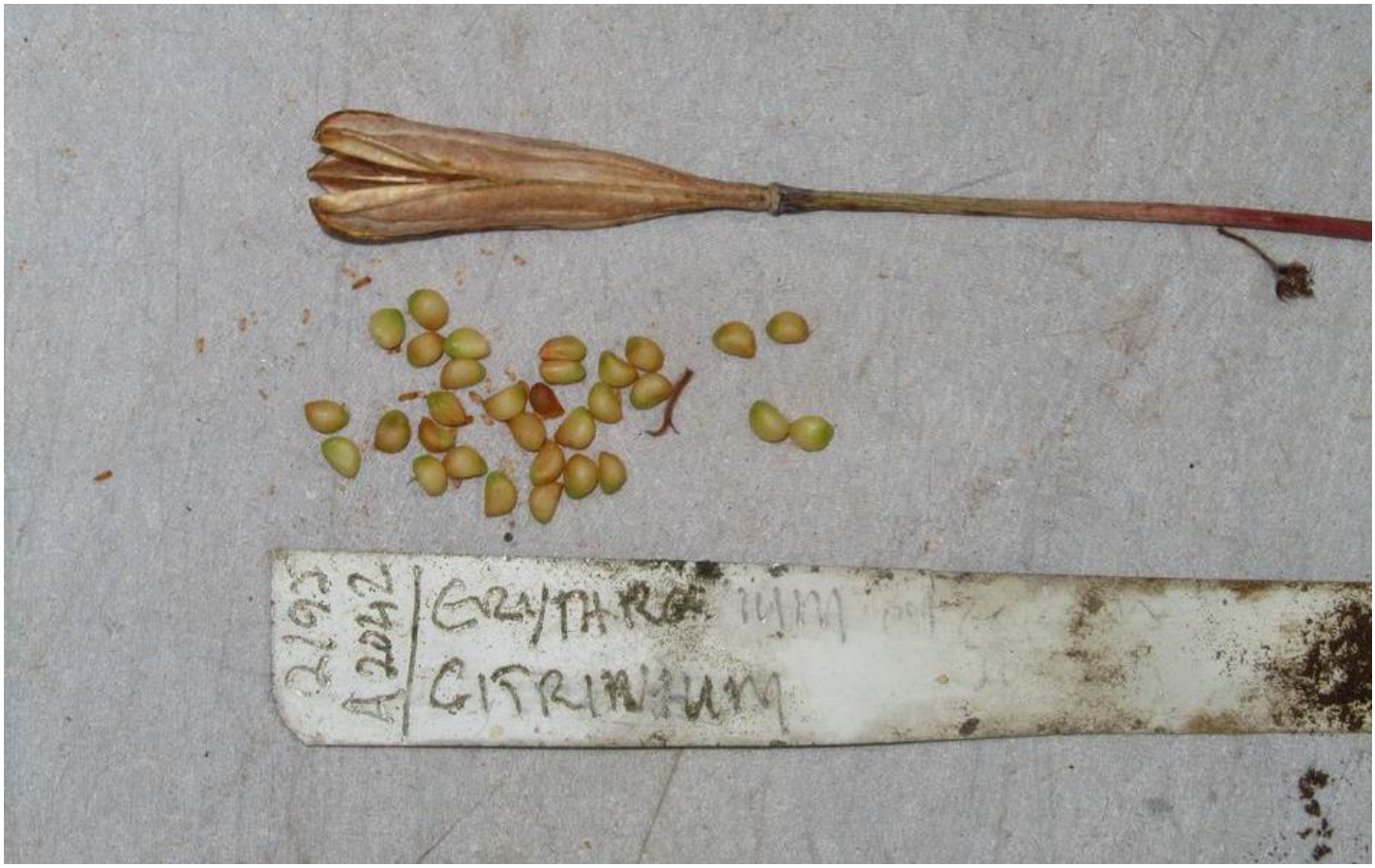
Another difference I have noted is in the shape of the flowers - when they are open *Erythronium citrinum* flowers open wider revealing more of the stamens, style and ovary when viewed from the side while the base of *Erythronium howellii* always remains more bell-like, wrapped around these parts of the flower.

Erythronium citrinum

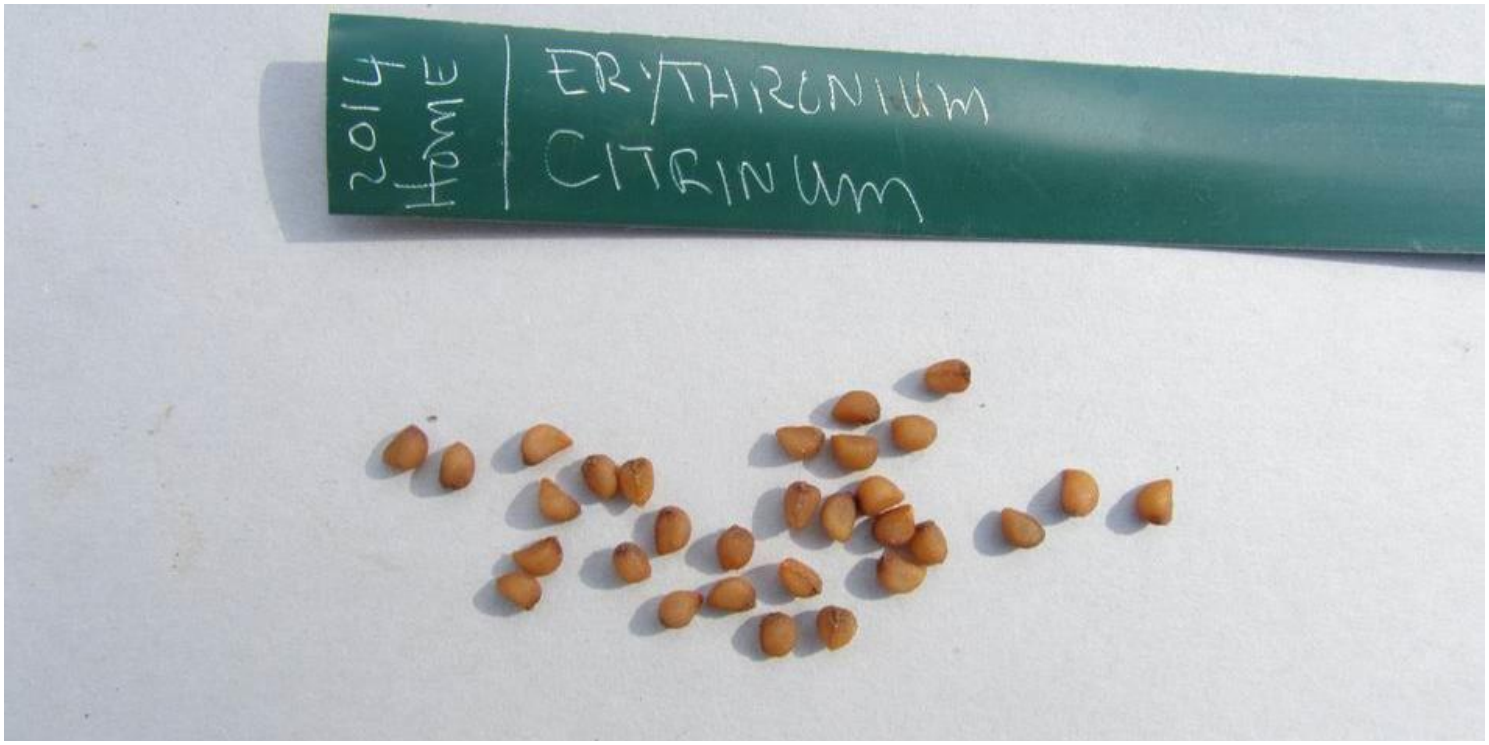
Erythronium howellii

Looking at the two species in flower you become able to tell them apart from the shape of the flower and a quick check inside for the presence or absence of the swollen appendages will confirm which species it is.

Seed



Seed is the best way to increase this species and you can expect around thirty seeds from a well fertilised capsule.



I store the seed dry in paper packets over the summer, ideally sowing it at the end of August after soaking it overnight. Above you see the same seed as in the previous picture which has now been soaked, ready for sowing. In the picture below is the resulting germination the following spring.

Erythronium howellii and *Erythronium citrinum* seedlings photographed on 30th April 2015.

Bulb

A group of typical *Erythronium citrinum* bulbs – you will note that there are no new offsets, just the remains of the previous years' growth attached at the base of the new bulb. In my experience this is another species that does not increase readily by division.

Leaves

***Erythronium citrinum* leaves**

Erythronium citrinum

Erythronium citrinum* var. *roderickii

A number of years ago a new variety was named *Erythronium citrinum* var. *roderickii* after the late Wayne Roderick: its distinguishing feature is the dark anthers which reveal brown pollen when they dehisce. I find this to be the most beautiful variation.

I have seen a number of plants of *Erythronium citrinum* in the UK which, on close inspection, appear to be hybrids, many have dark pattern lines around the central yellow zone – these plants do clump up quite well.

Erythronium citrinum is a relatively easily grown species and being that bit smaller in stature is ideally suited to growing among smaller plants on our rock garden.

Erythronium citrinum

Erythronium elegans

Flower

Erythronium elegans

Erythronium elegans hails from Oregon and looks very similar to *Erythronium montanum*: it has white flowers which turn shades of pink as they age. It is thought that this species may have evolved from an ancient cross between *Erythronium montanum and Erythronium revolutum*. I can see traces of both these species in the plants we grow - such as in the shape of the filaments which are intermediate not as slender as those *of E. montanum* - also the pink colour that develops in the flowers could possibly come from *E. revolutum*.

Erythronium elegans

Erythronium elegans

The pollen is golden yellow when ripe and the style is divided into three lobes but not so deeply as *in Erythronium montanum.*

Erythronium elegans

Seed

We get seed from *Erythronium elegans* most years which has resulted in sufficient plants for us to try planting them out in various situations in the garden.
It does best in the more open areas towards the edges of the beds where it gets more light and sunshine.
Where I do not collect the seeds this species has self-sown forming nice groups growing in the gravel path.

***Erythronium elegans* seed capsule**

Erythronium elegans

Pictured above are the freshly collected seeds of *Erythronium elegans*. On the left are the stored seeds that have been soaked overnight ready for sowing, below.

Bulb

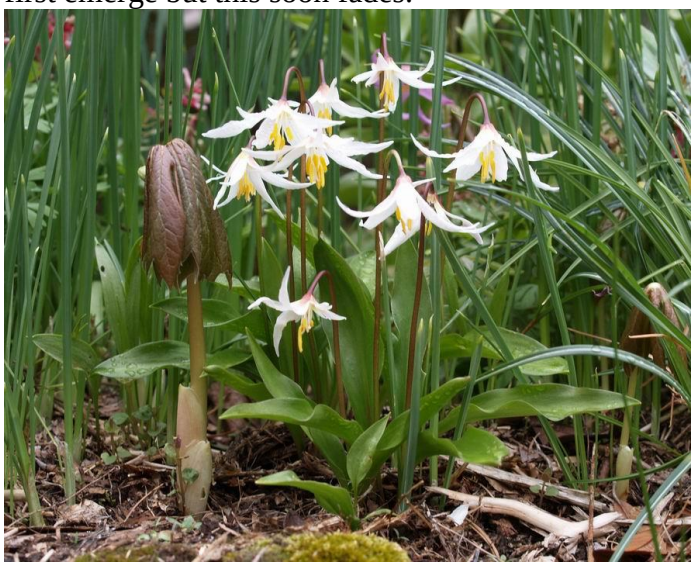
***Erythronium elegans* bulbs**

The bulbs of *Erythronium elegans* are similar in shape to those of the closely related *Erythronium montanum* but they tend to retain a bit more of the thin tunic. The bulbs also have the distinct chains of previous years' growth attached to the base. Some clones will slowly forms clumps by offsets.

Leaf

***Erythronium elegans* leaves are plain green.**

I have read that *Erythronium elegans* can have patterned leaves but all the plants we have raised from both introduced and home produced seed have been plain - a few have the slightest hint of a silver pattern when they first emerge but this soon fades.



Erythronium elegans

Erythronium elegans is relatively amenable to general cultivation - it is certainly an easy plant to grow in our garden where it lives up to its specific name bringing elegance with its beautiful white flowers which age to shades of pink.

Erythronium elegans

Erythronium elegans

Erythronium montanum

Erythronium montanum

Erythronium montanum is the last of all the Erythroniums to break through the ground in the garden - it is also the first to ripen seed and go dormant. This gives it the shortest growing season of all the species we grow. As the name suggests it is a mountain species coming into growth as the snow banks melt.

It has a white flower with a central yellow zone which, when viewed closely, reveals a zig-zag pattern in a deeper shade of yellow. The yellow pollen is held on long slender filaments and the white style is deeply divided into three recurving lobes.

The beauty of this species starts to reveal itself from the moment the crystalline white flowers start to unfurl – they emerge folded and creased like silk before expanding to their full glory.

The flowers can be quite large, the width of my palm, 10cms across. The width of the petals can vary so some, with separation between, are starry in appearance while others have broad and overlapping petals from about half way down. Even when fully expanded the petals retain a characteristic twist as they taper down to the narrowest of tips.

Seed

Provided our weather is reasonably mild and dry during the short flowering season we will get seeds from this species most years.

***Erythronium montanum* seed**

***Erythronium montanum* seed**

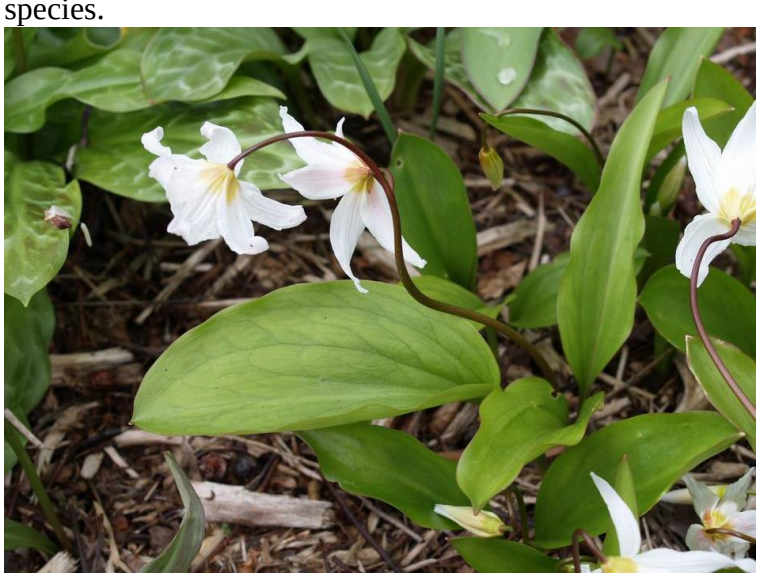
When I first read about this species, many years ago, I took the words ‘it could not be flowered in cultivation’ as a challenge, making me determined to try and prove otherwise. I acquired seed from a few sources that supplied collected North American seed and after around five years I had not only managed to get *Erythronium montanum* to flower but also got some viable seed. Since then I have always sown our own garden-produced seed in every year it has been set.

Each subsequent generation of garden seedlings became more acclimatised and adapted to grow in our garden conditions.

Leaves

***Erythronium montanum* leaves**

Erythronium montanum has plain green leaves with no markings. The petiole is more noticeable than in some other species.



Sometimes I find the leaves can be rather yellowish in colour with the dark green veins standing out –this is typical of a plant suffering a nutrient deficiency. To combat this I will water a few times during the growth period with a balanced liquid fertiliser with also contains trace elements. Understanding that the plant grows as the snow retreats leads me to conclude that it has evolved with no shortage of water during growth - in addition all that snow melt water will contain many nutrients, built up and stored over the winter, so it has a constant supply of moisture and nutrients during the growth - I mimic that by watering with the liquid feed.

Bulbs

***Erythronium montanum* bulbs**

Erythronium montanum bulbs are that bit different from most species with the exception of the closely related *Erythronium elegans*.

Their bulbs have a long slightly curved tapering shape.
The very thin tunic covering the bulb tends to wear away more than in many other species so the bulbs look whiter.

The vestiges of previous years' bulbs remain attached, like links in a chain, to the base and occasionally a secondary growth will form.

***Erythronium montanum* chains**

These chains, consisting of the compressed stem part of previous years' bulbs, will remain dormant for many years before eventually drying out but, if the dominant growth of the main bulb is removed or damaged, new buds will form on these chains.

Removing these chains does not harm the main bulb in any way so when I repot I will remove the chains, splitting them into individual links, and then growing them in the same conditions as the bulbs. Each link will form at least one new bulb.

Erythronium montanum

I grew this precious plant only in pots or mesh plunge baskets for many years until I had built up sufficient quantities to try some planted out into the open garden.

Erythronium montanum **flowering in a mesh plunge basket.**

Erythronium montanum is likely to remain one of the more challenging species to grow in the garden - you are more likely to succeed with it in cooler gardens like ours than you are in warmer areas.

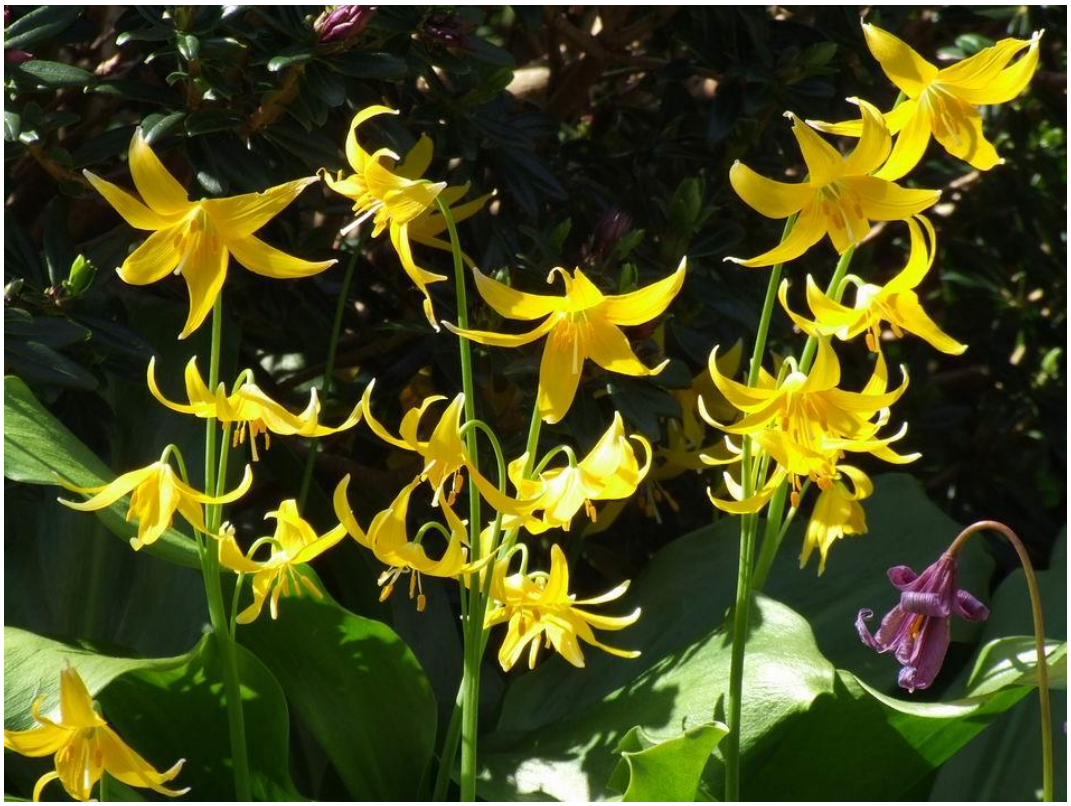
The remaining images show *Erythronium montanum* growing and flowering in our rock garden bed.

Erythronium montanum

Erythronium montanum

Erythronium montanum

Erythronium tuolumnense



Erythronium tuolumnense

Erythronium tuolumnense must be among the most commonly grown species in cultivation and that is largely down to the fact that the robust bulbs readily produce offsets allowing the plant to bulk up quickly.

Multiple yellow flowers are borne on a stem held above the plain green leaves.
It is native to Tuolumne County, California, where its habitat is that of sloping wooded river banks. This shaded environment would explain why it has evolved the largest leaves of all the species, to capture maximum light.
Erythronium tuolumnense is easy to grow in cultivation and though it grows well in the shade it also thrives in an open aspect. While it does not require shade from sunshine in our garden it does require shelter from the strong winds which will damage the leaves.

Flower

Erythronium tuolumnense

Erythronium tuolumnense flowers come in shades of yellow and the ripe anthers bear golden yellow pollen.

Being one of the few yellow species it is unlikely that you will mistake it for any of the others, the nearest being *Erythronium grandiflorum* – which is considerably smaller in stature.

There are a number of hybrids raised from this species such as *Erythronium* 'Pagoda' and these do look very similar to the species but most have some dark rings around the centre of the flower.

***Erythronium tuolumnense* seed**

It is not the most generous species with its seed in our garden but we do get some seed set most years.

Bulbs

Erythronium tuolumnense seedling bulbs being repotted for the first time three years after sowing.

Erythronium tuolumnense bulbs

Not surprisingly mature bulbs of *Erythronium tuolumnense* are also the largest found in the genus.
When growing well each bulb will divide producing two flowering sized bulbs every year - in addition to that they may also produce a number of smaller offsets.

Leaves

Erythronium tuolumnense has plain green leaves.

Erythronium tuolumnense

Although this is a fairly uniform species you will get some variation, in the depth of yellow of the flowers.
The most attractive forms are those where the open flowers are held well above the leaves.
On the left you can make out the subtle difference in these two clones as they start to open – then as mature flowers below.

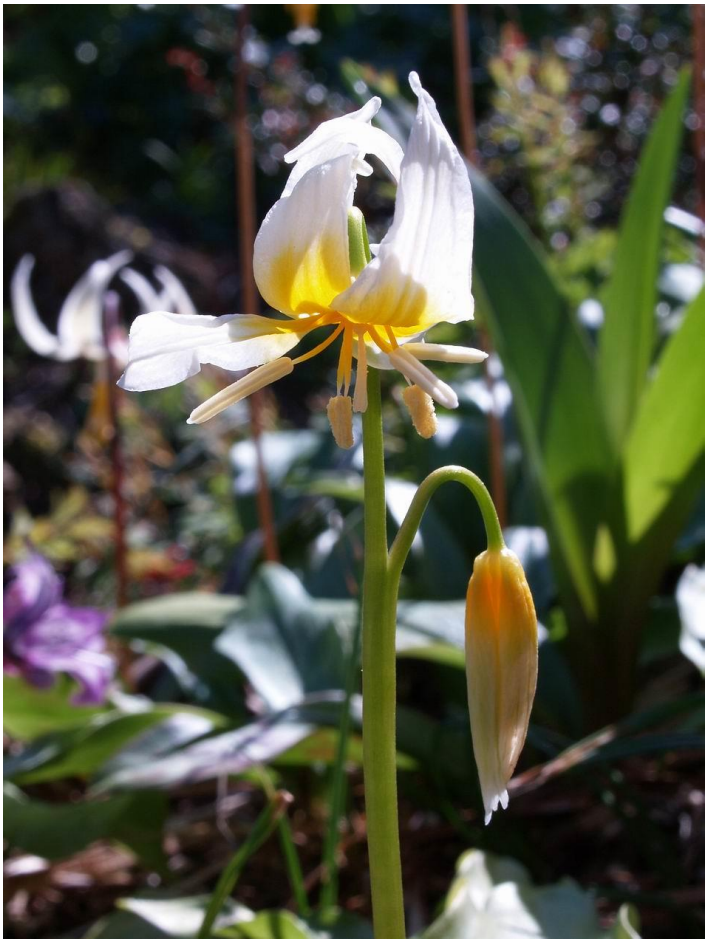
Being the largest and one of the few yellow species, *Erythronium tuolumnense* makes an excellent garden plant. It is especially suited to growing in shade and will grow happily below trees and shrubs provided it has some head room.

As it is clump forming it should be divided regularly before the competition for nutrients and moisture between the closely packed bulbs restricts flowering.

Erythronium tuolumnense

Erythronium taylorii

Erythronium taylorii



Erythronium taylorii is a relatively new species, described in 1998.
It has only been found in a single site in Tuolumne County, California where it has a fairly restricted habitat growing on steep rocky wooded cliffs.

We were among those lucky enough to get seeds which were sown and grown on, resulting in our first flowers on this species in 2006.

The flowers are white with a yellow throat and the pollen is white to cream. The filaments are bent through 90 degrees, holding the anthers out to the side until they start to dehisce then they straighten out so the ripe pollen is held forward close to the stigma.
The style is almost entire; only very slightly divided into three at the very tip.

We have had up to three flowers on a single stem.

Erythronium taylorii

Erythronium taylorii
Seed

We got the first flowers to set seed which we duly sowed producing a reasonable germination.

Bulbs

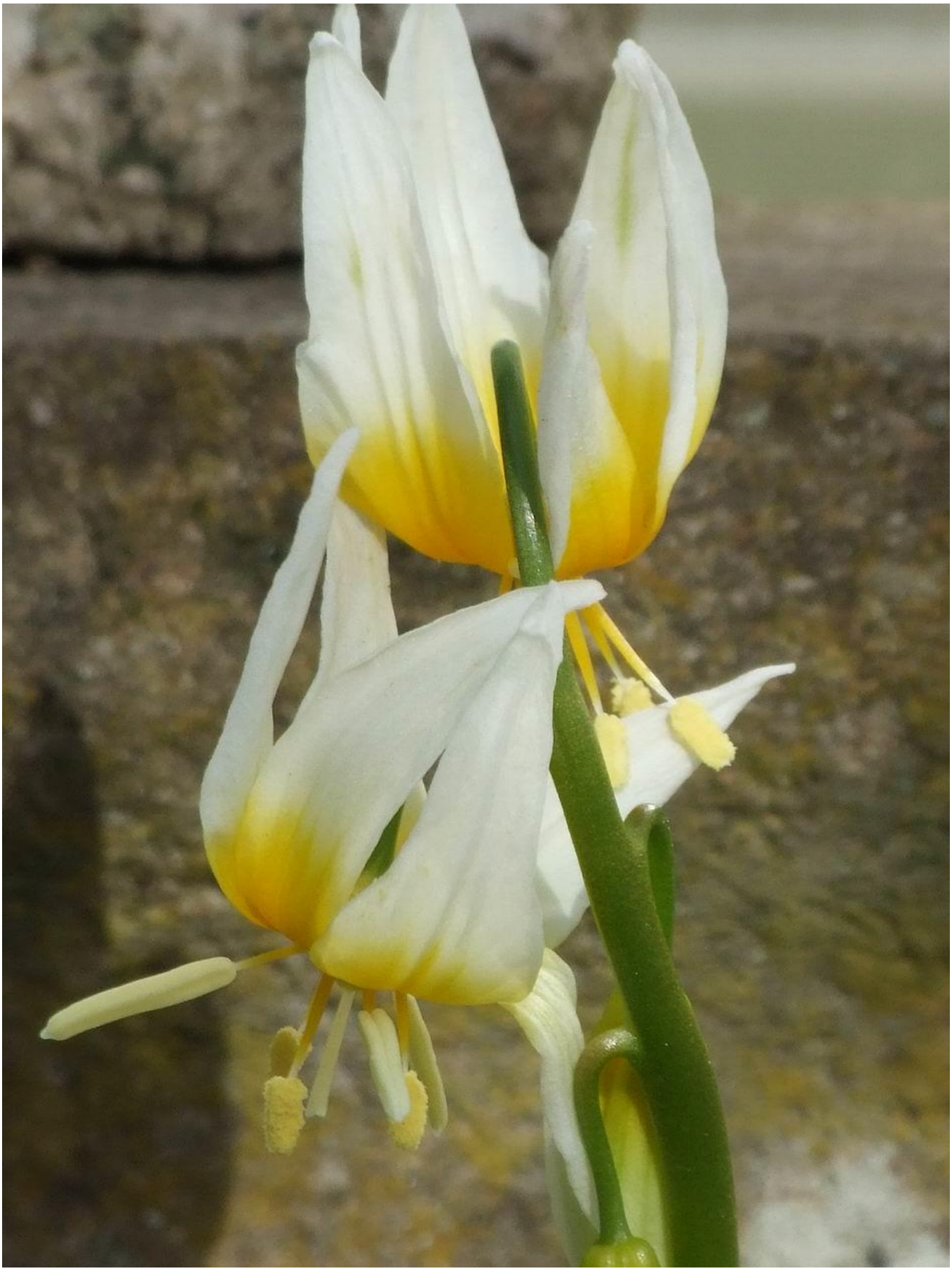
Erythronium taylorii bulbs are of reasonable size and early indications were that it would produce some offsets.

Erythronium taylorii

The leaves of *Erythronium taylorii* are plain green.

I had high hopes that this plant, with its graceful flowers, would prove a great addition to our garden but our early success soon turned into a struggle to keep this plant alive. I am at a loss to know what suddenly caused its demise: the most likely cause is that coming from a single location with such a restricted habitat type, it simply could not adjust to our climate.

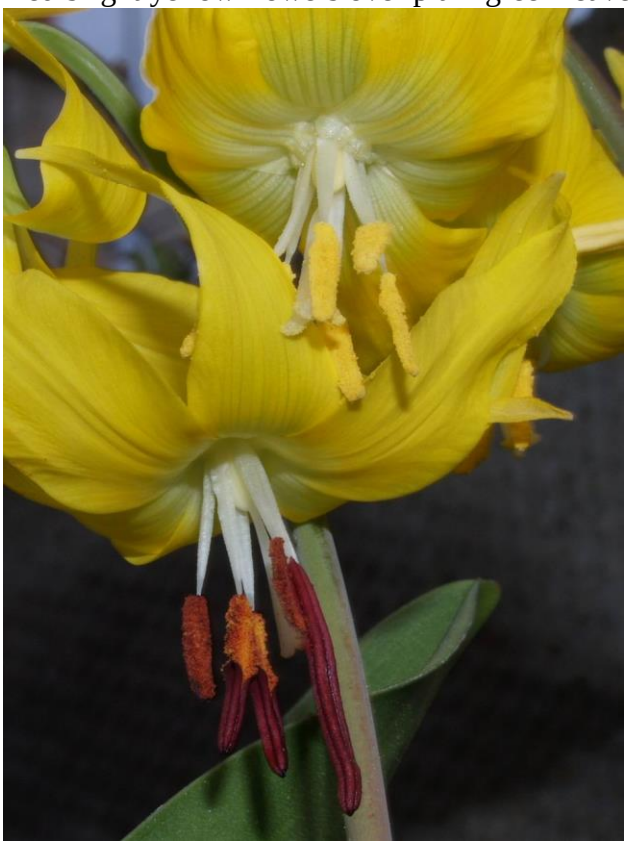
I had hoped that the garden seed we got would result in some clones more able to grow for us but that has not happened as the seedlings also succumbed. I am not aware of any one who is growing and flowering this plant successfully yet.

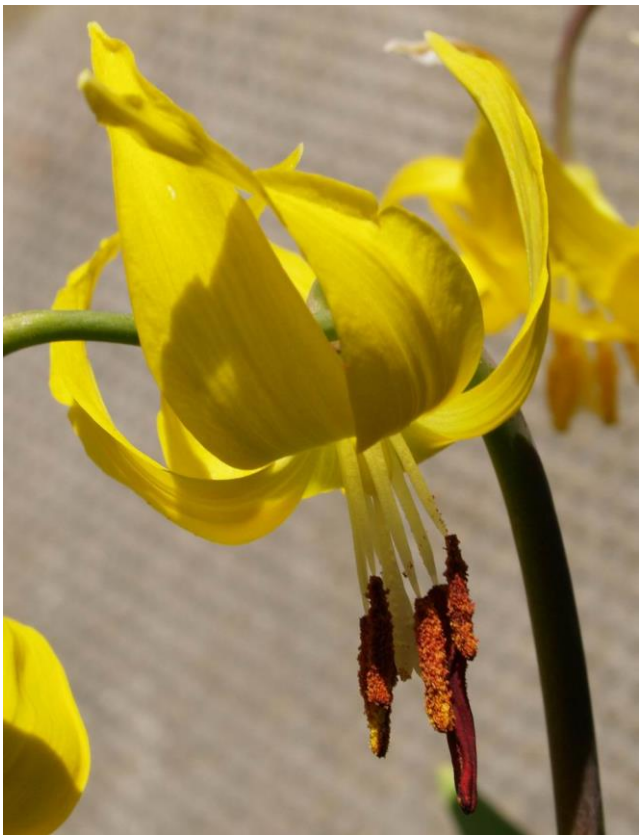


Erythronium taylorii

Erythronium grandiflorum

Erythronium grandiflorum has a wide distribution and can be found from Vancouver Island in Canada down through most of the western states to California. It is the best of the western yellows for the rock garden; it has good-sized bright yellow flowers over plain green leaves.



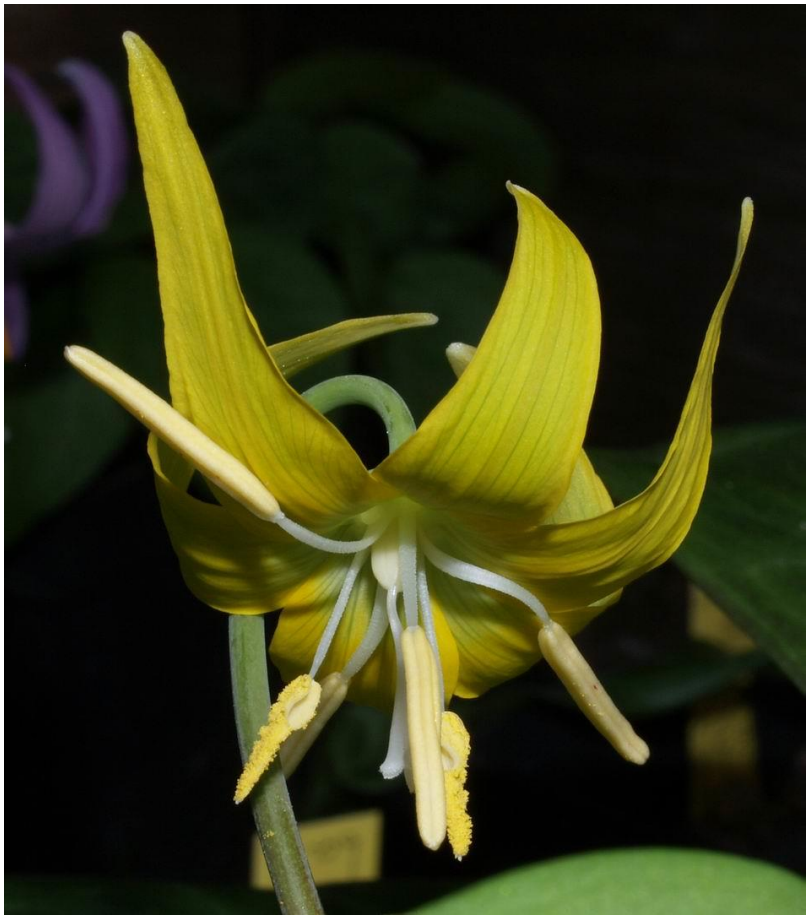


Erythronium grandiflorum* var. *grandiflorum

Three varieties are named depending on the colour of the anthers; var. *grandiflorum* has brown pollen, var. *chrysandrum* has yellow pollen and var. *pallidum* has cream pollen.

Erythronium grandiflorum* var. *chrysandrum

Erythronium grandiflorum* var. *pallidum



Erythronium grandiflorum

I have observed that in some forms of *Erythronium grandiflorum* var. *pallidum* the filaments were initially bent holding the anthers out to the side, then they project forward as the anthers dehisce. Since I first made this observation I have found this feature also in some of the other varieties.
I am not sure if this feature is of any botanical significance.

Leaves

The leaves of *Erythronium grandiflorum* are plain green, occasionally with a thin dark line running around the edge.

***Erythronium grandiflorum* leaves**

Bulb

The bulbs are typical in shape with no particularly defining features to separate them from most other Western North American species. The bulbs rarely produce offsets.

***Erythronium grandiflorum* seed**

Erythronium grandiflorum

Despite the fact that I have seen images showing massive areas of this species in habitat in full flower it remains uncommon in cultivation.

From my experience it is reluctant to increase by division of the bulb, leaving seed as the main method of increase in the garden. We do not get a successful seed set on this species every year.
Apart from this slow rate of increase *Erythronium grandiflorum* is not difficult to cultivate, growing in any of the beds where we have it planted. I think it is in the rock garden beds that it stands out the best.
It is a pity that this beautiful species is not seen in more gardens.

Shown on the left is *Erythronium grandiflorum* var. *chrysandrum* growing in the rock garden and below is a mixed group growing in a sand bed.

Erythronium grandiflorum

Erythronium grandiflorum* var. *pallidum

Erythronium grandiflorum* var. *grandiflorum

Erythronium species nova

Erythronium new species?

I grew this *Erythronium* for the first time from seed collected on Mount Prevost and passed on to me by Ian Christie. It was described as a form of *Erythronium grandiflorum* but it is very different from any form of that species we grow and I suspect this could be a new species.
A close up of the flower reveals some of the diagnostics used to distinguish the species such as the filaments and these differ slightly, being longer and narrower than in the various forms of *E. grandiflorum* that we grow. Also the style is much more deeply divided into three recurving stigma lobes which are also covered in a hair-like structure.

You can see from these pictures that this plant has plain green leaves.

Erythronium **new species?**

***Erythronium* new species?**

This plant, as grown by us to date, is small, being no more than 10cms tall with single yellow flower per stem but I feel we may not have grown it to its best and we may find it grows a bit bigger with possibly more flowers per stem as the bulbs mature.

Seed

Erythronium new species seed

We have now flowered this plant twice since sowing the original seed in 2006 and each time we also got seed to set. Above left is the dried garden seed after being stored - on the right is the same seed soaked overnight and ready for sowing in September 2014.

Erythronium sp. *nova ?*

The same seed as shown above germinating 30th April, 2015.

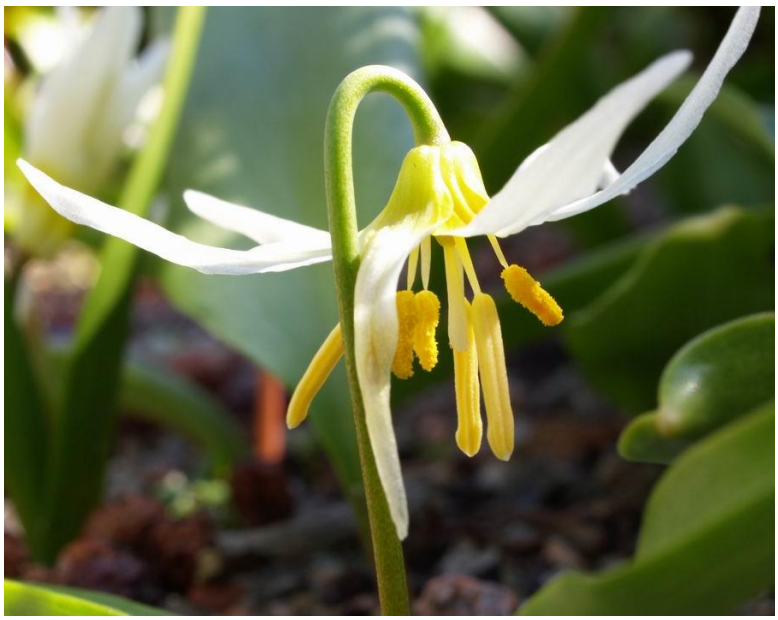
These are bulbs we raised from the original seed along with some of the seeds set. New roots were forming as I repotted these bulbs in August, so I suspect this species would not take kindly to being too hot and dry in the summer.

As the seedlings mature I look forward to seeing whether we can firmly establish this delightful compact plant into our garden.

Erythronium new species?

Erythronium klamathense

Erythronium klamathense

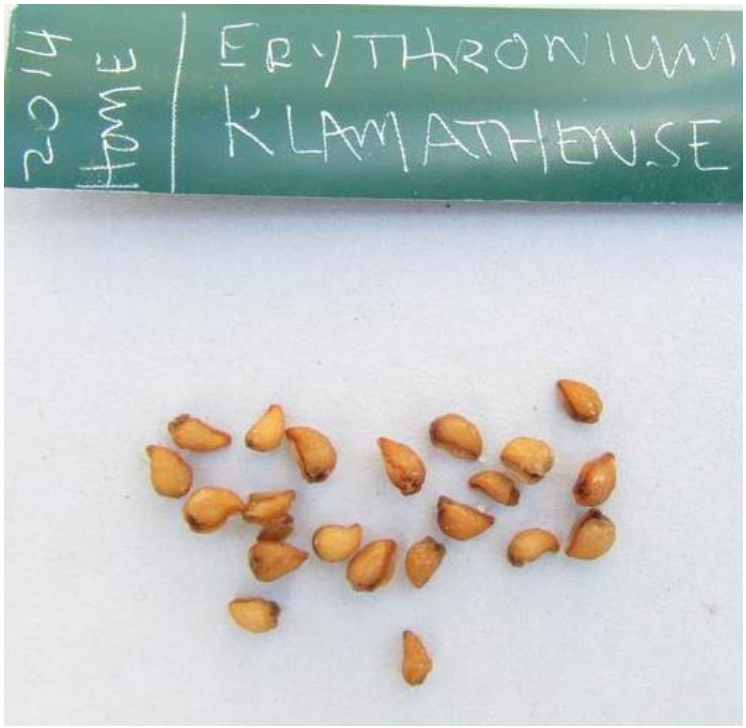


Erythronium klamathense is another species with white flowers which have a yellow centre. The filaments are slender, the pollen can be pale or golden yellow and the style is club shaped or slightly divided in to three at the tip.

Erythronium klamathense

Because of its diminutive size, 10 to 15 cms at flowering, you are unlikely to confuse this species with any other sharing similar colouring.
Up to three flowers per stem can be produced on a mature bulb.

Seed



Seed is set in the garden most years.

Bulb

Erythronium klamathense bulbs

Being one of the smaller species the bulbs are similarly smaller than most others but have the familiar shape.

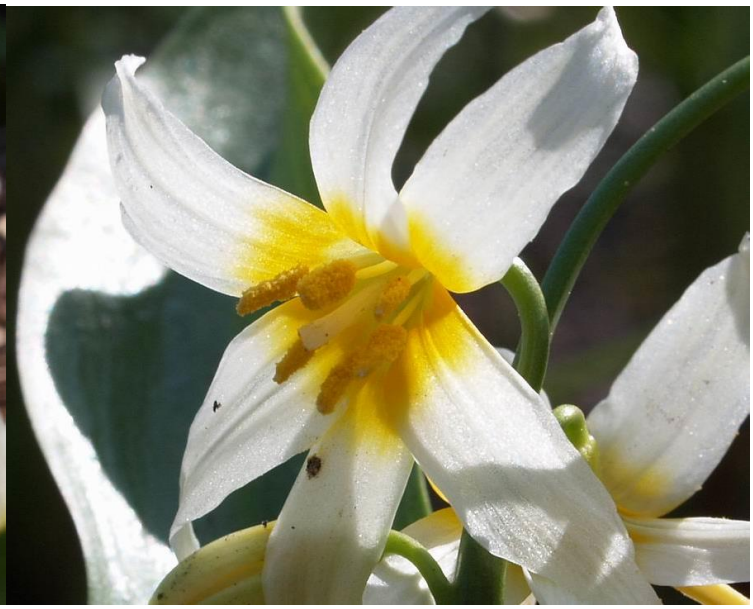
Erythronium klamathense leaves

The leaves of this species are plain green.

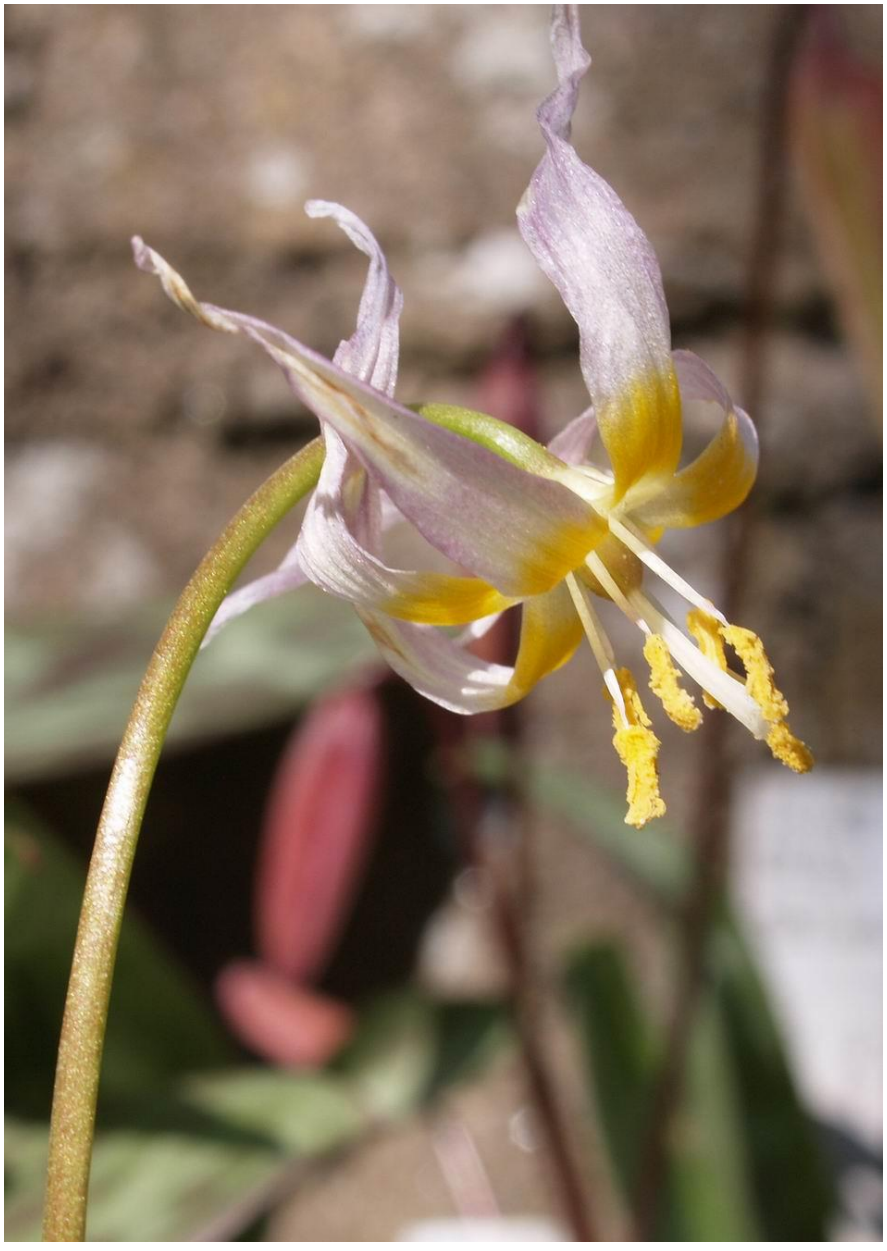
Due to its small stature you have to choose carefully where you plant this species – it is ideally suited to a trough or raised bed where you can fully appreciate its simple beauty.
As I do with all species, I grow the original bulbs, raised from wild collected seed, in mesh plunge baskets as a reference stock.

Erythronium klamathense

Erythronium purpurascens



Erythronium purpurascens



Erythronium purpurascens is one of the more challenging species to grow in the garden.
It is a snow-melt species that does not adapt well to our maritime climate with its poorly defined seasons. It may grow better in more Northern gardens where winters are long and cold followed by a warm spring then cool summers.
The plants pictured are our best efforts to grow this small white flowered species. The specific name *purpurascens* refers to the pale purple colour of the flowers as they age.

Flowers

The flowers are white with a yellow centre and there can be one or several on a stem depending on the size of the bulb.

The filaments are long and slender, the pollen pale yellow and the stigma is entire or slightly divided into three.

Unfortunately we have never had a seed set from our own plants to give us the chance of increasing the numbers of this charming species.

Bulb

The bulbs are small for the genus and so far our bulbs have shown no signs of making offsets.

***Erythronium purpurascens* seed**

Leaves

Erythronium purpurascens is a small plant with plain green leaves growing to a maximum height of 10 to 15cms.

Erythronium purpurascens

Erythronium purpurascens growing beside the larger, pink *Erythronium revolutum*.

Erythronium pluriflorum

Erythronium pluriflorum

Erythronium pluriflorum is another species that we find very challenging to grow.

This is a small yellow-flowered species from California where it is found in the south central Sierra Nevada.

This is the first flowering of an immature specimen so it does not necessarily represent the full stature of the plant.
It is recorded that this species can have up to ten flowers per stem.

What can be seen, especially in the detail above, is that the style and filaments are all yellow matching exactly the colour of the petals.
The leaves are plain green and our plants have grown to between 10 to 15cms tall.
We have not had a seed set nor have we had any increase from the few bulbs we originally raised from collected seed.

Erythronium hybrids

ERYTHRONIUMS IN CULTIVATION © Ian Young

The title picture shows ***Erythronium* 'Craigton Cover Girl'** the first hybrid that I named, after its picture appeared on the cover of the Rock Garden, the journal of the Scottish Rock Garden Club Journal, in January 2002. It was an open pollinated self-sown seedling which is likely to be a cross between *Erythronium revolutum* and *Erythronium* 'White Beauty'. It mostly has three pink flowers on a stem and it forms clumps by division almost as readily as that garden stalwart, 'White Beauty'.

There is an increasing number of hybrid Erythroniums becoming available to gardeners which is no bad thing. I think it is impossible to improve upon the beauty displayed by the true species nature provides us with but many of those are not so easy in cultivation, often slow to increase if at all. What the hybrids can bring is plants that will tolerate a wider range of growing conditions as well as bulbs that increase readily by division.
I included *Erythronium* 'White Beauty' under the chapter on *E. californicum,* of which it is believed to be a form, but on the left I show a selected seedling that I raised from the former which has darker marked leaves- I called it ***Erythronium* 'Craigton Beauty'.**

There has been a group of yellow *Erythronium tuolumnense* hybrids around for a very long time - plants such as 'Pagoda','Kondo', 'Citronella' and 'Sundisc' are well known and widely available. They are all easy to grow and the fact that they increase well has allowed them to spread and persist in cultivation for such a long time. Stocks of these are often mixed up and not true to the cultivar name but all offer a plant of similar look and size with yellow flowers, having some degree of red markings towards the centre, over large plain green leaves.

***Erythronium* 'Citronella'**

***Erythronium* 'Susannah'**

For me the two finest yellow *Erythronium* hybrids were raised by the late John Walker and named after his granddaughters.

***Erythronium* 'Susannah' and 'Eirene'** are both of similar size to *Erythronium tuolumnense* but have larger yellow flowers without any red markings. Mature bulbs will have three to five flowers beautifully displayed above the plain green leaves.

***Erythronium* 'Eirene',** above left, has paler flowers than ***E.* 'Susannah'** above right**.**

***Erythronium* 'Minnehaha'**

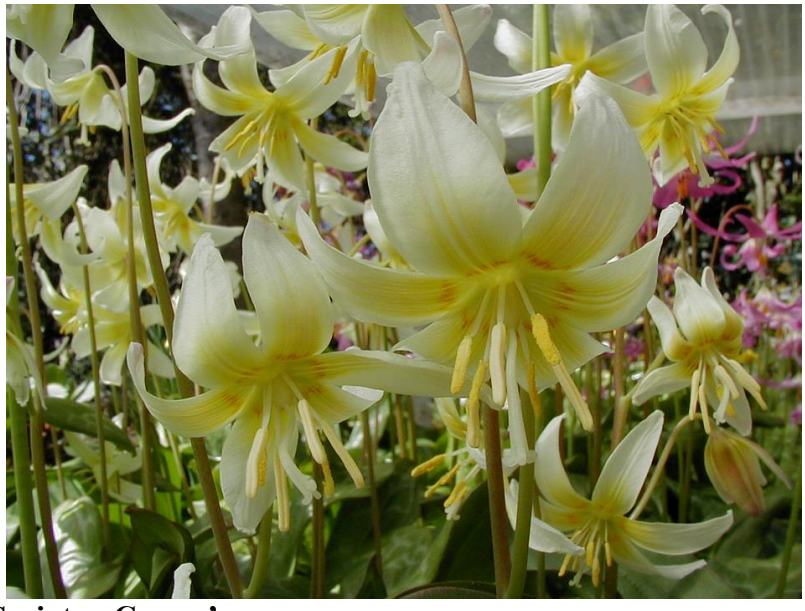
***Erythronium* 'Minnehaha'** is another excellent John Walker hybrid this one being white and probably a hybrid between *E. oregonum* and *E.* 'White Beauty'. All three of these John Walker hybrids are outstanding. Although they do appear on some bulb specialists' lists they are still quite uncommon in cultivation. I hope that in time this will change and that they will all become much more readily available.

***Erythronium* 'Joanna'** was introduced by John Amand and named after his daughter. It is a cross between a yellow flowered *Erythronium tuolumnense* and pink *Erythronium revolutum.* So often such crosses between pink and yellow result in muddy coloured offspring but this is not the case with *Erythronium* 'Joanna' which combines these two colours together to produce a clean, free flowering plant with flowers that have a yellow face with a pink reverse.

***Erythronium* 'Joanna'**

***Erythronium* 'Craigton Cream'**

Most of my attempts at controlled hybridisation of Erythroniums have so far failed with the majority of the hybrids we have occurring spontaneously as seedlings in the garden so their precise parentage is not always clear.
I selected *Erythronium* 'Craigton Cream' from a group of *Erythronium helenae* seedlings and indeed the bent style suggests that species is present in this hybrid.

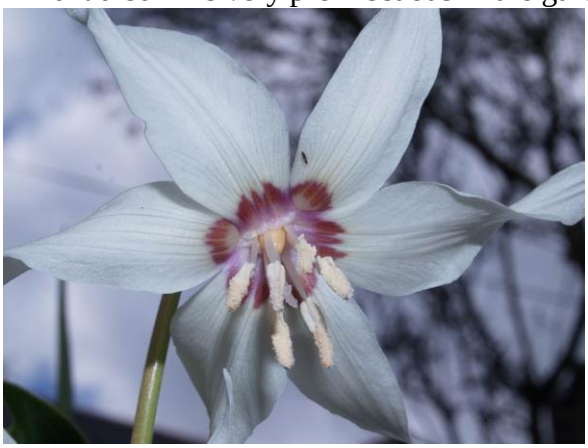


***Erythronium* 'Craigton Cream'**

Erythronium hendersonii* x *Erythronium citrinum

Hybrids are not just something that occurs in cultivation: the above *Erythronium hendersonii* x *Erythronium citrinum* hybrid is of wild origin - found where the two species grow together in Oregon. Hybridisation is an important factor in the evolution of plants –it is thought that a number of the species we know today are the result of a fertile hybrid producing a line of stable offspring, hence a new species evolves. Species that are geographically separated in the wild are brought together in the garden making hybrids much more likely. On the right is a group of ***Erythronium hendersonii*** **seedlings** that I planted out; the taller larger flowered white one is a hybrid.


Erythronium hendersonii is very promiscuous in the garden and we often find evidence of its genes in seedlings.




***Erythronium hendersonii* hybrids**

Pink pollen suggests that these ‘White Beauty’ seedlings may also have Erythronium hendersonii genes.

***Erythronium* 'Ardovie Bliss'**

ERYTHRONIUMS IN CULTIVATION © Ian Young

Erythronium ‘Ardovie Bliss’ is a lovely *Erythronium hendersonii* seedling that occurred in the Scottish garden of Betty Husker and was brought to my attention by Ian Christie.

There has been an increasing number of *Erythronium* hybrids being named and distributed in recent years. Two of the best growers are Susan Band of Pitcairn Alpines in Scotland and Keith Wiley of Wildside Nursery in England both of whom have named a number of excellent Erythroniums.

I do not intend to give a long list of them here as I do not have experience of growing them all. I want to share with you the range of hybrids that are occurring in our garden which are similar in parentage to those offered by the above growers and are the sort of plant you may expect to get if you also grow a number of Erythronium in your garden and allow them to seed.

***Erythronium* ‘Craigton Beauty’**

One of my great joys is inspecting every single *Erythronium* flower in our garden, and we have a lot. It was on one of those detailed inspections that I first discovered ‘Craigton Cover Girl’.

***Erythronium* hybrids**

As an artist you learn to not just look but also to *see* what is in front of you. At first glance all the flowers in the group of *Erythronium* seedlings above look the same.

Look again; more carefully; check the details, as shown on the left, and you should see that some have yellow pollen while in others the pollen is creamy white.

Species and hybrid seed capsules and seed.

Many of the hybrids are fertile and produce seeds - but you will find the number of seeds in a capsule is much less in the hybrid than it is in the species - the top capsule and seed is from a species and that below, from a hybrid. Seedlings from a hybrid can look remarkably similar to the parent unless the pollen came from another different species or hybrid. The following images show some of the many, as yet un-named, hybrids in our garden.
I am putting these through a rigorous trial after which I will select only the best to name.

***Erythronium revolutum* hybrids**

It is not just the beauty of a flower or leaf that makes a good garden hybrid it also has to grow well in a wide range of garden conditions and the bulb has to increase well.

***Erythronium revolutum* hybrids**

A group of self-sown seedlings from *Erythronium revolutum* : most likely they have hybridised, they display a number of flowers, up to nine, on a single stem.

I have yet to decide if this is a desirable feature or not - but it does make them stand out.

***Erythronium revolutum* hybrids**

Other plants in this same group of ***Erythronium revolutum* hybrids** have stunning leaves making them very desirable.
I am now growing the best of these forms on to see how well they will increase – that will dictate whether they are worth naming and distributing or not.

Are there too many *Erythronium* hybrids being named now? No – I think it is important that hybrids are named when they are first distributed. All the plants we have raised and named have the prefix of 'Craigton', after the area of Aberdeen where we garden; this makes it easy to know the origin.

It does not bother me if there are hundreds of Erythronium hybrids being named - time will sort them out.
In ten or twenty years' time many of those being named now may no longer be in cultivation – the ones that have persisted will have passed the best trial of all - that is they have proved that they will grow and increase successfully in a wide range of garden conditions.

***Erythronium* hybrid**